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A HYDROSTATICALLY CONSISTENT NORTH AMERICAN RADIOSONDE DATA BASE AT THE FORECAST SYSTEMS LABORATORY, 1946-PRESENT

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A HYDROSTATICALLY CONSISTENT NORTH AMERICAN RADIOSONDE DATA BASE AT THE FORECAST SYSTEMS LABORATORY, 1946-PRESENT

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ABSTRACT. A data base containing all known upper-air reports for North America has been created at the Forecast Systems Laboratory (FSL). Rawinsonde data acquired from various sources for the period from 1946 to the present were subjected to gross error and hydrostatic consistency checks. The data base was created for two reasons: to satisfy a requirement to support ongoing case studies and climatological research with a conveniently accessible data base located at FSL, and to include data not contained in the data base residing at the National Climatic Data Center (NCDC). This Technical Memorandum describes the creation of the FSL data base and the quality control procedures used. It also includes the methods used to replace parts of the soundings that are missing from the NCDC data, a description of the data access routine, real-time updates to the data base, and station history and inventory information.

1. INTRODUCTION

Vertical distributions of temperature, humidity, and winds are fundamental meteorological observations used in weather forecasting and research. These data are acquired by an instrument known as the radiosonde (or rawinsonde; these terms are used interchangeably in this document), which is sent airborne on weather balloons. Although the radiosonde may eventually be replaced by remote sensing systems, such as the profiler and satellites, it is the benchmark standard for new upper-air observing technologies. Realizing the importance of these data, most governments around the world participate in upper-air observing programs. In North America, the United States has operated a radiosonde observational program continuously since 1937. Observations that are taken by the National Weather Service (NWS) and the U.S. military have extended over the continental United States, Alaska, Hawaii, Canada, Mexico, and the Caribbean.

Upper-air data have been summarized by various methods and published in many places. From 1937 to 1945, statistics were customarily presented for data at constant height intervals above sea level. In 1946, governments around the world converted to a system of measuring upper-air parameters at constant pressure surfaces. The altitudes (heights) of these pressure surfaces are computed and included with the basic observations. Data taken by observation sites under U.S. control have been archived at the National Climatic Data Center (NCDC) in Asheville, North Carolina, since the change to constant pressure in 1946. The NCDC digitizes and performs limited quality control procedures on most original station records of radiosonde observations. These digitized observations are available on magnetic tape (TD6201 series data) approximately 1 year after the original station records are received for processing at NCDC. The TD6201 digital rawinsonde data base contains most observations taken within North America from 1946 to 1970, but it is missing Canadian and selected U.S. military observations taken after approximately 1970. The data base contains no observations from Canada after 1970 because the control of these stations went to the Canadian government. Canadian data are archived and digitized by the Atmospheric Environment Service (AES) in Downsview, Ontario, and are also available at the National Center For Atmospheric Research (NCAR) in Boulder, Colorado. For reasons unknown at the time of this writing, data from most U.S. military locations are no longer archived in TD6201, nor are they digitized by the military. Therefore, to obtain a complete digital archive of historical and real-time rawinsonde data for North America, one must supplement TD6201 data with data from other sources.

Most stations with a regular radiosonde observing program communicate their observations to national meteorological centers around the world over the Global Telecommunication System (GTS). A GTS radiosonde report is a subset of the original station observation that is coded for international dissemination in accordance with World Meteorological Organization (WMO) regulations. GTS data are recorded on magnetic tape by the National Meteorological Center (NMC) in the United States.

There are significant differences between GTS data and NCDC digital data. Each has desirable and undesirable characteristics for use in a research data base. Using either alone in creating an archive for research is undesirable for several reasons. Since NCDC does not receive all observations, digital Canadian data after approximately 1970 must be obtained from the AES or NCAR, and digital military data for certain locations are available only over GTS. NCDC does not include some of the information available in the GTS message, and NCDC data are not available in near or real time. GTS data are not quality controlled, must be decoded, require that users compute the heights of significant pressure levels and the pressures of winds reported at heights defined by the WMO, are of lower resolution, and are more difficult to access than NCDC data.

Realizing the important differences in the availability, quality control, information content, and ease of access of both data sets, FSL decided to create its own radiosonde data base by merging GTS data with NCDC TD6201 data. In addition to providing rawinsonde data for real-time update capability and data from certain military stations that are no longer digitized and archived at NCDC, archived GTS data contain originally transmitted winds, maximum wind, and original tropopause information. Since 1971 NCAR has provided FSL with NCDC TD6201 data and Canadian data. Although GTS data have been available from NCAR, NCDC, and other research organizations since 1960, they are difficult to access because other globally transmitted meteorological data (e.g., surface observations) are usually stored along with the radiosonde data. Fortunately, FSL was able to acquire an easily accessible archive of GTS radiosonde data for 1970 to 1985 from the National Severe Storms Forecast Center (NSSFC). In 1986, FSL began a real-time decoding and archiving system for GTS data, and no longer needs to go outside the laboratory for them.

In this document we discuss how the FSL data base was created, what it contains, what additional quality control procedures are used, and how the data can be accessed. Section 2 discusses the differences between GTS and NCDC radiosonde data. Section 3 describes the principal components of the FSL merged data set, and how the NCDC and GTS data were merged. Section 4 covers the hydrostatic checking and correction procedure that is applied to all the data. The technique is similar to the one previously employed by Inman (1968) at the National Severe Storms Laboratory but is more sophisticated in its application. Examples applying this technique to erroneous data are presented in Section 5. In Section 6, other diagnostic gross error handling procedures are discussed. In Section 7, the data storage and access methods are briefly outlined. It is the ease and flexibility of accessing the FSL data base that distinguishes it from other, similar data bases available elsewhere. Section 8 discusses the data inventories FSL has created. These digitally available inventories provide the researcher a convenient way of determining the availability of data. In Section 9 we describe our effort to establish a digital upper-air station historical file.

Appendix A contains a legend for interpreting the FSL data base format. The user will want to refer to this appendix since the data examples in Sections 2 and 5 use this format. Appendix B (1) lists a period of record inventory, Appendix B (2) gives the station history, and Appendix B (3) gives the station equipment history. To use historical radiosonde data intelligently requires knowledge of station location, elevation, instrumentation, and identification numbers. Before we processed the data and created a station history, there had not been a digital station history for upper air at NCDC. This version of the history is now available at the NCDC. Appendix C shows an example of the hydrostatic checking and correction computer procedure for those interested in software. (The complete code can be obtained. See Appendix C for more information.)

2. A COMPARISON OF GTS AND NCDC DATA

Table 1 contains a typical sounding in its GTS format up to 100 mb that can be decoded using the Federal Meteorological Handbook No 4 (U.S. Departments of Commerce, Defense, and Transportation, 1976). Tables 2 and 3 show the same sounding data decoded and put into the FSL format (see Appendix A), but from

NSSFC and after NCDC processing, respectively. NSSFC decodes the GTS message and computes the heights of significant levels and the pressures of wind levels. Comparing Table 1 or 2 with Table 3 reveals important differences between GTS data and data after processing at the NCDC. These are reviewed below.

2.1. Significant Level Information

There are two reasons why the NCDC data have more significant levels (identifier, first column in Table 3) than the GTS data. First, the NCDC data base has significant-level information at every 50 mb increment, and at 25 mb increments above 200 mb because of a decision to generate this information to satisfy a climatological requirement for 50-mb and 25-mb data. Although there is no documentation on how these levels are computed, we determined that logarithmic interpolation in pressure (log p) is performed to compute the temperature at these levels using the nearest originally measured significant-level or mandatory-level temperatures. The temperature at pressure level n, T_n, is computed from T_h and T_l, the temperature at pressure level P_h and pressure level P_l, according to the following formula:

$$T_n = T_l + (T_h - T_l)\ln(P_n/P_l)/\ln(P_h/P_l). \qquad (2.1)$$

For example, from Table 3, we can confirm that the temperature at 800 mb is 22.3°C by using the temperatures at 833 and 700 mb, 25.4°C and 12.1°C, respectively, in Eq. 2.1. The computed 800 mb height (2051 m) can be obtained by using the hydrostatic equation (described in Section 4) between 833 and 800 mb by employing the temperature at 800 and 833 mb and the height at 833 mb. When there is more than one level to which data are to be interpolated (e.g., given observed data at 833 and 700 mb, NCDC will generate data at 800 and 750 mb), only observed data are used to generate other data (i.e., the 800 mb interpolated data are not used to generate the 750 mb data). For data before 1976, it is impossible to distinguish generated data from real data in the NCDC data base. However, since 1976 generated data are flagged.[1]

The second reason for additional significant-level information in the NCDC data is that NCDC archives high-resolution data recorded at the actual upper-air sites, in accordance with the criteria for selection of significant level outlined in the Federal Meteorological Handbook No. 3 (U.S. Department of Commerce et al., 1981): "At pressures of 300 mb or greater, or the first conventional

[1]Since we acquired the majority of our data from NCAR, where the latest NCDC TD-6201 series data was not received until 1984, none of our data contains the generated data flag. However, as time permits, future updates of our data base will include these flags indicating generated data levels.

tropopause, whichever is reached first, the temperature at any level between two adjacent significant levels should not differ by more than 0.5°C from that obtained by linear interpolation between the two selected levels." Significant levels for the GTS coded messages, however, are selected in accordance with the WMO reporting criteria, which use a departure from linearity of 1.0°C. Criteria differ for data above 300 mb and for relative humidity. The departure from linearity for temperature data above 300 mb is 2°C and 1°C for GTS and NCDC data, respectively. For relative humidity selection, a 10% departure from linearity is applied to GTS data and 5% is applied to NCDC data. The sample sounding in Table 3 shows, in addition to the generated 50 mb data, levels at 595, 554, 321, 175, 174, 142, 122, and 113 mb, which were not included in the GTS data because of the difference in the application of the significant criteria.

NCDC data from before 1970 often contain only generated significant-level information at 50 mb increments up to 200 mb and 25 mb increments up to 100 mb. The actual significant levels used to generate that information, along with original station records, are no longer available. This is an unfortunate situation for the researcher expecting to obtain a full thermodynamic profile of the atmosphere from the archive prior to 1970.

2.2. Wind Data

The NCDC report in Table 3 contains winds at the thermodynamically significant levels. In the original GTS data (Table 1), winds are coded for WMO transmission at "regionally fixed and significant" (PPBB) levels. At NCDC, the winds are received from the observation sites at 1-min balloon ascent intervals (these data are not available in digital form, but they are available on microfilm). These 1-min winds are then interpolated to the thermodynamically significant levels. Figure 1 is an example of the distributions of wind speed with height for the PPBB section of the GTS report and the NCDC interpolated data for the 0000 UTC 11 May 1985 sounding at Oklahoma City, Oklahoma. The inter-polation smooths some of the information contained in the original GTS wind profile. In addition, there are small differences in the mean wind and maximum wind speeds between the two data sources. We compared mean and maximum winds for GTS and NCDC thermodynamic-level winds for approximately 4 days from June 1982 (approximately 600 soundings). Wind speed differences greater than 0.5 knots occurred 63% of the time. Differences greater than 5 knots occurred in 10 soundings.

Interpolating the 1-min wind data to the significant levels makes the number and location of wind levels in the NCDC soundings a function of the number and location of thermodynamically significant levels. Significant wind levels could be omitted if they do not fall near a thermodynamically significant level. Likewise, unnecessary attention may be given to the wind profile if many thermodynamically significant levels fall close to one another.

The original transmission of mandatory-level data (TTAA section of Table 1; data at 1000, 850, 700, 500, 400, 300, 250, 200, 150, and 100 mb) contains a maximum wind ("77" level in the TTAA in Table 1; "8" level in Table 2). This information is transmitted in addition to the PPBB levels because it is common for a maximum wind to occur between prescribed wind reporting levels. This information has been omitted from NCDC data. For the same 600 matched soundings discussed above, the greatest wind speed from the NCDC data often failed to duplicate the actual (GTS) maximum wind. Section 3.2 describes our efforts to acquire the original maximum wind from GTS data and insert it into the NCDC sounding.

2.3. Tropopause Data

The level of the tropopause has been flagged in the NCDC data since 1976; before 1976 this information was omitted. In addition, only the lowest tropopause (sometimes there is more than one) is included. The original computation of the tropopause height is performed using all available information from the rawinsonde, which may or may not get reported as mandatory or significant levels in the GTS transmission of the data. In other words, although a tropopause height can be recomputed from the reported levels supplied by NCDC for data before 1976, the real tropopause height cannot be recreated because unreported data could have been used in computing the original tropopause height. Section 3.3 describes a procedure for estimating a tropopause height to be inserted into the NCDC data when the original tropopause height from GTS data is not available (all data before 1980).

2.4. Mandatory-Level Heights Below the Surface

Information on mandatory-level height below the surface was included in the NCDC data before, but not after, 1970. Section 3.4 describes the procedure by which we calculated these heights hydrostatically. The 1000 and 850 mb heights appearing in Table 3 were added by our processing programs.

2.5. General Differences

Comparisons of GTS data with NCDC data reveal other differences. A sounding is considered hydrostatically consistent when the implied height difference (the thickness) between two adjacent mandatory pressure levels equals the difference of the (reported) heights of the same two levels (see Section 4 for a complete description of hydrostatic computations). For the most part, the NCDC temperature-height data are more consistent, hydrostatically. This is especially true for observations taken before 1970, for which the information was calculated and transmitted by hand rather than by computer. Because computers replaced manual methods after 1980, most of the GTS data are also hydrostatically consistent. In either case, GTS thermodynamic data were not used for the FSL archive unless information was missing from the NCDC archive.

Differences in GTS and NCDC dewpoint depressions are worth noting. A comparison of the dewpoint temperatures in Tables 2 and 3 reveals a U.S. reporting practice in effect since 1973. All relative humidities less than 20% are reported operationally as 30°C dewpoint depressions and are archived at NCDC as 19%. Therefore, if relative humidity is computed from GTS data, it is possible that some of the 30°C dewpoint depressions convert to relative humidities less than 19%. Since all NCDC humidities less than 20% are set to 19%, when they are converted back to dewpoint depression, the dewpoint depression does not match what is contained in the GTS report. Therefore, when processing GTS data, the computer program should set the relative humidity to 19% whenever the dewpoint depression is reported as 30°C, and when processing NCDC data, should set the dewpoint depression to 30°C whenever the relative humidity is 19%. According to Wade (1991), the relative humidity sensor now used on U.S. radiosonde flights is accurate below 19%, and relative humidities of less than 19% could be reported. This reporting practice may change in the near future (Facundo, personal communication).

Neither NCDC nor decoded NSSFC data retain the information about the sounding that is usually transmitted in the GTS message at the end of the TTAA section. This information is referred to as regional or additional information, and it is preceded by the indicator group 51515. In North America, stations report a lifted index (which can be recomputed by the user) and a mean wind, usually for the surface to 5,000 ft and 5,000-10,000 ft MSL. Should the radiosonde instrument fail for any reason, additional coded information appears after the 51515 group to indicate the problem. Information in the TTBB section of the sounding preceded by the group 31313 pertains to the type of radiosonde in use and the actual time it was released; this too is not retained in the NCDC or NSSFC versions. When available, sonde type and reported release time are included in the FSL data base.

3. THE FSL DATA BASE

3.1. General Description

The FSL data base consists of rawinsonde data from 1946 to the present that are available from the sources described in Section 1. Because our research concerns the troposphere and lower stratosphere, data above 100 mb are not included in this archive. As mentioned, we obtained the NCDC data from NCAR because they were available to us at a much lower cost. There are minor problems with NCAR data that should be noted. NCAR, in an effort to keep their archive as up-to-date as possible, acquires data from NCDC in near real time. But NCAR data before 1984 are not the most recent version of NCDC TD-6201 series data, and thus, NCAR data, and subsequently data in our data base from 1976 to 1984, do not contain the tropopause level or the flag that indicates generated significant levels. If we had acquired data directly from NCDC, we could have included these flags where they appeared in the data. In addition, since NCAR in effect acts as another processor of NCDC data before they enter our data base, any errors NCAR may have created (we have yet to find any) become part of our data set. Canadian data also were obtained from NCAR, which receives these data processed by AES.

As mentioned in Section 2, NSSFC was our source of GTS data for 1981 to 1986. Since 1986, FSL has received GTS data directly, and they are checked for quality as described in Section 4. NSSFC runs a decoder through the GTS reports to supply their operational forecasters with an early look at standard-level charts and to process data for local studies. The decoder has problems processing certain real-time data. As a result, the NSSFC data base contains occasional erroneous and incomplete soundings, and Canadian and Mexican data are particularly scarce. Unfortunately, NSSFC data for the 1970s have not been retrieved because they reside on old 7-track tapes, which we cannot read. NSSFC data have not been checked for quality since 1980 because Inman's (1968) original hydrostatic quality control program was not converted to run on their new computer system.

3.2. Merging Originally Transmitted Wind Information

Much of the data after 1980 in the FSL data base contain winds at thermodynamically significant levels (as provided by the NCDC) and at original GTS wind levels, as long as the reported sounding was available in both the NCDC and GTS archives. Wind information at the "6" levels are the originally transmitted GTS winds. Therefore, if winds are given in both the "5" (NCDC significant levels) and "6" levels, duplication, not additional detail, of the wind results.

The process of merging GTS wind data into NCDC data was tricky and deserves some discussion. The most important step in merging two soundings is to verify that they are from the same location and for the same time. The first check is to match the WBAN (Weather Bureau, Army, and Navy) station numbers assigned by NCDC to corresponding WMO numbers, which are the only numbers included with GTS data, by cross-referencing a station historical file. If the station numbers and times match, a final check is done by comparing the data. If the surface-level pressure and temperature are within 1°C and 1 mb, the soundings are considered to be the same. If the data are not already in the NCDC data set, then they are merged into the FSL data base as a new sounding. First, the raw data are input and the wind levels are extracted. Since the pressures for the wind levels must be computed, they are set to missing so they can be recomputed in context of the NCDC sounding data. (The user of the data base can tell if GTS winds were merged into their data by examining the data source parameter, which is set to "2" if merged wind data exist [see Appendix A].)

If a maximum wind level ("77" level in the WMO coded message) is found in the GTS data, it too is merged into the NCDC sounding. The pressure at this level appears in the maximum wind index of the third identification line (see Appendix A) and also in the sounding as the "8" line. However, in cases where the original maximum wind is missing, and for data before 1980 for which we had no other data to merge, the user of the FSL data base will notice an entry for the pressure of the maximum wind in the identification line, but will not see an "8" entry in the data. We objectively searched all the wind data in the sounding and placed the pressure where the greatest wind is found in the identification line. This step gives some information for maximum wind in the identification line for users who may need it "up front" rather than having to search for it in the body of the sounding. When there is an entry for maximum wind and no corresponding "8" line, the pressure of the maximum wind is an estimate and not from the original GTS report.

3.3. Reclaiming and Estimating Tropopause Pressure

As with the maximum wind, NCDC does not retain tropopause data, the "88" level in GTS reports. We merged this information into NCDC thermodynamic data when it is available. However, for data before 1980, and for soundings after 1980 for which we could not find the GTS data, we estimated the pressure of the tropopause and inserted it into the identification line. When a "7" level appears in the data, the tropopause is from the GTS data; otherwise the tropopause pressure found in the identification line has been derived.

We use the WMO definition of the tropopause found in the Federal Meteorological Handbook No. 3 (U.S. Departments of Commerce and Defense, 1981) to compute the tropopause. Since the FSL data base does not include levels above 100 mb, a complete test for the existence of the tropopause may not always be possible. If data in a sounding meet the tropopause criteria, but testing stops because the 100 mb level has been reached, the tropopause index on the identification line will list the derived tropopause as suspect. For more information on the computer code that was used to estimate a tropopause, see Appendix C.

3.4. Adding Heights of Mandatory Pressure Levels Below the Surface

The FSL data base contains heights for all mandatory pressure levels regardless of their elevations, which may fall below the surface elevation of the station. Since 1970, the NCDC has omitted these below-surface heights, which were part of the originally transmitted GTS data. Since it is useful to have these data for completeness, we recomputed missing mandatory-level heights and inserted them into our data base.

The hydrostatic relationship, discussed in detail in Section 4.1, can be used to estimate the height of a mandatory pressure surface when the temperatures at both adjacent levels are known. However, a problem arises when we apply this relationship to estimate the height of a pressure surface when the station pressure is less than the mandatory pressure, because the temperature at the mandatory surface does not exist. Therefore, we cannot apply the hydrostatic relationship directly because its use requires estimation of a fictitious mean virtual temperature. Saucier (1955) explains in considerable detail how the NWS computed the mean virtual temperature for these fictitious layers before 1970 (before computerization). This required averaging a current surface temperature, and a temperature from 6 hours earlier, as part of an estimate for the plateau correction for stations in the Rocky Mountains. Since 1970, the NWS has used the following algorithm to compute the virtual temperature (see Section 4.1 for the definition of the virtual temperature) for the mandatory-level surface that falls below the elevation of the station:

$$T_f = T_{av} + [FF(P_f + T_{av} - P_s - 223.15)], \qquad (3.1)$$

where T_f equals temperature of the mandatory level below the surface (at a pressure, P_f, of 1000 or 850 mb), T_{av} equals the average of the current temperature (K) and the temperature at time t - 12, and P_s equals the surface pressure. The empirically derived constant FF varies according to the variation in average temperature, as shown in Table 4.

We did not apply either of these methods because we did not have the necessary surface temperature observations, and we did not learn of the NWS algorithm until most of our data had already been processed. The user can recompute the heights of mandatory levels below the surface using Eq. 3.1. To do so, the previous sounding or a surface observation at the site is needed for the temperature at t -12. Then simply reapply the hydrostatic equation to calculate the required mandatory pressure surface. In this manner, the user will obtain a mandatory height that is similar to that from above.

Our method of estimating a fictitious temperature below the ground assumes that the current surface virtual temperature, and not some averaged value based on the temperature 6 or 12 hours ago, is sufficient to extrapolate downward below the surface. By doing so, we are ignoring part of the plateau correction included in the formulas previously described. To estimate the fictitious temperature below the ground, we first need to estimate how far under the ground this surface is by estimating the thickness (dz) of the fictitious layer defined by the surface elevation where the station pressure is measured and the mandatory-level surface below the elevation of the station. The dz value can be computed by applying the hydrostatic equation (Eq. 4.4), assuming that the virtual temperature remains constant extrapolating downward. Thus, we use T_s, the virtual temperature of the surface, to approximate the average virtual temperature in the fictitious layer in the expression for dz:

$$dz = (RT_s/G)dp/P_s, \qquad (3.2)$$

where P_s is the pressure at the surface, $dp = -(p_{man} - P_s)$, where p_{man} is either 1000 or 850 mb, R is the gas constant for dry air, and G is the gravity constant. From this estimate of dz we compute a temperature for the mandatory-level surface below the ground using the U.S. Standard Atmosphere lapse rate of $6.5°C\ km^{-1}$.

The next step is to test the accuracy of the dz estimate with Eq. (4.4), using the average of the estimated virtual temperature of the mandatory-level surface and the surface virtual temperature as the mean virtual temperature for the layer, T_{avg}.

In practice, we solve Eq. (4.4) for the pressure of the mandatory-level surface and examine the error based on the dz estimate. With this pressure estimate error (p_{error}), we substitute back (p_{error} is used as dp) into the expression for dz above, and compute how much dz_{error} results because of p_{error}. We subtract this dz_{error} from the previous estimate of the thickness in the layer (to arrive at a new thickness estimate) and recompute a new temperature for the mandatory-level surface below the ground. Once again, the new thickness estimate is used to solve for the pressure at the bottom of the layer in Eq. (4.4). This process is iterated until the thickness of the layer between the surface and the mandatory level below the surface converges. Convergence is archived when the computed pressure at the bottom is equal to the pressure of the mandatory-level surface below the ground (in practice the estimate is considered equal if it is within 0.1 mb). Once the final thickness has been computed, the elevation of the mandatory level below the ground is simply the difference between the surface elevation and the computed thickness. The computer code that performs this iterative process is a subroutine in the hydrostatic check routine (see Appendix C).

4. OBJECTIVE HYDROSTATIC CHECKING AND CORRECTING

All data in the FSL data base are subjected to a hydrostatic error handling procedure that is designed to detect gross inconsistencies between observed temperatures and reported heights. A hydrostatic check cannot detect more serious errors sometimes found in rawinsonde data; for example, if a pressure cell fails, erroneous data may still exhibit hydrostatic consistency. The hydrostatic check is most effective in detecting errors caused by encoding, faulty transmission signals, or incorrect computations. This section outlines the simple theory behind the procedure used in the application programs, much of which is a review of material discussed by Inman (1968).

4.1. Review of Basic Principles and Methodology

One of the best approximations in theoretical meteorology is the hydrostatic equation (Hess, 1959), which states that the vertical pressure gradient force exactly balances the force of gravity; i.e., $dp/dt = -\rho g$, where ρ is density and g is acceleration due to gravity. This equation can be integrated between any two isobaric surfaces, P_1 and P_2, where $P_2 > P_1$ when virtual temperature is substituted for density using the equation of state. The virtual temperature is the temperature of a parcel of dry air having the same total pressure and density as that of the moist air parcel, i.e., an increase in temperature due to the lowering of air density due to water vapor at constant pressure. The following relationship is obtained:

$$H(P_1) - H(P_2) = (R_d/G)T_{av}^{*} \ln(P_2/P_1), \qquad (4.1)$$

where H is the geopotential measured in meters, $R_d = 2.8704 \times 10^6$ erg g^{-1} K^{-1} (gas constant for dry air), G = 980.616 cm s^{-1}, the acceleration due to gravity, and T_{av}^{*} is the mean virtual temperature (K) in the layer.

If the mean virtual temperature in the layer defined by P_1 and P_2 can be calculated, the thickness of the layer can be found. In practice, the virtual temperature is computed using

$$T_{av}^{*} = T_{av}/(1 - 0.622Q_{av}), \qquad (4.2)$$

where Q_{av} is the mean specific humidity in the layer. See Byers (1974) for the derivation.

Above 700 mb, $T_{av}^{*} - T_{av} < 1$ K. Below 700 mb, the effect of moisture is such that T^{*} may differ from T by as much as 5 K (Saucier, 1955). Since our objective is to detect only gross errors, virtual temperatures are used in the hydrostatic checks below 700 mb and regular temperatures are used above that level. If the air temperatures were distributed according to the U.S. Standard Atmosphere in the 500-700 mb layer under saturated conditions, our practice of employing regular temperature and not virtual temperature could produce a 4-m error in the thickness of that layer and, subsequently, a 4-m error in the height of the 500-mb surface.

The mean temperature of a layer can be estimated by

$$T_{av} = (T_1 + T_2)/2. \tag{4.3}$$

When the actual temperature distribution in the layer deviates significantly from linearity, this estimation can introduce large errors into (4.1). This often is the case for deep layers, or layers in which there is a strong temperature inversion. When significant-level data are available in a layer bounded by mandatory levels, a logarithmic weighting scheme (see Section 4.4.2) using the additional temperatures at significant levels provides a better estimate of the mean temperature. However, in most applications, use of Eq. (4.3) is sufficient for gross error detection.

The thickness of any layer can be checked for consistency by evaluating the difference between the value obtained from the reported heights at the levels in question and the value computed from Eq. (4.1). We call the difference the delta (Δ) for that layer:

$$\Delta = H_1 - H_2 - \{[(R_d/G)T_{av}^*] \log_e(P_2/P_1)\}. \tag{4.4}$$

When Δ is large (see Section 4.2), errors can exist in the reported level temperatures, heights, or both.

The Δ's for layers bound by mandatory pressure levels can be computed most readily from the reported temperatures and heights when the terms in Eq. (4.4) are grouped into a coefficient, Co:

$$\Delta = H_2 - H_1 - [Co(T_1 + T_2 + 546.32)], \tag{4.5}$$

where $Co = R_d/G \times \ln(P_2/P_1)$. Thus, each layer defined by mandatory pressure levels has a coefficient proportional to the difference of the natural logarithm of the bounding mandatory pressure levels, as shown in Table 5.

4.2. Delta Calibration

When using Eq. (4.5) to determine inconsistencies between reported temperatures and calculated heights, acceptable differences (or the allowable discrepancy, ε) must be established. If ε is selected too small (i.e., only a few meters), many Δ values will be flagged incorrectly because the method is not exact. Conversely, a large ε allows significant errors to pass undetected.

Inman (1968), in his application of Eq. (4.5), employed a calibration of Δ determined by Robstov, who performed an analysis of vertical temperature profiles in the Soviet Union. Since obtaining the original reference to this work was not practical, we determined typical values of Δ empirically from rawinsonde data observations in North America. It is important to remember that most of these data have been subjected to quality control procedures at NCDC; we anticipated that the Δ values would be small and that they would vary over time owing only to differences in quality control and processing procedures at the NCDC.

We surveyed 7 years of data between 1950 and 1980 (1950, 1955, 1960, 1965, 1970, 1975, and 1980). Four seasonably representative months (January, April, July, and September) were chosen. The distribution of Δ's we found was fairly uniform and varied only slightly from year to year and season to season. In Table 6, we present some statistics from a subset of approximately 1000 soundings in July 1975. The distribution in this table is typical of the different seasons and years surveyed. As anticipated, most of the Δ's are small. Note the rarity of discrepancies greater than 20 m. In general, the number of larger Δ's increases with the height and depth of the layers. These results indicate that, although errors are relatively rare, they do exist in the NCDC-processed data.

Based on this survey, we tried three to four times the absolute standard deviation of Δ as the value for ε. However, extensive testing determined that this value produced many small corrections to data that, upon closer inspection, should not require adjustment. So, we adjusted the ε's upward (values in parentheses in Table 7) to be closer to those developed by Robstov and used by Inman (1968).

4.3 Hydrostatic Checking Procedures

Heights are computed from reported temperatures by starting with observed surface data and proceeding mandatory level by mandatory level, always assuming the information for the bottom of each layer (the surface data for the initial check) is correct. If a surface data error exists, hydrostatic checking is impossible because accurate data are required as a baseline for hydrostatic computations. Therefore, it is essential that the elevation of rawinsonde release point is known and that the correct pressure (baroswitch) and temperature calibrations have been made. In practice, checking surface data is difficult because NCDC does not archive the surface conditions that are part of the sounding observation. Because of their importance, surface data problems are discussed further in Section 4.4.

Equation (4.5) is used to search each sounding for errors in height, temperature, or both, by computing the Δ's for the 10 mandatory pressure layers. The first Δ is computed for the layer bounded by the surface and the first mandatory layer above the surface. The Δ for the layer bounded by the first and second mandatory pressure level above the surface is computed next. This process continues upward until the last Δ, bounded at the top by the 100 mb level, is computed. Errors are detected by searching for two (and only two) consecutive Δ's that exceed ε for their respective layer. When two isolated (the Δ's below and above the two layers in question fall below the allowable ε) consecutive Δ's exceed the ε for their respective layers, the mandatory level in common between the two layers is likely in error. For example, if the Δ's for the 850-700 mb and 700-500 mb levels are both greater than their respective ε's, and the Δ's above and below these two layers are smaller than their respective ε's, the 700 mb level data are probably erroneous. When more than two consecutive Δ's exceed the ε, adjustments to data become difficult to apply with confidence (see Section 4.3.3). On occasion, only an isolated Δ will exceed its ε. This special case is discussed in Section 4.3.2. The method for distinguishing height and temperature errors is described next.

4.3.1. Correcting Heights and Temperatures for Two Consecutive Large Deltas

When two consecutive large Δ's are isolated and are of equal magnitude but opposite sign, then the height of the mandatory level shared by the two layers contains a simple height error (complex height errors are described below). In practice, equal magnitude occurs when the difference in the consecutive Δ's is less than or equal to 20 m. The correction that is applied to the original height is

$$C_h = 1/2\,[\Delta_{(upper)} - \Delta_{(lower)}], \qquad (4.6)$$

where upper and lower indicate the upper and lower layers used in the computation. This type of error is the most common one detected, and the easiest to correct with confidence.

When two consecutive large Δ's have the same sign and magnitudes that are equal proportionals of their respective coefficients, then an error exists in the temperature of the mandatory level common to the two layers. In practice, some tolerance in the definition of proportionality is allowed. The Δ for each layer is divided by its appropriate coefficient (Table 5). If the absolute difference between these quotients is ≤ 1 m, the Δ's are considered proportional to their coefficients. The correction applied to the reported temperature is

$$C_t = 1/2\,[\Delta_{(lower)}/C_{o(lower)} + \Delta_{(upper)}/C_{o(upper)}]. \qquad (4.7)$$

This simple procedure is most effective for detecting and correcting temperatures that carry the wrong sign. Whenever a temperature is adjusted, another check is performed to ensure that a superadiabatic lapse rate has not been created as a result of the change (see Section 4.4.1). When it has been determined that the temperature correction is realistic, the dewpoint temperature is adjusted using the same correction. If the correction is unrealistic because a superadiabatic lapse rate has been created, no correction is made to the reported temperature and the hydrostatic check stops.

When two consecutive Δ's are large but do not appear to be simple errors of the types described above, corrections must be applied to both the temperature and height. If the initial Δ's have opposite signs (but do not meet the criteria for equality), we presume or our experience is that most of the error is probably due to a height error. We then correct the height first, using

$$C_{ht} = [C_o(\text{lower})\,\Delta_{(\text{upper})} - C_o(\text{upper})\,\Delta_{(\text{lower})}] \,/\, [C_o(\text{lower}) + C_o(\text{upper})], \tag{4.8}$$

and the Δ's are recomputed using the corrected height. The new Δ's should have the same sign and be equal proportionals of their coefficients. Equation (4.7) is then applied to correct the temperature. Our experience indicates that most of the correction is accomplished with the initial height adjustment, generally resulting in very little adjustment to the temperature.

If the signs of the initial Δ's are the same, but the values are not proportional to their coefficients, then most of the error is probably due to a temperature error, which we first correct using

$$C_{th} = [\Delta_{(\text{lower})} + \Delta_{(\text{upper})}] \,/\, [C_o(\text{lower}) + C_o(\text{upper})]. \tag{4.9}$$

The Δ's are then recomputed using the corrected temperature, which should yield new Δ's that are nearly equal but opposite in sign. At this point, a small adjustment can be made to the height using Eq. (4.6).

Equations (4.8) and (4.9) can be applied to all situations because they produce results that are equivalent to those of Eqs. (4.5) and (4.6) when they are applied to simple errors not requiring simultaneous adjustment of both heights and temperatures. (When Eqs. [4.8] and [4.9] are applied to simple errors, the recomputed Δ's are nearly zero, requiring no further corrections.) But our correction procedure generally does not apply to Eqs. (4.8) and (4.9) unless initial calculations of the Δ's indicate that using Eqs. (4.5) and (4.6) is inappropriate. This practice eliminates the unnecessary small second adjustments that arise from using Eqs. (4.8) or (4.9).

4.3.2. Correcting an Isolated Error

When computing the Δ's for the 10 layers, it is possible to find a single, isolated Δ that exceeds ε. In this case, the error is most likely because an observer incorrectly computed the relative geopotential thickness between two layers. For example, if the 1000 and 850 mb heights were computed correctly but an error was made computing the 700 mb height, only the 850-700 (not the 700-500) mb Δ will exceed the ε. This incorrect 700 mb height will cause all heights above 700 mb to be in error as well. In our correction procedure, this is treated as a major revision to the original report and is applied only when it is completely safe to do so.

To assure that it is safe, a more stringent test than the one applied to two consecutive Δ's is applied to the isolated large Δ. This test requires that the isolated Δ exceed the ε by 150%. If the Δ exceeds ε, but by less then 150%, the hydrostatic check stops at the layer in question and no further corrections are applied to the sounding. When the Δ exceeds the ε by 150%, the correction made to the top level of the layer and all heights above this level is

$$C_h = -\Delta. \qquad \text{(layer)} \qquad (4.10)$$

In practice, it is desirable to find the cause of the isolated Δ that is inconsistent. Section 4.4 discusses diagnostic tests for superadiabatic lapse rates, superinversions, and inaccurate estimates of the mean temperature that often result in large isolated discrepancies in (4.5).

4.3.3. Uncorrectable Errors: Three or More Consecutive Large Deltas

Soundings containing numerous errors are very difficult to correct. When more than two consecutive Δ's exceed the ε's, it is not safe to apply corrections to the data. For example, if all the 850-700, 700-500, and 500-400 mb Δ's exceed their respective ε's, both the 700-mb data and the 500-mb data are questionable and it is impossible to determine which, if not both, need to be corrected.

As with the isolated large Δ, our objective checking procedure performs additional diagnostics (discussed in Section 4.4) to verify the existence of three consecutive large Δ's. In addition, if any two of the three large Δ's have the characteristics described in Section 4.3.1 that require simple temperature or height corrections, these corrections are attempted and Δ's are recomputed. If the Δ's are successfully reduced by the simple height or temperature correction, the original situation of three large Δ's is thus reduced to the isolated Δ situation.

4.4. Enhancements

Our experiences with the hydrostatic check procedure discussed in Section 4.3 lead us to believe that we needed more sophisticated diagnostic tests on the data than those employed by Inman's original application of the theory. For the most part, these additional tests are performed to ensure that the surface layer Δ computation is correct. These tests also ensure that other Δ's exceeding their respective ε's arise solely from inconsistencies between reported temperatures and calculated heights, and are not due to superadiabatic lapse rates, inversions, or an inaccurate determination of the average mean virtual temperature in a layer. Since it is difficult to safely correct a sounding with more than two consecutive large Δ's with any degree of confidence, and difficult in the case of the isolated large Δ, these additional tests should be applied to these situations as well. The goal is to reduce the Δ for any of the three, resulting in only two consecutive large Δ's, i.e., a more desirable situation, or to eliminate the isolated large Δ altogether.

4.4.1. Checking for Superadiabatic Lapse Rates

When the surface layer Δ exceeds the ε, the objective procedure first checks for a superadiabatic lapse rate (super). The minimum depth of a layer that is checked is 50 mb; a layer is flagged as a super if the temperature decrease with height exceeds 9.8°C km^{-1}. One of the more common errors that this check flags and corrects effectively is an incorrect sign in the temperature for the surface or first mandatory level (often 1000 mb) above the surface. If the surface temperature has the erroneous sign, a super or an inversion is often created. The first test concerns a large surface Δ resulting from a super created by erroneous surface data. In this case, the sign of the surface temperature is reversed (with the additional condition that the absolute value of the temperature from the surface to the first mandatory level above the surface be greater than 20°C; this additional check is a safeguard to ensure that the sign of the temperature and not some other error is truly responsible for the creation of the superadiabatic lapse rate) and the Δ is recomputed. When the incorrect sign is at the mandatory level above the surface, the Δ above the surface Δ would reflect this error as well; i.e., the first two Δ's can have the same sign and equal proportionals to their coefficients if no other error is present. When this is the case, the standard temperature correction, Eq. (4.7), is applied.

The check for a super is also performed before accepting any isolated large Δ (other than the surface layer) or a third consecutive large Δ. Testing is done below and above the layer in question for minimum layers of 50 mb. If a super is found below (above) the layer in question, we try to correct the temperature and height for the bottom (top) level of the isolated erroneous layer. Before accepting any correction, a recheck is performed to see if the super no longer exists and if the recomputed Δ falls below the ε. If the super still exists or the Δ still exceeds the ε, the corrections are not retained and the original data are returned to their positions in the data array.

4.4.2. Applying a Pressure-Weighted Log-Average Temperature Calculation

Our hydrostatic check procedure is not appropriate when the atmosphere's temperature distribution with height varies greatly from linearity. A pressure-weighted log-average technique employing any significant-level data available in the layer is used to determine the mean virtual temperature for the layer if an isolated large Δ is encountered, is in the surface layer, or is the third in a series of large Δ's. By doing so, the magnitude of a Δ is often reduced. This correction often reduces the number of consecutive large Δ's to two, a situation that can be corrected objectively, or eliminates the isolated large Δ.

When the sign of the surface temperature creates an inversion, the procedure is not as simple as setting a limit on the temperature increase with height. Arctic soundings often contain very steep inversions; there is no theoretical constraint on how much temperature can increase with height as there is with a temperature decrease (the autoconvective lapse rate). The checking routine assumes a nonlinear temperature distribution with height and recomputes the mean temperature using a pressure-weighted average temperature by using significant-level data. This often reduces the magnitude of the surface Δ. The computer code that performs this pressure-weighted log-average computation can be obtained by contacting the authors (see Appendix C).

4.4.3. Correcting Significant Level and Wind Level Data

In the introduction, we mentioned that archivers of GTS data must compute heights at significant pressure levels and pressures at WMO-defined wind levels. Only the pressure of significant levels and the height of wind levels are reported in GTS data. Therefore, it is necessary to correct some of these values whenever a correction is made to any mandatory level. This is because these added heights and pressures are computed using the mandatory-level data. For example, if erroneous data are corrected at 500 mb, all significant level heights and pressures at the wind levels between 700 and 500 mb and between 500 and 300 mb must be recomputed.

5. APPLYING HYDROSTATIC CHECKING PROCEDURES

This section provides examples of the techniques discussed in Sections 4.3 and 4.4. In addition, two examples of soundings with errors where no correction could be safely applied are described. These are only a few of the many situations that can be encountered, especially when processing real-time data. The reader is reminded that corrections should be attempted only for errors due to inconsistencies between reported temperatures and calculated heights. Errors resulting from other sources, such as bad pressure cells or thermistors, are not detectable with this procedure.

5.1 Correcting a Sounding with a Simple Height or Temperature Error

Table 8 is a sounding from Chihuahua, Mexico, with a temperature error at 300 mb. The original transmission indicated a 300 mb temperature of -27.7°C. The Δ's computed from the objective hydrostatic checking routine for the 500-300 mb and 300-250 mb layers are -42 and -28 m, respectively. The scheme determined that these Δ's are nearly equal proportions of their respective coefficients (4.21 and 2.67, respectively; the quotients for these layers are 9.97 and 10.41), and the scheme applied a 10°C correction to the original temperature. Based on climatological values for the temperature at 300 mb, it seems quite reasonable that -37°C, not -27°C, was the actual 300 mb temperature.

Table 9 is a sounding with a height error at 850 mb. Note that τηε Δ's for the 1000-850 mb and 850-700 mb layers are the only available ones exceeding the ε's. Their signs are different but their magnitudes are nearly equal (within 20 m), indicating a problem with the height for the level shared between the two layers. The procedure determined that the reported height of 1341 m was too low by 196 m. The sounding is shown before and after to illustrate the effect of the objective procedure when a correction is made to a geopotential height. A correction is necessary for any computed significant-level height and significant wind-level pressure that originally fall in the 1000-850 mb and 850-700 mb layers because these quantities are computed using the 850 mb level height. For example, the wind level at 609 m had its pressure recomputed as 951 mb; the original computation was 943 mb.

5.2. Correcting a Sounding with a Simultaneous Height and Temperature Error

Section 4.3.1 discussed the situation when two successive Δ's exceed the ε's, but do not have magnitudes that would identify the error as a simple single correction to the height or temperature. This occurs when the signs of the two large Δ's are the same and their magnitudes are not equal proportions of their respective layer coefficients, or when their signs are different and their magnitudes are not equal (within 20 m).

Table 10 is a sounding, in which both the height and the temperature are in error at 400 mb. Note that the 500-400 mb and 400-300 mb layer Δ's exceed the ε's and have opposite signs, but are not equal in magnitude. The objective routine recognizes this as a compound error involving a primary correction to the height and a secondary adjustment to the temperature. As the error message displays, 48.6 m was subtracted from the 400 mb height and 4.2°C was added to the temperature. As with any correction to the height, minor adjustments are made to significant-level heights and wind-level pressures for data that fall in the surrounding layers shared by the 400-mb level.

5.3. Recalculating the Pressure-Weighted Log-Average Mean Layer Temperature

Table 11 and Fig. 2 show a sounding taken into a deep arctic inversion, illustrating problems this kind of sounding can cause for computing the surface layer Δ. This sounding contains a marginally high surface Δ of 30 m, i.e., the discrepancy between reported temperatures and heights for the 966-850 mb layer if the 966 mb and 850 mb temperatures of -19.9°C and -0.5°C (the endpoints) are used to compute the mean virtual temperature (-10°C). Using all the available significant-level data at and between 966 and 850 mb (941, 900, and 882 mb) to compute a log-weighted average temperature yields a mean virtual temperature of -2.5°C. This results in a Δ of only 2 m, well within the allowable ε. The net effect is a sounding that passes the hydrostatic check to 100 mb. If this additional recomputation had not been performed, the program would have flagged the surface Δ as exceeding the ε and no further hydrostatic checking would have been possible because of the large surface Δ. The top of the hydrostatic check (flag in the identification line of the archived sounding) would have been set to the surface pressure of 966 mb.

Table 12 and Fig. 3 depict a sounding with an interesting nonlinear temperature distribution between 700 and 500 mb. This is also a good example of a sounding that only appears to have an isolated inconsistent layer (the Δ for the 700-500 mb layer is 28 m, and is surrounded by Δ's of 3 and 0 m). The objective procedure first recomputes the mean virtual temperature in the layer and a new Δ, before concluding it is an isolated inconsistent layer. The log-weighted procedure recomputes the temperature to be -12.7°C, compared with the -15.1°C computed using only the temperatures at the endpoints. The difference in the mean virtual temperatures accounted for a decrease in the Δ from 28 to 4 m. As a result of this recomputation, the objective procedure was able to continue checking to 100 mb and did not apply a correction to data at 700 mb and above, which would have been the case if the recomputed mean virtual temperature had failed to better estimate the real discrepancy in the layer.

5.4. Correcting a Sounding With an Isolated Inconsistent Layer

Table 13 is a sounding with an isolated, inconsistent 700-500 mb layer. The Δ of 46 m exceeds by 50% the ε for this layer and could not be reduced by recomputating the mean virtual temperature for that layer. The objective procedure subtracted 46 m from the heights at 500 mb and above at the mandatory levels. If this sounding had significant levels available, adjustments would have been made to these heights as well. Note that no changes were made to the heights of the wind levels, and thus their pressures, since these heights were originally transmitted data and are not tied to the heights at the surrounding mandatory pressure surfaces.

5.5. Uncorrectable Errors

Table 14 and Fig. 4 show a sounding that contains a superadiabatic lapse rate between 1000 and 850 mb. The Δ for this layer is -27 m. The objective procedure finds that a superadiabatic lapse rates exists and cannot improve the discrepancy in the layer with a better estimation of the mean virtual temperature. This sounding passes the hydrostatic check to 1000 mb, which alerts the user to potential problems with data above 1000 mb.

Table 15 contains mandatory-level data for a sounding in which three consecutive Δ's exceed their respective ε's. In accordance with the discussion from Section 4.3, no correction was made to this sounding and the hydrostatic check terminated at 400 mb. It is obvious to those who are familiar with typical values of standard level heights that the height at 300 mb is in error. However, even though the Δ's of the 400-300 mb and 300-250 mb layers are of opposite sign and quite large, they are not equal in magnitude. In addition, because the large Δ for the 250-200 mb layer suggests that the 250 mb data may also be erroneous, we are unsure about the contribution to the large 300-250 mb layer Δ from 250 mb data. Therefore we cannot assume that the 300-250 mb layer Δ is large only because of erroneous data at 300 mb. As a result of the uncertainty, the program cannot objectively make a correction to the data.

6. GROSS ERROR CHECKS

Gross error checking of the FSL rawinsonde data base covers point data checks, data level checks, and general sounding checks. Most of these checks either remove bad data or set them to missing; however, corrections are attempted when there are sufficient data.

6.1. Point Data Checks

Out-of-range data are the most common point data problem encountered. Pressure, height, temperature, and dewpoint are all checked against the bounds listed in Table 16. If dewpoint values are greater than their corresponding temperatures, both values are set to missing. Dewpoint values are also set to missing if the corresponding temperatures fall below -40°C. This mainly affects Canadian data since their sites do not follow the U.S. convention of cutting off dewpoints when the temperature falls below -40°C. In addition, if the magnitudes of the temperature are out of bounds in the positive sense but not in the negative sense, the sign of the temperature is reversed and later checked hydrostatically.

Other corrections to point data are made on a limited scale and only to satisfy the requirement that all levels have valid heights and pressures. Corrections to missing heights and pressures are made when sufficient real data are available. The hydrostatic equation uses significant-level or mandatory-level data to compute missing heights. In addition, a logarithmic interpolation in pressure using real heights is used to compute missing pressures. Missing pressures are most common in both the significant-level data from NCDC and the wind-level data from NSSFC or FSL GTS reports.

6.2. Data Line Checks

The second type of gross error check is a data line check. Valid pressures and heights are required for all data levels. Those levels that cannot be computed by gross error correction routines are removed. When a duplicate level is detected, the level with greatest number of missing fields is removed. A duplicate level is defined as a level that has the same pressure and level type (surface, mandatory, significant, or wind) as another level within the same sounding.

6.3. General Sounding Checks

Three general sounding checks were also performed. All soundings are required to have mandatory-level data above 700 mb, with one exception: Real-time data whose wind levels are merged with an NCDC sounding are required to have only surface and wind levels. The second type of sounding check, for duplicate soundings, is done by looking at the station and hour fields of the matrix file (see Section 7) from the data-base access files (Fig. 5) for duplicates. Finally, soundings that have fewer than five data levels are removed.

7. DIRECT ACCESS DATA RETRIEVAL

The FSL data base was created on a VAX VMS computer. Removable disk pack technology provides the platform around which the data set was designed. Since the data base was too large to store economically on disks, most of the data were written to magnetic tapes. Using a specialized disk/tape controller (Hierarchical Storage Controller), we can transfer a set of data files (2-4 years) from tape to disk pack in about 3 minutes. That makes the data base quite accessible; however, for convenience, six of the most recent data file sets (1981-1990; older data rotated off as new data are available) are permanently stored on disk packs. As computer storage technology continues to improve and become more economical, we plan to archive the data base on higher density CD-ROMS.

A magnetic tape of FSL data contains 2-4 years of data, depending on the years selected. This limitation was bounded by the physical capacity of the storage media (256 MB per disk pack). With the exception of the first disk pack, which has two sets, or 8 years of data, all the disks have one set of data files. Because the volume of data increases with each year since 1948, we are currently able to store only 2 years of data on a disk pack.

Three files are associated with every physical rawinsonde data base file once it has been transferred from magnetic tape to disk (Fig. 5). The "acc" (access) file and the "mtx" (matrix) file provide random access into the "fil" (data base) file. The acc file contains information on which time periods can be found within the mtx file. The acc file is an unformatted, sequential, fixed-length (4 bytes) record file. Data contained within are read into a fixed size array of dimensions by year (4), by month (12), and by day/hour (62). Each day is divided into two time units: 0000 and 1200 UTC. Any odd hour data (i.e., special observations) between 0000 and 1200 UTC are stored in the 0000 UTC location. Likewise, data from 1200 to 2300 UTC are stored in the 1200 UTC location. Therefore, users who request data for 1500 UTC, for example, can retrieve any data that were available from 1200 through 2300 UTC. In addition, it is possible to access data valid only at synoptic (0000 or 1200 UTC) hour.

The mtx file contains information on every station's physical location in the fil file for any given time period. The mtx file is an unformatted, direct access, fixed-length (12 bytes) record file. Direct access record numbers are obtained from the acc file, which contains the number of records that follow for the specific time period. Data from the mtx file are read into a VAX structure that has three values defined: the record number for the fil file (4 bytes), the WBAN station number (4 bytes), and the hour of the station (2 bytes).

The fil file is an unformatted, direct access, fixed-length (16 bytes) record file. Data from the fil file are read through direct access file numbers provided by the mtx file. There are several different records in the fil file.

As an illustration, a typical access would work with the three types of files as follows. A sounding for WBAN station number 3131 is desired for 0000 UTC 2 January 1982. The accessing routine first copies the contents of the acc file into a working array, to locate which records within the mtx file need to be accessed. A starting record number for the mtx file is then received by the software. The direct access mtx access file can now be read. The first line input from this file contains the number of stations that follow for the requested time period. Successive entries in the mtx column contain the WBAN station number, the hour of the sounding, and the direct access line number, indicating the location of the actual data values in the fil file. The direct access line number given by the mtx entry for station number 3131 (6024) represents the first line of that sounding. A value within that line in the fil file is the number of lines that follow for that sounding. Therefore, once the starting line number for the sounding is known, the rest of the sounding in the fil file is accessible for output.

The station historical file (see Section 9 and Appendix B) plays a vital role for data retrieval. It contains information such as station latitude, longitude, surface elevation, and time period. The only station identification information physically stored in the direct access files are the WBAN station number and the date; therefore, when a sounding is requested, the station historical file must be accessed to obtain specific station identification information. Although a sounding may be in the data base, unless there is information in the station historical file on that station for the date that the data is requested, it will not be possible to access it.

We have a separate station historical file for accessing the data base for two reasons. First, by not storing specific station historical information with every sounding, we are able to save 12 bytes of data for station location information for each sounding, which is a significant saving. Second, since we know that station history continues to change as we receive new data, we want to be able to update the sounding dynamically with the latest station identification information. Therefore, whenever a sounding is accessed, the historical information received will always be the latest. Although the station historical file may have the most accurate sounding location information, it may not match data in the sounding report. We have noticed discrepancies between the station history elevation and the height of the surface level in the sounding. Rather than change the surface height so it agrees with the height from the station history, we let the user determine which value is correct. As our information on station histories continues to improve, this problem will decrease.

8. DATA INVENTORIES AND PROCESSING STATISTICS

8.1. Inventories

There are three types of data inventory for the FSL data base: hourly, period of record, and full data. The hourly inventory file contains the total number of soundings for each reporting time in the data base. Table 17 shows a segment of the period-of-record inventory file, which gives the first and last date that a sounding can be found for all stations in the data base. We have also added the total number of soundings for each station's period of record along with the number of possible soundings, which is the number of days for the period of record multiplied by two, the number of regular observation times per day. (A complete listing of this file is available in Appendix B (2).)

The full-data inventory gives detailed information for every station for any 24-h period. Table 18 illustrates the format of the full inventory of WBAN station number 3131. In this example, San Diego reported at least once a day from 6 June 1956 through 5 April 1980, and there were 17,368 soundings for the period. (You may contact the authors for this type of detailed information about other stations.)

8.2. Processing Statistics

A number of statistics on the FSL data base are kept. Table 19 shows these statistics, valid for the most recent processing of the data. The statistics shown from 1946-1988 are for NCDC data only. The 1989 and 1990 statistics are for real-time GTS data. A time period is defined as a 12-h period starting at 0000 or 1200 UTC.

During the 1950s, approximately 20 stations took observations four times daily. This explains the rise in average number of soundings per time period up until 1957, and then the sudden drop in 1958 when stations changed to two observations per day. In later years, special observations were taken, some of which may have been taken for field experiments. An example of this can be seen in 1979 and 1986, where the "max-snd" field rises well beyond the average. The significant drop in the average number of soundings reported for 1988 can be attributed to the lack of archived Canadian data. The FSL archive, as of this writing, has NCAR-supplied Canadian data up through 1987. The numbers rise again in 1989 and 1990 because Canadian data are available from FSL's GTS data source. More disturbing, though, is the general decline in the average number of soundings since 1977, which probably reflects the general decline in the number of stations taking observations in North America.

The statistics in Table 20 relate to the overall quality of the data set. Percentages were computed for the number of soundings having data up to various mandatory pressure levels, and on how many of these pass the hydrostatic check. For example, in 1960, 99.94% of the soundings went up to at least 700 mb. Overall, the completeness (how high in the atmosphere the sounding has data) of the data looks good. More than 93% of the soundings after 1955 have data up through the 300 mb level, and of these, 93% are hydrostatically consistent to 300 mb. Maximum quality values are highlighted for each parameter. There is little change in the statistics since 1960. Soundings that are not hydrostatically consistent up to 700 mb probably failed the hydrostatic check for the surface layer, probably because the surface height discrepancy discussed in Section 7. It is interesting to note that in recent years there has been a small decline in the number of soundings that are hydrostatically consistent up through 100 mb. The decline in this number since 1985 seems to coincide with the implementation of a fully automated observing system in the United States. We have noted an increase in the number of missing, erroneous, and incomplete soundings for the U.S. network. See Schwartz (1990) and Schwartz and Doswell (1991) for details concerning data quality within the last few years.

9. STATION HISTORICAL DOCUMENTATION

To our knowledge, a comprehensive, complete, and accurate station history for North American upper-air stations does not exist. We have undertaken considerable effort to compile and document as much historical information as possible. This is an ongoing activity, as we continue to learn more about where stations are, where they have been, where they are moving to, how they are identified (WBAN and WMO numbers), and, most important for research, their elevation.

NCDC and others launched similar efforts in the past. Most notable was that of the Weather Bureau in 1964. The document entitled "Key to Meteorological Records and Documentation No. 5.21, History and Catalogue of Upper Air Data for the Period 1946-1960" (U.S. Department of Commerce, 1962) is an excellent early reference for information on U.S.-controlled stations. In addition to providing basic station location, identification, and elevation information, this publication reviews the type of equipment in use from the beginning of the upper-air program in 1937 through the early 1960s. Contact the NCDC for a copy of this document since it is no longer available through the U.S. Government Printing Office and may not be available through your library. This is our and NCDC's primary source of historical information up through 1960.

In 1973, NCDC issued an in-house (unpublished) paper entitled "Historical Documentation of Upper Air Observations of All U.S. Services." We were unable to ascertain how the information in this document was acquired; however, our experience using and checking the information suggests that it is some of the only reliable historical information available through 1973. In addition, it is the only source of information on Canadian upper-air sites that we have found. In 1977, NCDC produced another unpublished, abbreviated upper-air history. This compilation of information relied on handwritten memos, telephone conversations, and official correspondences between NCDC and the reporting sites themselves. Our experience with this publication has not been as favorable as with what was done in 1973.

We were able to obtain only some of the original Weather Bureau A1 forms from the various regions within the NWS. These A1 forms are the official documentation describing station moves, equipment changes, etc., associated with all NWS operational offices. We requested these forms in an attempt to verify the documentation we received from NCDC. The response to our inquiries varied. For example, documentation sent to us from the Western Region was extensive whereas very little was available from the Eastern Region. In addition, a student from the University of Virginia had hand-compiled the previously mentioned telephone memos and correspondence NCDC had saved on summary sheets for each upper air station. It remains a mystery to us what has happened to the documentation the student used and to many of the original A1 forms.

The AES has been contacted concerning the Canadian stations. Although most of the Canadian histories seem to be known in NCDC, there is a problem in identifying the elevations at many of these sites. For example, in the NCAR archive, many of the elevations of the Canadian stations were erroneously identified. In many instances, the elevations of nearby hourly observing sites are used instead of the elevation at the raob observing site. In some instances, these elevations can differ by as much as 100 m. We are working with the AES and NCAR to correct these problems.

The station historical information in Appendix B (2) was compiled by cross-checking all the above-mentioned references. In many instances, we were forced to act as referee when discrepancies arose. In cases where there were more than two sources of information, the majority ruled. Some entries have question marks or comments because we were unable to locate the necessary information to make a valid entry. We hope to eliminate these gaps as we learn more about these histories. Entries have been made for every station we know about that ever took rawinsondes and that are currently taking them. We exclude stations that were open for less than one month and stations that were open only for special observational experiments. Since the station history is a continuing effort, the results we present here are still preliminary. This history can be obtained in digital form by contacting the authors.

9.1. Basic Station Historical Information

The first station historical file contains basic history, i.e., station name, WMO and WBAN identifiers, latitude and longitude, and cross-reference information. Table 21 describes the entries in the digital file (see Appendix B (2). Most stations have multiple entries. A new entry is made for a station when any parameter in the entry is no longer valid, e.g., if a station changed latitude or longitude, station elevation, etc. The dates that appear are the valid times for the current entry, and a 99 for year, month, or day indicates that this information is unknown. A blank ending date indicates that the station is open as of this writing.

Each entry normally is followed by a blank column, but a question mark immediately following an entry indicates that the entry is questionable and should be used with caution. Blanks for three-letter identifiers indicate that we could not determine if the station had one. All stations have WBAN numbers, but not all have WMO numbers. Note that the WBAN number is unique, but the WMO number is not. For example, WMO number 72293 was used for San Clemente Island, California, and is currently used for San Diego (Miramar Naval Air Station), California, but each has its own WBAN number.

To make this history more useful, we tried to track stations that changed location and WBAN number. The number in columns 88-92 is the WBAN number that this station had previously been identified by. The number in columns 94-98 is the WBAN number the station moved to. In this manner, one can follow the relocation of principal observational sites through the years. For a few stations, the entry for the "from" and "to" location is the same. This is not an error. For example, the Oklahoma City, Oklahoma, area station started as WBAN number 13967, moved to 13919, then to 3948, back to 13967, and then back to 3948 again. The WBAN number in columns 100-104 indicates that there is another station that should be referenced when accessing data for this station. In most cases, the cross-referenced station records winds only. If a "W" appears in column 106, this indicates that this station took wind observations only and data for the station may not be in the archive. The comments beginning in column 108 further explain some of the questionable entries and may contain other useful information about the station.

9.2. Equipment Historical Information

The second file contains information we compiled about types of equipment used at the various sites and is listed in Appendix B (3). This information is incomplete for many sites, especially secondary sites, that were not in operation for a long time, and Canadian and Mexican sites. The records that appear in this file are 80 columns long, but are of variable number. For any given station, depending on how many changes to instrumentation were made and what information we were able to acquire for the station, a variable number of lines appear. Table 22 is a description of the entries in this file.

10. CONCLUDING REMARKS

In this memorandum we describe the creation of a complete, research-quality, upper-air data base for North America from 1946 to the present. The most important reason for creating and updating this data base was to support research within FSL and affiliated research organizations. The FSL data base, because of its direct-access format, is well suited to support research requiring long-term access to upper-air data, such as climatological and statistical studies. Because an effort has been made to acquire data not found in NCDC's data base for North America, the FSL data base is also excellent for the researcher interested in individual meteorological case studies requiring a complete set of observations.

Much of the knowledge of upper-air data that has been conveyed here was acquired through working with NCDC data and real-time data for the FSL data base. Because the FSL data base is updated daily with GTS data and eventually with NCDC data, we will continue to become more knowledgeable about these data. As mentioned in Section 9, the station history remains an open-ended project. Interest in the station history for upper air has risen in recent years because climatologists need radiosonde data to investigate scientific issues concerning global warming and climate change. Updated information will be added to the station history as we receive it.

We are also continuing our efforts to acquire data previously thought to be lost and military data that have not been digitized. We consider the acquisition of any historical radiosonde data for the FSL data base a top priority. We are also continuing to cooperate with the NCDC and NCAR so that improvements and corrections to upper-air data can benefit a wide range of users of these data bases. The authors encourage users of the FSL data base to keep us informed about problems and errors in the data so that we can continue to improve the quality of our data for future researchers.

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TABLE 1

GTS RAWINSONDE REPORT
FROM 0000 UTC, 1 AUGUST 1986, FOR DENVER, COLORADO

```
 72469 TTAA  51001 72469 99841 27867 32008 00080 ///// /////
85519 ///// ///// 70191 12056 12514 50591 07960 26032 40761
20561 28047 30967 35980 26548 25091 451// 27051 20237 555//
27055 15417 621// 26550 10664 671// 24015 88129 657// 27540
77184 27567 41521 51515 10164 00052 10194 ///// 05009=

72469 TTBB  5100/ 72469 00841 27867 11833 25466 22700 12056
33647 08464 44621 05659 55537 03761 66513 06557 77481 10365
88459 12362 99444 13580 11367 26159 22353 28164 33278 39780
44222 519// 55129 657// 66113 637// 77100 671//=

PPBB  51000 72469 90067 32008 33508 01007 9089/ 08007 11010
91124 12012 13508 28514 9168/ 29522 26030 92013 26034 26535
29043 925// 28047 9305/ 26548 26549 9425/ 27565 26058 9504/
27540 23515=
```

TTAA: Mandatory level data

TTBB: Significant level data

PPBB: Regional and significant wind levels

TABLE 2

NSSFC DECODED GTS RAWINSONDE REPORT
FROM 0000 UTC, 1 AUGUST 1986, FOR DENVER, COLORADO

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD
4	1000	80	32767	32767	32767	32767
4	850	1519	32767	32767	32767	32767
9	841	1611	278	108	320	8
5	833	1695	254	94	32767	32767
6	820	1828	32767	32767	335	8
6	792	2133	32767	32767	10	7
6	764	2438	32767	32767	80	7
6	737	2743	32767	32767	110	10
4	700	3191	120	60	125	14
6	687	3352	32767	32767	120	12
6	662	3657	32767	32767	135	8
5	647	3845	84	-56	32767	32767
5	621	4182	56	-34	32767	32767
6	614	4267	32767	32767	285	14
6	570	4876	32767	32767	295	22
5	537	5350	-37	-147	32767	32767
6	528	5486	32767	32767	260	30
5	513	5710	-65	-135	32767	32767
4	500	5910	-79	-179	260	32
6	488	6096	32767	32767	260	34
5	481	6211	-103	-253	32767	32767
6	469	6400	32767	32767	265	35
5	459	6571	-123	-243	32767	32767
5	444	6825	-135	-435	32767	32767
6	433	7010	32767	32767	290	43
4	400	7610	-205	-315	280	47
6	399	7620	32767	32767	280	47
5	367	8240	-261	-351	32767	32767
5	353	8520	-281	-421	32767	32767
6	323	9144	32767	32767	265	48
4	300	9670	-359	-659	265	48
5	278	10194	-397	-697	32767	32767
6	259	10668	32767	32767	265	49
4	250	10910	-451	32767	270	51
5	222	11696	-519	32767	32767	32767
4	200	12370	-555	32767	270	55
6	187	12801	32767	32767	275	65
8	184	12945	32767	32767	275	67
6	161	13716	32767	32767	260	58
4	150	14170	-621	32767	265	50
7	129	15091	-657	32767	275	40
6	126	15240	32767	32767	275	40
5	113	15898	-637	32767	32767	32767
6	103	16459	32767	32767	235	15
4	100	16640	-671	32767	240	15

LEV: level type (4=mandatory, 5=significant, 6=wind, 7=tropopause, 8=max wind, 9=surface; 32767 denotes missing or unreported value)

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 3

NCDC ARCHIVE RADIOSONDE DATA
FROM 0000 UTC, 1 AUGUST 1986, FOR DENVER, COLORADO

LEV	PRES	HGHT	TMPC	DEWPT	DIR	SPD
9	841	1611	278	109	320	8
4	1000	49	32767	32767	32767	32767
4	850	1516	32767	32767	32767	32767
5	833	1697	254	88	327	8
5	800	2051	223	88	357	6
5	750	2607	172	81	102	8
4	700	3192	121	57	123	14
5	650	3810	87	-45	154	4
5	647	3848	84	-54	178	2
5	621	4185	56	-37	285	12
5	600	4466	35	-79	294	18
5	595	4533	29	-90	295	18
5	554	5106	-22	-105	277	23
5	550	5164	-25	-112	275	23
5	537	5353	-36	-149	266	25
5	513	5713	-64	-129	260	29
4	500	5913	-78	-176	260	32
5	481	6213	-102	-248	263	35
5	459	6572	-122	-242	279	36
5	450	6723	-129	-283	285	39
5	444	6826	-134	-320	287	41
4	400	7609	-204	-315	278	47
5	367	8239	-261	-349	279	54
5	353	8519	-281	-427	278	52
5	350	8583	-285	-430	278	52
5	321	9195	-324	-477	264	47
4	300	9669	-358	-510	266	48
5	278	10194	-396	-543	264	47
4	250	10912	-451	32767	269	51
5	222	11694	-518	32767	275	49
4	200	12365	-554	32767	270	55
5	175	13208	-598	32767	276	60
5	174	13244	-600	32767	274	58
4	150	14166	-621	32767	264	50
5	142	14505	-617	32767	270	43
5	129	15094	-657	32767	274	39
5	125	15285	-658	32767	273	37
5	122	15433	-659	32767	270	35
5	113	15901	-636	32767	260	21
5	109	16121	-659	32767	254	17
4	100	16643	-670	32767	238	15

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 4

EMPIRICAL CONSTANT USED BY THE NATIONAL WEATHER SERVICE TO COMPUTE HEIGHT OF MANDATORY PRESSURE SURFACE BELOW THE ELEVATION OF A STATION

FF	Condition
0.020	$T_{avg} < 273.15K$
0.025	$273.15K < T_{avg} < 283.15K$
0.030	$T_{avg} > 283.15K$

Table 5

VALUE OF THE COEFFICIENT (Co), PROPORTIONAL TO THE DIFFERENCE OF THE LOG OF BOUNDING MANDATORY PRESSURE LEVELS, USED IN EQUATION 4.5.

Bounding levels (mb)	Co
1000-850	2.38
850-700	2.84
700-500	4.93
500-400	3.27
400-300	4.21
300-250	2.67
250-200	3.27
200-150	4.21
150-100	5.94

TABLE 6

DISTRIBUTION OF ALLOWABLE DISCREPANCIES (DELTAS) FOR LAYERS BOUNDED BY THE INDICATED MANDATORY LEVELS. APPROXIMATELY 1000 SOUNDINGS TAKEN FROM July 1975 WERE SURVEYED. (ALL DATA ARE IN METERS.)

	Layer (x 10 mb)								
	100/85	85/70	70/50	50/40	40/30	30/25	25/20	20/15	15/10
Sample size	999	1000	994	985	976	972	965	951	943
Mean alg. error	3.8	2.1	3.4	1.6	0.5	0.0	-1.3	-2.3	-10.3
Mean abs. error	5.4	3.8	6.0	2.3	2.3	1.0	2.1	5.6	12.5
Abs std. dev.	4.8	3.6	4.5	1.8	2.3	1.1	2.9	4.9	-9.3
Distribution									
<1	287	255	240	353	459	653	618	358	247
1-5	384	589	384	584	449	312	263	256	138
6-10	207	189	249	48	60	6	64	216	154
11-15	89	26	89	0	8	1	18	82	170
16-20	25	5	25	0	0	0	2	31	103
21-25	4	4	5	0	0	0	0	8	56
26-30	3	2	0	0	0	0	0	0	43
31-35	0	0	2	0	0	0	0	0	14
36-40	0	0	0	0	0	0	0	0	7
41-45	0	0	0	0	0	0	0	0	6
46-50	0	0	0	0	0	0	0	0	2
>50	0	0	0	0	0	0	0	0	1

TABLE 7

ABSOLUTE VALUE OF ALLOWABLE DISCREPANCIES (DELTAS) FOR EACH MANDATORY LAYER (FROM RUBSTOV AND ADAPTED BY INMAN, 1968). NUMBERS IN PARENTHESIS ARE VALUES USED BY THE FSL OPERATIONAL HYDROSTATIC CHECKING ROUTINE.

Layer (mb)	Delta (m)
1000-850	25 (21)
850-700	30 (20)
700-500	40 (25)
500-400	30 (20)
400-300	35 (20)
300-250	35 (20)
250-200	40 (25)
200-150	45 (30)
150-100	50 (35)

TABLE 8

DECODED GTS RAWINSONDE REPORT FROM 1200 UTC, 2 MAY 1990, FOR CHIHAUHUA, MEXICO (WMO STATION 76225), DEPICTING A SIMPLE TEMPERATURE ERROR AT 300 MB. ONLY THE DATA AND DELTAS (VALUE FOR EACH DELTA SHOWN AT TOP OF LAYER) SURROUNDING THE ERRONEOUS DATA ARE SHOWN. CORRECTIVE ACTION TAKEN BY THE HYDROSTATIC CORRECTION SCHEME SHOWN BELOW.

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD	DELTA
4	400	7450	-221	-521	250	47	-2
6	390	7620	32767	32767	250	49	
5	368	8057	-265	-271	32767	32767	
6	359	8229	32767	32767	250	71	
5	358	8255	-277	-357	32767	32767	
5	336	8707	-315	-405	32767	32767	
5	332	8791	-323	-359	32767	32767	
5	322	9006	-335	-345	32767	32767	
6	315	9144	32767	32767	255	74	
4	300	9500	-277	-289	260	74	-42
6	252	10668	32767	32767	260	91	
4	250	10730	-475	32767	260	92	-28
6	220	11582	32767	32767	255	98	
8	219	11584	32767	32767	255	98	
4	200	12170	-595	32767	255	90	4

76225 1990 MAY 1 1200 UTC; ERROR AT 300 MB
-10.2 DEG ADDED NEW TEMP= -378

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 9

DECODED GTS RAWINSONDE REPORT FROM 1200 UTC, 2 JANUARY 1984, FOR QUILLAYUTE, WASHINGTON, SHOWN BEFORE AND AFTER (BOTTOM) HYDROSTATIC CORRECTION OF THE HEIGHT AT 850 MB. ONLY THE DATA AND DELTAS (THE VALUE OF EACH DELTA SHOWN AT THE TOP OF EACH LAYER) SURROUNDING THE ERRONEOUS DATA ARE SHOWN. NOTE THE CORRECTIONS TO THE HEIGHTS OF THE SIGNIFICANT LEVELS AND PRESSURES OF THE WIND LEVELS BETWEEN 1000 AND 850 MB AND 850 AND 700 MB.

--- BEFORE ---

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD	DELTA
9	1017	56	88	82	170	12	
4	1000	196	76	69	170	21	
6	985	304	32767	32767	170	29	
6	943	609	32767	32767	180	36	
5	933	684	58	47	32767	32767	
6	903	914	32767	32767	215	37	
5	873	1152	72	60	32767	32767	
6	865	1219	32767	32767	245	40	
5	859	1266	88	75	32767	32767	
4	850	1341	80	67	245	45	-198
6	806	1828	32767	32767	245	51	
6	779	2133	32767	32767	245	53	
6	754	2438	32767	32767	245	61	
6	729	2743	32767	32767	245	59	
4	700	3115	-7	-41	245	60	194
6	653	3657	32767	32767	245	62	
6	604	4267	32767	32767	245	58	
6	558	4876	32767	32767	245	73	
6	537	5181	32767	32767	250	82	
4	500	5730	-157	-217	245	70	4

--- AFTER ---

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD
9	1017	56	88	82	170	12
4	1000	196	76	69	170	21
6	987	304	32767	32767	170	29
6	951	609	32767	32767	180	36
5	933	765	58	47	32767	32767
6	916	914	32767	32767	215	37
6	883	1219	32767	32767	245	40
5	873	1310	72	60	32767	32767
5	859	1444	88	75	32767	32767
4	850	1537	80	67	245	45
6	820	1828	32767	32767	245	51
6	790	2133	32767	32767	245	53
6	761	2438	32767	32767	245	61
6	733	2743	32767	32767	245	59
4	700	3115	-7	-41	245	60
6	653	3657	32767	32767	245	62
6	604	4267	32767	32767	245	58
6	558	4876	32767	32767	245	73
6	537	5181	32767	32767	250	82
4	500	5730	-157	-217	245	70

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 10

DECODED GTS RAWINSONDE REPORT FROM 0000 UTC, 21 JUNE 1990, FOR HUNTINGTON, WEST VIRGINIA, SHOWN BEFORE (TOP) AND AFTER (BOTTOM) HYDROSTATIC CORRECTION TO BOTH THE HEIGHT AND TEMPERATURE AT 400 MB. ONLY THE DATA AND DELTAS (SHOWN AT THE TOP OF EACH LAYER) SURROUNDING THE ERRONEOUS DATA ARE SHOWN.

--- BEFORE ---

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD	DELTA
4	500	5820	-69	-115	265	52	12
6	482	6096	32767	32767	270	56	
5	448	6669	-109	-179	32767	32767	
4	400	7530	-169	-269	270	52	62
6	395	7620	32767	32767	270	52	
6	363	8229	32767	32767	270	49	
5	348	8559	-245	-291	32767	32767	
6	320	9144	32767	32767	260	49	
4	300	9630	-325	-425	260	50	-31
5	278	10161	-371	-441	32767	32767	
5	276	10208	-561	32767	32767	32767	
6	256	10668	32767	32767	245	53	
4	250	10830	-623	32767	245	55	-6

--- AFTER ---

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD
4	500	5820	-69	-115	265	52
6	483	6096	32767	32767	270	56
5	448	6673	-109	-179	32767	32767
4	400	7531	-157	-227	270	52
6	395	7620	32767	32767	270	52
6	364	8229	32767	32767	270	49
5	348	8566	-245	-291	32767	32767
6	321	9144	32767	32767	260	49
4	300	9630	-325	-425	260	50
5	278	10161	-371	-441	32767	32767
5	276	10208	-561	32767	32767	32767
6	257	10668	32767	32767	245	53
4	250	10830	-623	32767	245	55

72425 1990 JUNE 21 00 UTC BOTH T AND H CORR AT 400MB
4.2 DEG ADDED NEW T= -15.7 DEG -48.6M ADDED NEW HT= 7531 M

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 11

DECODED GTS RAWINSONDE REPORT FROM 0000 UTC, 1 JANUARY 1984, FOR FORT NELSON, B.C., CANADA (SEE FIG. 2), ILLUSTRATING THE EFFECT OF A STRONG TEMPERATURE INVERSION ON THE CALCULATION OF THE SURFACE LAYER (966-850 MB) DELTA. ONLY DATA SURROUNDING THE SURFACE LAYER ARE SHOWN.

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD
4	1000	124	32767	32767	32767	32767
9	966	379	-199	-225	0	0
5	941	579	-71	-77	32767	32767
5	900	933	24	-66	32767	32767
5	882	1097	22	-68	32767	32767
4	850	1395	-5	-95	270	26
5	750	2379	-99	-144	32767	32767
5	702	2886	-135	-195	32767	32767
4	700	2908	-137	-197	300	29

***** Surface Delta Computation *****
30 m Using simple mean virtual temp of -10.0
2 m Using log average mean virtual temp. of -2.5

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 12

DECODED GTS RAWINSONDE REPORT FROM 1200 UTC, 1 JANUARY 1984, FOR WASHINGTON, D.C. (SEE FIG. 3), ILLUSTRATING THE EFFECT OF A NON-LINEAR TEMPERATURE DISTRIBUTION UPON THE CALCULATION OF THE 700-500 MB DELTA. ONLY DATA AND DELTAS (VALUE OF EACH DELTA SHOWN AT THE TOP OF EACH LAYER) SURROUNDING THE NON-LINEAR TEMPERATURE DISTRIBUTION ARE SHOWN.

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD	DELTA
4	850	1569	-51	-151	330	15	3
5	834	1718	-59	-129	32767	32767	
5	825	1804	-57	-357	32767	32767	
6	822	1828	32767	32767	305	18	
5	814	1909	-41	-181	32767	32767	
5	794	2106	-47	-80	32767	32767	
6	791	2133	32767	32767	305	19	
6	761	2438	32767	32767	310	21	
6	732	2743	32767	32767	310	23	
5	717	2902	-101	-103	32767	32767	
5	707	3012	-79	-81	32767	32767	
4	700	3089	-83	-85	305	28	3
5	682	3291	-83	-92	32767	32767	
5	669	3442	-71	-131	32767	32767	
6	651	3657	32767	32767	305	28	
5	627	3945	-103	-153	32767	32767	
6	626	3962	32767	32767	305	22	
5	614	4107	-93	-243	32767	32767	
6	601	4267	32767	32767	310	18	
6	555	4876	32767	32767	325	22	
6	533	5181	32767	32767	325	21	
4	500	5660	-219	-379	315	23	28*
6	471	6096	32767	32767	310	27	
5	467	6158	-251	-551	32767	32767	
6	451	6400	32767	32767	305	29	
4	400	7260	-347	-497	310	33	0

*700-500 mb delta computed from simple mean temperature of -15.1 = 28 m
computed from log average temperature of -12.7 = 4 m

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 13

DECODED GTS RAWINSONDE REPORT FROM 0000 UTC, 4 MARCH 1981, FOR MONETT, MISSOURI, DEPICTING AN ISOLATED INCONSISTENT LAYER AT 500 MB. DATA AND DELTAS (VALUE OF EACH DELTA SHOWN AT THE TOP OF EACH LAYER) SURROUNDING 500 MB SHOWN BEFORE (TOP) AND AFTER (BOTTOM) SUCCESSIVE CORRECTION OF 46 M IS APPLIED TO MANDATORY LEVEL HEIGHTS AT AND ABOVE 500 MB.

--- BEFORE ---

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD	DELTA
4	700	2998	-9	-9	205	24	3
6	669	3352	32767	32767	200	17	
6	644	3657	32767	32767	205	19	
6	596	4267	32767	32767	215	25	
6	552	4876	32767	32767	220	27	
6	531	5181	32767	32767	220	31	
4	500	5650	-165	-415	225	36	46
6	471	6096	32767	32767	235	45	
4	400	7300	-257	-279	245	71	3
6	399	7315	32767	32767	245	72	
6	382	7620	32767	32767	245	72	
6	308	9144	32767	32767	255	79	
4	300	9320	-419	32767	255	83	3

--- AFTER ---

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD
4	700	2998	-9	-9	205	24
6	669	3352	32767	32767	200	17
6	644	3657	32767	32767	205	19
6	596	4267	32767	32767	215	25
6	552	4876	32767	32767	220	27
6	531	5181	32767	32767	220	31
4	500	5604	-165	-415	225	36
6	471	6096	32767	32767	235	45
4	400	7254	-257	-279	245	71
6	399	7315	32767	32767	245	72
6	382	7620	32767	32767	245	72
6	308	9144	32767	32767	255	79
4	300	9274	-419	32767	255	83

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 14

DECODED GTS RAWINSONDE REPORT FROM 0000 UTC, 1 JANUARY 1984, FOR GUAYMAS, MEXICO (SEE FIG. 4) DEPICTING A SUPERADIABATIC LAYER BETWEEN 1000 AND 850 MB. DATA AND DELTAS (THE VALUE OF EACH DELTA IS SHOWN AT THE TOP OF EACH LAYER) ONLY SHOWN SURROUNDING THE SUPERADIABATIC LAYER.

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD	DELTA
9	1013	12	228	8	305	11	
4	1000	123	310	90	305	13	-3
6	979	304	32767	32767	305	16	
6	944	609	32767	32767	305	9	
6	911	914	32767	32767	160	2	
6	879	1219	32767	32767	170	3	
5	859	1416	118	-182	32767	32767	
4	850	1503	124	-176	265	2	-27
5	841	1592	132	-168	32767	32767	
6	817	1828	32767	32767	325	3	
6	788	2133	32767	32767	295	6	
6	759	2438	32767	32767	290	12	
6	732	2743	32767	32767	285	14	
4	700	3111	38	-262	285	15	8

PRES: Pressure (mb)
HGHT: Height (m)
TEMP: Temperature (tenths Celsius)
DEWPT: Dewpoint temperature (tenths Celsius)
DIR: Wind direction (degrees)
SPD: Wind speed (knots)

TABLE 15

DECODED GTS RAWINSONDE REPORT FROM 0000 UTC, 1 JANUARY 1981, FOR FORT NELSON, B.C., CANADA, ILLUSTRATING THREE CONSECUTIVE LARGE DELTAS FOR WHICH NO HYDROSTATIC CORRECTION COULD BE APPLIED. (VALUE FOR EACH DELTA SHOWN AT THE TOP FOR EACH LAYER).

LEV	PRES	HGHT	TEMP	DEWPT	DIR	SPD	DELTA
4	1000	274	32767	32767	32767	32767	
9	986	379	-221	-245	20	4	
4	850	1517	-3	-103	290	16	-7
4	700	3060	-57	-167	295	37	5
4	500	5630	-205	-315	315	52	7
4	400	7240	-325	-425	310	66	-2
4	300	2180	-489	32767	300	48	-7019
4	250	10580	-593	32767	300	54	7230
4	200	11740	-707	32767	300	58	-200
7	192	11980	-729	32767	300	58	
4	150	13460	-633	32767	295	54	-17
8	102	15859	32767	32767	290	69	
4	100	15960	-593	32767	290	68	-16

TABLE 16

GROSS OUT-OF-RANGE POINT ERROR CHECKS PERFORMED BY FSL FOR PROCESSING RADIOSONDE DATA

Parameter	Acceptable Bounds
Pressure (mb)	0 < pres < 1085
Height (m)	-250 < hght < 25000
Temperature (C)	-90 < temp < 50

TABLE 17

SEGMENT OF THE PERIOD OF RECORD INVENTORY (THE FULL INVENTORY IS SHOWN IN APPENDIX B.)

	FROM			TO					
WBAN #	DY	MO	YR	DY	MO	YR	NUMBER	#POSS	PERCENT
3109	11	AUG	1951	5	NOV	1955	1831	3095	59
3120	9	JUL	1957	31	OCT	1958	1878	8264	23
3121	18	APR	1957	28	SEP	1957	591	326	181
3123	21	JUL	1954	15	OCT	1954	192	173	111
3124	4	JAN	1955	30	JUL	1971	6571	12107	54
3125	1	JUL	1955	27	JUL	1971	7166	11742	61

TABLE 18

EXAMPLE FROM FULL RADIOSONDE INVENTORY FILE

3131 72290 SAN DIEGO MONTGOMERY CA US 32.82 117.13

-- START --			---- END ---			
yr	mo	dy	yr	mo	dy	number
1956	6	16	1980	4	5	17368
1980	4	7	1980	4	9	4
1980	4	11	1987	8	21	5355
1987	8	25	1987	8	25	2
1987	8	27	1987	9	4	18
1987	9	6	1988	1	2	233
1988	1	4	1989	1	3	722
1989	1	5	1989	1	20	30
1989	1	23	1989	3	29	130
1989	4	1	1989	6	7	132
1989	6	10	1989	6	13	8
1989	6	15	1989	6	18	6
1989	6	20	1989	7	27	75
1989	7	31	1989	8	31	62

TABLE 19

GENERAL FSL RADIOSONDE DATA BASE STATISTICS (MAXIMUM NUMBER IN EACH COLUMN IS UNDERLINED.)

year	Max-snd	av-snd	max-lvl	av-lvl	num-snd	num-lns	size (MB)
1946	16	9.4	22	18.4	6844	132867	2.13
1947	22	12.4	22	18.8	9045	169672	2.71
1948	100	84.7	36	21.5	61822	1327115	21.23
1949	113	94.9	35	21.4	69278	1483069	23.73
1950	129	112.4	39	22.1	82017	1811357	28.98
1951	137	127.3	41	22.9	92901	2129806	34.08
1952	149	132.2	44	24.1	94778	2326968	37.23
1953	170	150.5	41	25.4	109855	2785829	44.57
1954	166	145.0	45	25.6	105817	2712442	43.40
1955	181	156.8	42	25.8	114465	2952912	47.25
1956	186	166.4	39	26.6	121449	3229784	51.68
1957	199	169.0	41	28.4	123390	3504979	56.08
1958	171	148.2	43	29.0	108220	3138991	50.22
1959	167	145.0	48	29.5	105879	3127079	50.03
1960	168	140.8	45	29.6	102808	3046366	48.74
1961	169	142.9	43	27.7	104318	2888744	46.22
1962	166	151.0	44	27.7	110204	3054534	48.87
1963	169	150.6	42	27.7	109947	3044619	48.71
1964	174	153.6	44	27.9	112107	3125691	50.01
1965	175	153.3	46	27.9	111914	3125379	50.00
1966	171	151.9	44	28.2	110884	3125323	50.00
1967	168	151.4	53	30.7	110510	3392068	54.27
1968	170	151.1	48	30.8	110315	3394745	54.32
1969	167	149.9	67	32.7	109428	3583436	57.33
1970	171	143.6	69	34.9	104817	3656928	58.51
1971	173	144.2	67	36.9	105292	3882890	62.13
1972	142	135.7	69	39.4	99060	3905846	62.49
1973	155	138.8	87	40.0	101307	4053727	64.86
1974	158	141.4	85	40.3	103235	4163829	66.62
1975	175	146.9	81	40.4	107253	4336164	69.38
1976	166	147.2	80	41.3	107438	4437197	71.00
1977	181	147.6	80	42.1	107747	4535853	72.57
1978	182	147.4	81	40.7	107624	4375022	70.00
1979	225	145.4	75	41.0	106115	4350559	69.61
1980	174	141.6	81	41.6	103392	4302906	68.84
1981	164	139.9	78	42.6	102147	4354046	69.66
1982	159	136.8	77	43.3	99830	4325498	69.21
1983	154	136.7	84	43.5	99770	4345532	69.53
1984	182	135.9	84	43.9	99195	4353133	69.65
1985	180	138.8	83	43.8	101340	4439036	71.02
1986	260	137.1	91	43.3	100112	4331520	69.30
1987	146	133.3	90	42.6	97327	4149044	66.38
1988	123	104.4	87	40.9	76247	3118267	49.89
1989	172	119.7	88	45.3	87412	3956357	63.30
1990	152	122.4	91	47.4	89322	4233172	67.73

Max-snd	maximum number of soundings per time period
av-snd	average number of soundings per time period
max-lv	maximum number of levels for any sounding
av-lv	average number of levels per sounding
num-snd	total number of soundings for the year
num-lns	total number of lines for the year
size	size (MB) of the file for the year

TABLE 20

FSL RADIOSONDE DATA BASE STATISTICS SHOWING SOUNDING COMPLETENESS AND HYDROSTATIC QUALITY. VALUES ARE PERCENTAGES OF THE TOTAL OF NUMBER OF SOUNDINGS FOR EACH YEAR. (MAXIMUM VALUES IN EACH COLUMN ARE UNDERLINED.)

	Sounding Completeness				Hydrostatic Balance			
year	700MB	500MB	300MB	100MB	700MB	500MB	300MB	100MB
1946	98.63	92.14	73.71	17.31	80.76	75.61	59.66	13.65
1947	98.68	91.43	67.98	13.09	76.87	70.98	50.66	10.03
1948	99.70	97.32	89.49	34.20	91.47	89.09	82.13	32.32
1949	99.56	96.83	88.63	34.72	93.36	90.61	82.84	33.36
1950	99.79	97.44	90.84	48.75	94.06	91.65	85.24	46.31
1951	99.82	98.06	92.84	59.10	93.78	91.96	86.78	56.22
1952	99.79	97.85	92.74	66.43	94.32	92.23	87.01	62.74
1953	99.86	98.10	94.19	71.60	96.06	94.17	90.06	68.51
1954	99.91	98.71	95.70	74.69	97.04	95.63	92.27	71.79
1955	99.90	98.94	96.69	81.04	97.05	95.85	93.27	77.52
1956	99.90	98.79	96.46	82.01	96.78	95.49	92.80	78.12
1957	99.92	99.30	98.07	85.77	97.12	96.34	94.78	82.10
1958	99.93	99.57	98.96	91.01	96.05	95.45	94.51	86.18
1959	99.93	99.64	98.93	91.63	96.03	95.59	94.64	86.92
1960	99.94	99.76	99.27	93.34	96.32	96.06	95.34	88.85
1961	99.93	99.70	98.35	93.55	95.29	94.94	93.45	88.40
1962	99.88	99.69	99.13	94.23	96.61	96.34	95.71	90.48
1963	99.91	99.76	99.37	95.26	95.52	95.29	94.81	90.43
1964	99.85	99.57	99.17	95.53	95.52	95.21	94.76	91.16
1965	99.89	99.50	99.07	95.76	97.04	96.69	96.20	92.87
1966	99.94	99.60	99.18	95.91	97.43	97.23	96.77	93.44
1967	99.95	99.74	99.18	95.67	97.57	97.35	96.75	93.22
1968	99.95	99.72	99.10	95.71	97.71	97.43	96.71	93.35
1969	99.90	98.44	98.14	94.72	98.05	96.54	96.15	92.68
1970	99.84	97.48	96.96	93.82	98.88	96.51	95.91	92.69
1971	99.81	95.08	94.60	90.82	98.88	94.15	93.60	89.78
1972	99.95	99.69	99.38	95.18	98.95	98.65	98.29	94.00
1973	99.92	99.42	98.18	93.58	98.93	98.40	97.14	92.49
1974	99.94	99.36	98.06	93.72	99.02	98.41	97.07	92.67
1975	99.90	97.03	95.70	91.51	99.05	96.16	94.80	90.58
1976	99.91	97.72	96.63	92.63	99.07	96.86	95.75	91.71
1977	99.85	97.87	96.71	92.38	99.06	97.04	95.86	91.47
1978	99.88	97.80	96.50	92.29	99.08	96.97	95.64	91.43
1979	99.90	98.25	96.50	92.76	99.10	97.42	95.65	91.87
1980	99.95	99.59	97.51	93.69	99.09	98.69	96.56	92.63
1981	99.92	99.77	98.56	95.00	98.58	97.81	96.53	92.73
1982	99.92	99.78	98.47	94.96	99.19	98.98	97.59	93.87
1983	99.95	99.85	98.56	95.30	99.19	99.00	97.65	94.22
1984	99.95	99.84	98.76	95.77	99.31	99.12	97.99	94.80
1985	99.94	99.84	98.50	95.20	99.39	99.21	97.83	94.43
1986	99.91	99.72	97.94	93.40	99.26	99.02	97.17	92.51
1987	99.92	99.69	96.84	91.52	99.33	99.02	96.13	90.71
1988	99.93	99.64	96.65	89.66	99.75	99.39	96.35	89.30
1989	99.83	99.60	96.94	90.60	98.31	97.80	94.67	87.61
1990	99.85	99.59	98.39	93.23	96.91	96.36	94.53	88.74

TABLE 21

DESCRIPTION OF THE FSL RADIOSONDE STATION HISTORICAL FILE

Column #	description
2-4	3-letter identifier
6-10	WBAN number
12-16	WMO number
18-23	latitude (deg.min)
25-30	longitude (deg.min)
32-35	elevation (m)
38-43	beginning date (yymmdd)
45-50	ending date (yymmdd)
53-76	station name
78-79	state/province abreviation
81-82	country abreviation (see below)
88-92	previous (from) WBAN station number
94-98	next (to) WBAN station number
100-104	cross reference WBAN number
106	wind only (Pibal) identifier
108-132	remarks

Country codes:

US: United States	JA: Jamaca
CN: Canada	HO: Honduras
MX: Mexico	CI: Cayman Islands
PN: Panama	GU: Guatemala
BA: Barbados	CU: Cuba
AN: Antigua	BM: Bahamas
GU: Guadeloupe	BI: British West Indies
NA: Netherland Antilles	BE: Bermuda
SL: St Lucia	TR: Trinidad
DR: Dominican Republic	

TABLE 22

DESCRIPTION OF THE FSL RADIOSONDE EQUIPMENT HISTORICAL FILE

Column #	Description
2-4	3-letter identifier
6-10	WBAN number
12-16	WMO number
18-19	number of entries to follow

Each entry contains a date (yymmdd) indicating the type of instrument, radiosonde, computer technology, etc. (code, see below) used on the date specified.

Equipment code

Ground Equipment:

G0: 72.2 equipment
G1: SCR 584
G2: SCR 658 (and Canadian METOX)
G3: GMD-1
G4: GMD-1A
G5: GMD-1B
G6: GMD-4
G7: WBRT-57
G8: WBRT-60
G9: LORAN

Radiosonde:

S1: hyposometer (pressure)
S2: transponder type
S3: accu-lock sonde
S4: VIS B sonde
S5: SDC sonde

Humidity Sensors:

H1: carbon hygristor
H2: Lithium Chloride hygristor
H3: redesigned duct
H4: new carbon hygristor

Miscellaneous:

M1: relative humidity to dewpoint
M2: ms-1 to knots
M3: contract personnel

Computer technology:

C1: transistorized equipment
C2: time share computer operation
C3: mini-computer
C4: ART operation
C5: mini-ART 1
C6: mini-ART 2
C7: micro-ART

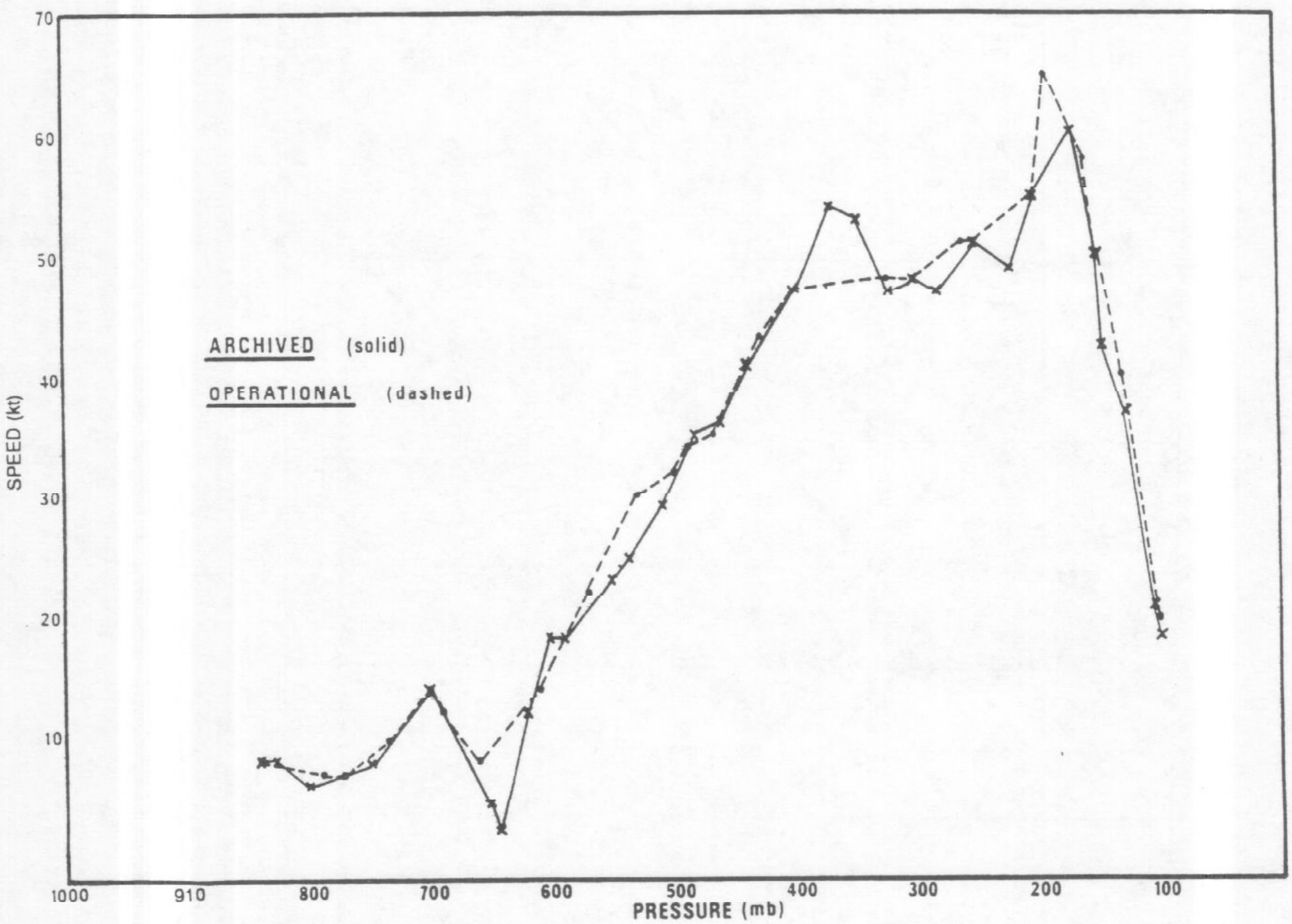

Fig. 1 Comparison of GTS and NCDC-processed wind speed versus pressure for the Oklahoma City, OK, sounding taken on 11 May 1985.

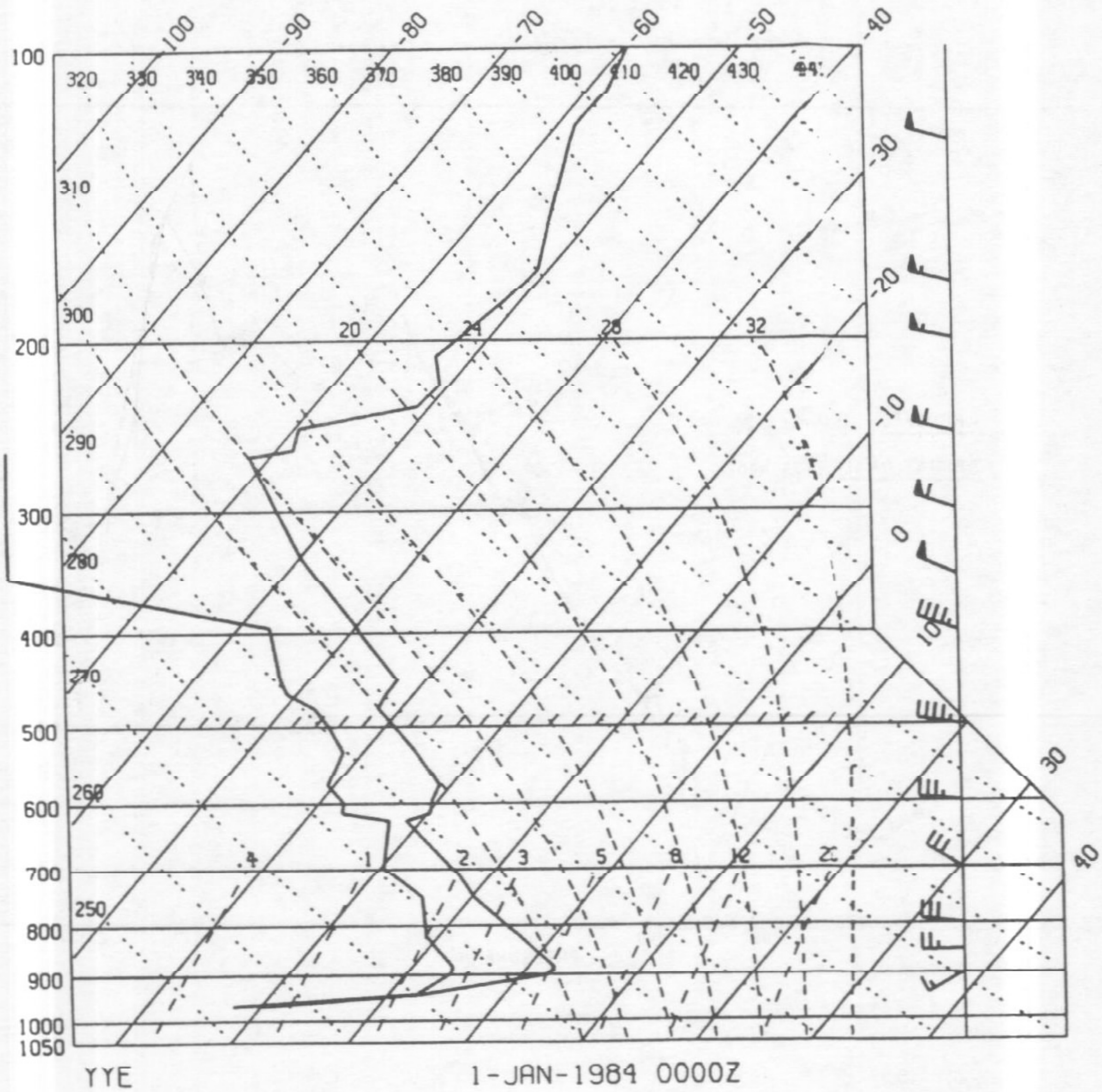

Fig. 2 Skew-T, log-P plot of the sounding taken at Fort Nelson, British Columbia, Canada, on 1 January 1984.

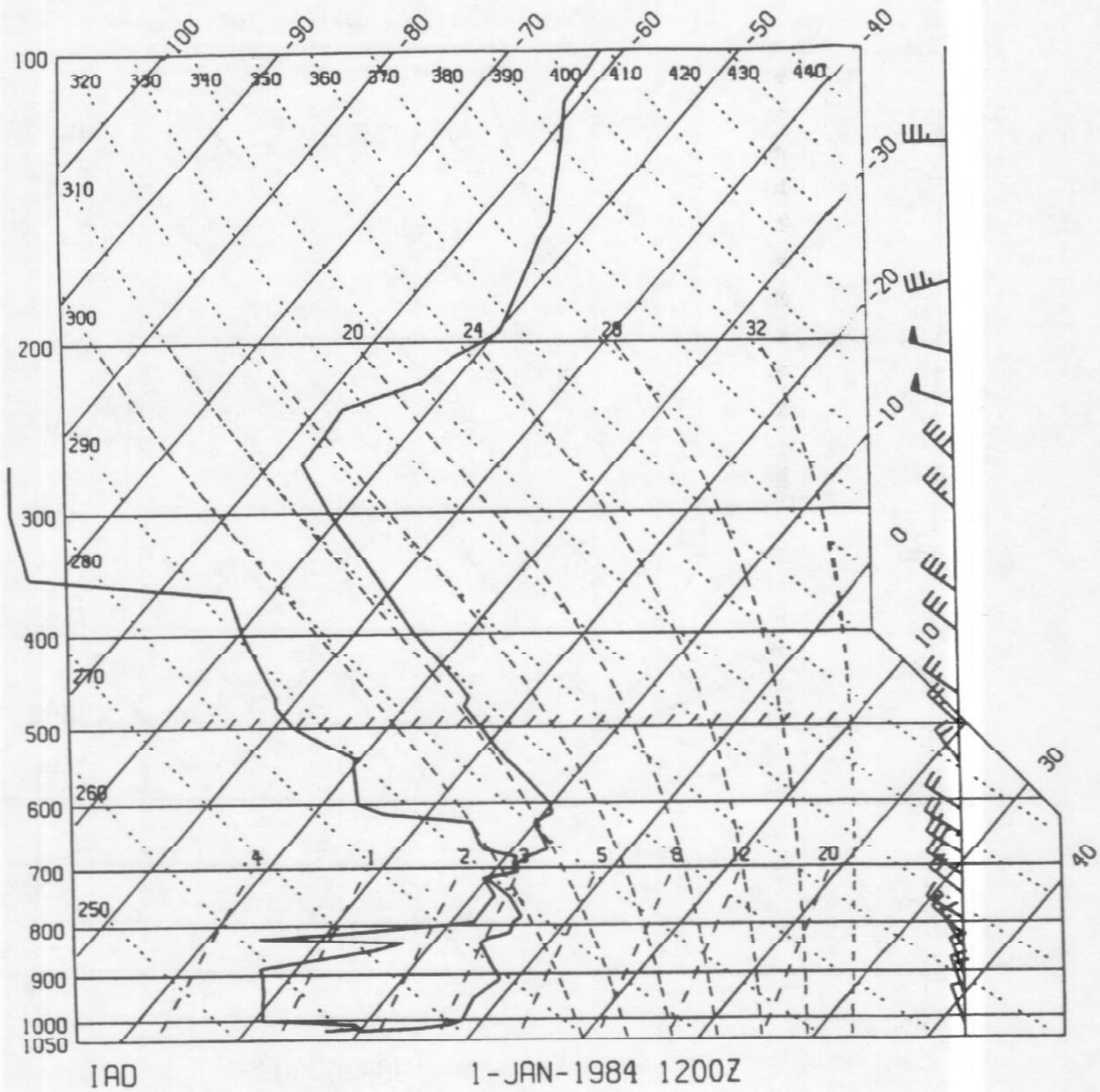

Fig. 3 Same as Fig. 2, except for Washington, D.C. (Dulles).

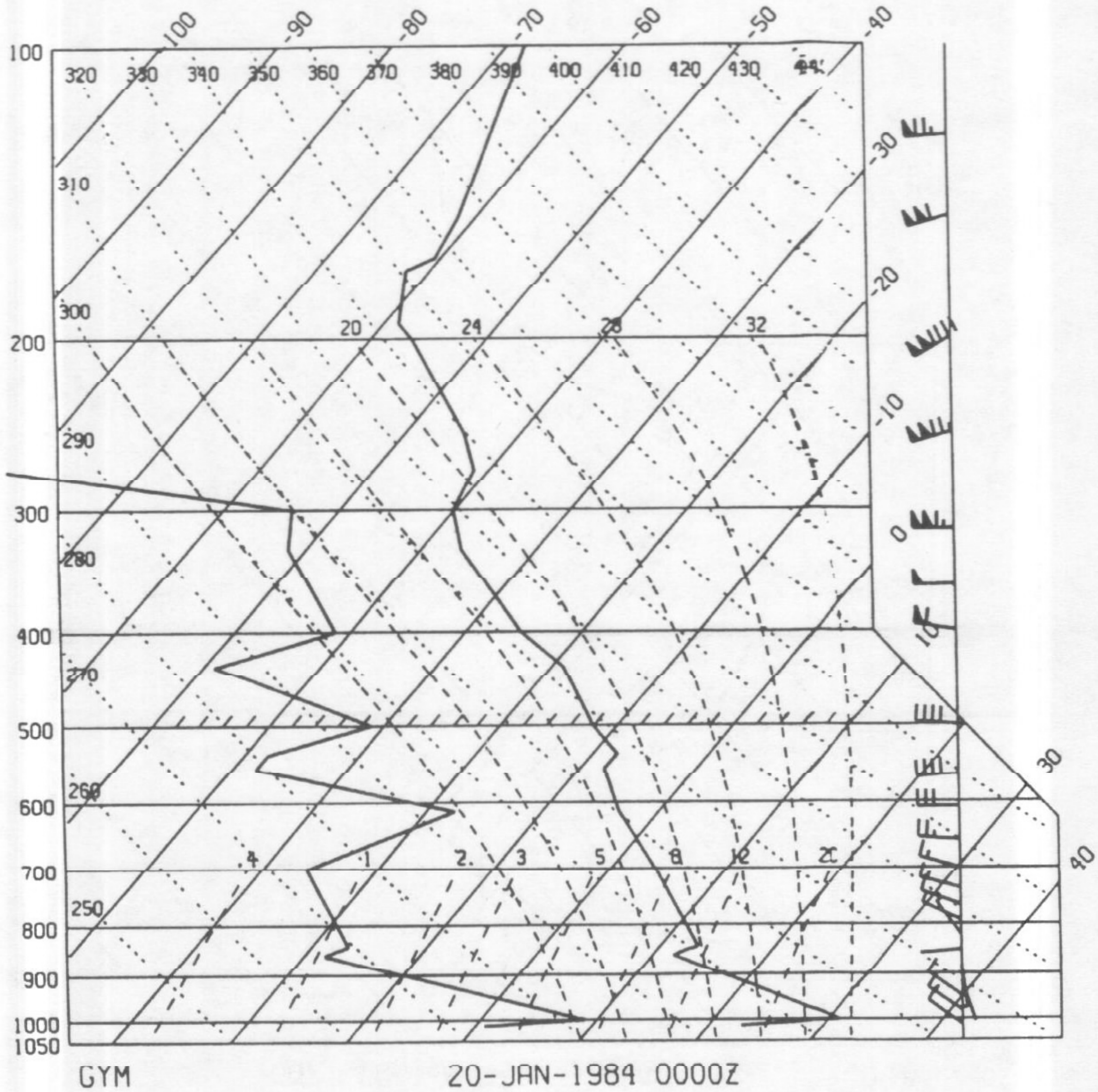

Fig. 4 Same as Fig. 2, except for Guaymas, Mexico, on 20 January 1984.

RAOB DATABASE INTERNAL FILE ORGANIZATION
(Physical Archive Layer)

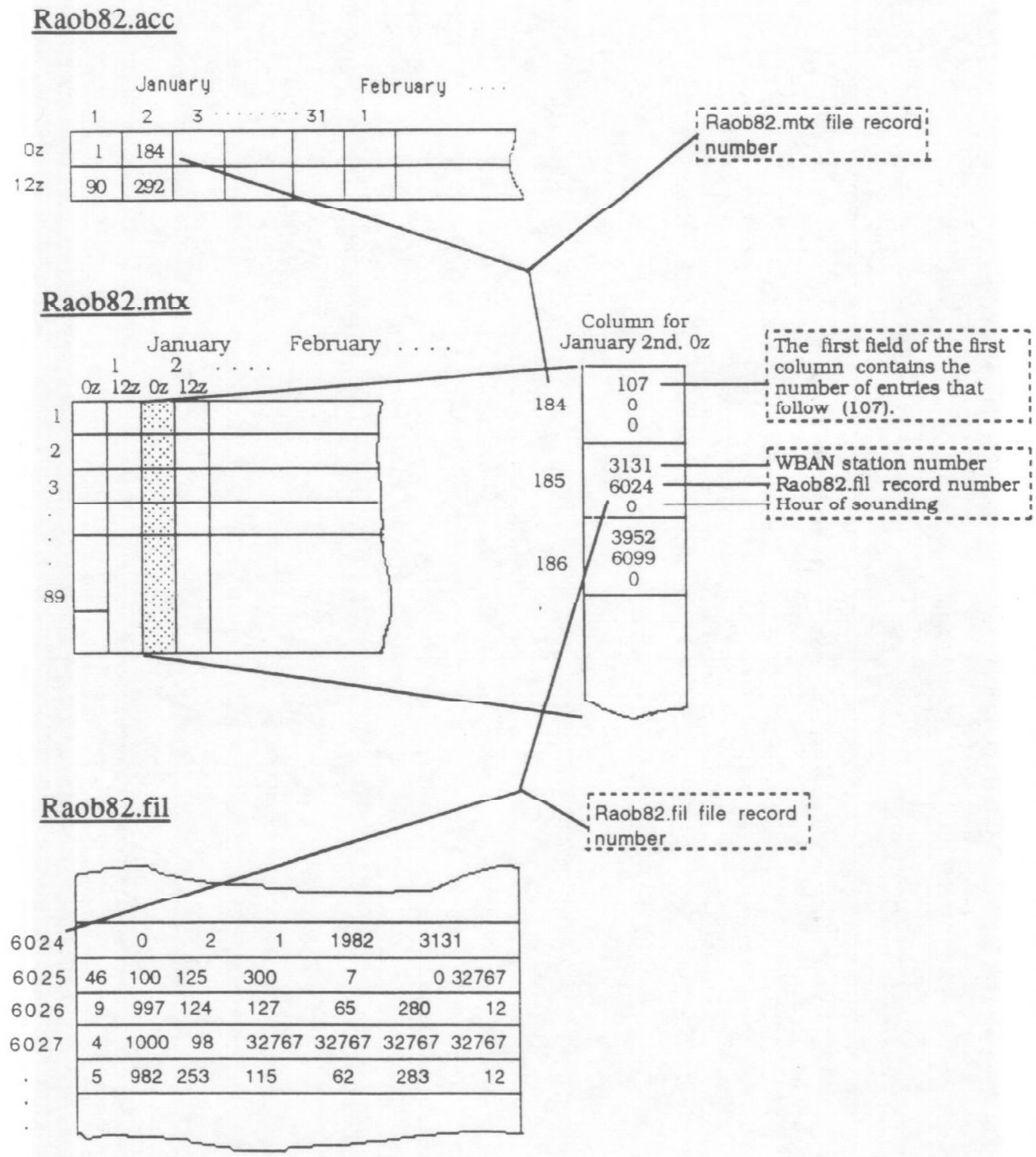

Fig. 5 File structure for the FSL radiosonde data set.

APPENDIX A

FSL Rawinsonde Data Format

FSL Rawinsonde data format

The official FSL data format is similar to the format used by the National Severe Storms Forecast Center (NSSFC) in Kansas City. When a user of the data base retrives data using the direct access method discussed in section 7, data appears in this ascaii "card image" format. The first 4 lines of the sounding are identification and information lines. All additional lines are data lines. An entry of 32767 indicates that the information is either missing, not reported, or not applicable.

---COLUMN NUMBER---

1 LINTYP	2	3	4	5	6	7
			header lines			
254	HOUR	DAY	MONTH	YEAR	(blank)	(blank)
1	WBAN#	WMO#	LAT	LON	ELEV	RTIME
2	HYDRO	MXWD	TROPL	LINES	TINDEX	SOURCE
3	(blank)	STAID	(blank)	(blank)	SONDE	WSUNITS
			data lines			
9	PRESSURE	HEIGHT	TEMP	DEWPT	WIND DIR	WIND SPD
4						
5						
6						
7						
8						

LEGEND

```
LINTYP: type of identification line
        254=indicates a new sounding in the output file
          1=station identification line
          2=sounding checks line
          3=station identifier and other indicators line
          9=surface level
          4=mandatory level
          5=significant level
          6=wind level (PPBB) (GTS or merged data)
          7=tropopause level (GTS or merged data)
          8=maximum wind level (GTS or merged data)
HOUR:   time of report in UTC
LAT:    latitude in degrees and hundredths
LON:    longitude in degrees and hundredths
ELEV:   elevation from station history in meters
RTIME:  is the actual release time of radiosonde from TTBB. Appears in GTS data
        only.
HYDRO:  the pressure of the level to where the sounding passes the hydrostatic
        check (see section 4.3).**
MXWD:   the pressure of the level having the maximum wind in the sounding.  If
        within the body of the sounding there is no "8" level then
        MXWN is estimated (see section 3.2).
TROPL:  the pressure of the level containing the tropopause. If within the
        body of the sounding there is no "7" level, then TROPL is estimated
        (see section 3.3)**
LINES:  number of levels in the sounding, including the 4 identification lines.
TINDEX: indicator for estimated tropopause. A "7" indicates that sufficient
        data was available to attempt the estimation; 11 indicates that data
        terminated and that tropopause is a "suspected" tropopause.
SOURCE: 0=data acquired from NCDC(NCAR) or AES only
        1=NSSFC GTS or FSL GTS data only
        2=merge of NCDC and GTS data
SONDE:  type of radiosonde code from TTBB. Only reported with GTS data
        10=VIZ "A" type radiosonde
        11=VIZ "B" type radiosonde
        12=Space data corp.(SDC) radiosonde.
WSUNITS:wind speed units (selected upon output)
         0=meters per second
         1-knots

PRESSURE: in whole millibars (mb)
HEIGHT:   height in meters (m)
TEMP:     temperature in tenths of degrees Celsius
DEWPT:    dew point temperature in tenths of a degree Celsius
WIND DIR: wind direction in degrees
WIND SPD: wind speed in either knots or tenths of a meter per second
          (selected by user upon output)
```

An example of fortran format statements necessary to read output rawinsonde data, according to LINTYP, is as follows:

LINTYP	
254	(3i7,6x,a4,i7)
1	(3i7,2f7.2,2i7)
2	(7i7)
3	(i7,3x,a10)
4,5,6,7,8,9	(7i7)

** Refer to the sections in this Technical Memorandum.

APPENDIX B(1)

Record Inventory for North American Upper-air Stations

Period of record inventory for North America
upper-air stations

WBAN	WMO		----START----			------END-----		
3109	72387	MERCURY/TEST SITE	1951	8	11	1955	11	5
3120	72388	N CHINA LAKE/B-1 RANGE	1947	7	9	1958	10	31
3121	99999	ST GEORGE	1957	4	18	1957	9	28
3123	72292	CAMP PENDLETON	1954	7	21	1954	10	15
3124	72273	FT HUACHUCA	1955	1	4	1971	7	30
3125	72280	YUMA	1955	7	1	1971	7	27
3131	72290	SAN DIEGO MONTGOMERY	1956	6	16	1989	8	31
3132	72485	TONOPAH	1956	9	20	1958	10	31
3133	72385	YUCCA FLAT	1956	9	16	1979	5	14
3134	99999	BAKER	1957	4	23	1957	9	28
3143	72385	JACKASS FLATS	1959	4	29	1967	12	19
3146	72281	EL CENTRO	1962	2	28	1968	8	30
3149	72278	PHOENIX/LITCHFIELD PARK	1963	8	26	1963	10	22
3158	72291	SAN NICOLAS/SITE #2	1973	9	4	1983	1	7
3160	72387	DESERT ROCK/MERCURY	1978	5	16	1990	9	26
3190	72293	MIRAMAR	1989	9	22	1990	9	26
3816	72435	PADUCAH	1988	12	5	1990	9	26
3851	72326	KNOXVILLE/McGHEE-TYSON	1955	2	15	1956	6	18
3855	72222	PENSACOLA/F. SHERMAN FLD	1955	6	6	1968	6	4
3860	72425	HUNTINGTON	1961	12	1	1990	9	25
3879	72433	SALEM	1969	10	1	1988	11	28
3881	72229	CENTERVILLE	1974	11	16	1990	9	26
3926	72344	FT SMITH	1953	3	17	1964	5	18
3937	72240	LAKE CHARLES	1962	1	1	1990	9	26
3940	72235	JACKSON/THOMPSON FLD	1970	7	1	1990	9	26
3946	72349	MONETT	1970	9	5	1990	9	26
3948	72357	NORMAN	1974	1	1	1990	9	26
3951	72247	LONGVIEW	1975	7	13	1990	9	26
3952	72340	N LITTLE ROCK	1975	12	20	1990	9	26
4734	71722	MANIWAKI	1955	7	1	1990	9	26
4738	72528	NIAGARA FALLS	1954	3	15	1960	8	20
10701	78806	BALBOA/ALBROOK AFB	1946	1	3	1990	9	26
10717	80222	BOGOTA	1960	8	17	1971	12	31
10809	78762	SAN JOSE/JUAN SANTA MARIA	1983	6	1	1990	9	26
11501	78954	SEAWELL APT	1965	7	30	1990	9	26
11621	78967	TRINIDAD NAS	1946	2	1	1969	12	8
11629	78486	SANTO DOMINGO	1962	8	6	1990	6	22
11630	78535	ROOSEVELT ROADS	1988	10	1	1988	12	7
11631	78526	SAN JUAN	1948	1	1	1950	1	31
11634	78970	TRINIDAD/PIARCO IAP	1969	12	12	1990	9	26
11636	78526	SAN JUAN/ISLA GRANDE	1950	2	1	1955	5	23
11641	78526	SAN JUAN/ISLA VERDE	1955	5	24	1990	9	26
11642	78897	POINT A PITRE/RAIZET	1956	2	21	1990	9	26
11643	78988	CURACAO/WILLEMSTAD	1956	6	5	1990	9	26
11644	78949	ST LUCIA AAFB	1956	7	20	1957	10	3
11645	78866	SINT MAARTEN/JULIANA	1956	10	2	1990	9	26
11646	78467	SABANA DE LA MAR	1956	9	19	1962	8	4
11647	78861	ST JOHN/COOLIDGE AAFB	1957	9	1	1989	5	1
11706	78367	GUANTANAMO NAS	1948	8	1	1990	9	25
11715	78397	KINGSTON/PALISADOES	1956	9	4	1990	9	26
11807	78501	SWAN ISLAND/ISLAS DEL CIS	1948	1	7	1980	2	6
11813	78384	GRAND CAYMAN	1956	8	14	1990	9	26
11816	78724	CHOLUTECA	1973	1	17	1975	12	23
11817	78720	TEGUCIGALAPA D.C.	1976	6	3	1990	9	26
11818	78583	BELIZE	1982	6	1	1990	9	26
11901	78641	GUATEMALA CITY	1973	11	8	1989	2	19
11903	76679	MEXICO CITY/TACUYA	1948	1	1	1990	9	26
11904	76692	VERACRUZ	1952	1	25	1990	9	26
12711	78355	CAMAGUAY	1948	4	14	1990	9	18
12712	78063	GRAND BAHAMA/GOLD ROCK CK	1951	1	25	1970	5	29
12713	78076	ELEUTHERA I/COFFIN HILLS	1952	5	1	1970	5	29
12714	78118	GRAND TURK IS AFB	1954	11	16	1983	6	22
12715	78107	FLAMINGO HILL/MAYAGUAN AA	1955	11	10	1957	10	2
12716	78089	SAN SALVADOR AAFB/BONEFIS	1956	1	12	1964	12	15
12717	78073	NASSAU APT	1977	12	14	1990	9	17
12832	72220	APALACHICOLA	1948	1	1	1990	9	26
12839	72202	MIAMI	1948	1	1	1977	2	22
12842	72211	TAMPA	1948	1	1	1990	9	26
12844	72203	W. PALM BEACH	1977	3	3	1990	9	26
12850	72201	KEY WEST/BOCA CHICA NAS	1954	4	26	1990	9	26
12863	72232	BURRWOOD	1950	8	16	1965	2	12
12864	78325	HAVANA	1948	1	1	1960	11	1
12866	76106	MERIDA	1948	1	1	1956	10	6
12867	74794	CAPE CANAVERAL/PATRICK	1950	2	4	1956	11	17
12868	74794	CAPE CANAVERAL	1956	11	18	1990	1	23
12878	76644	MERIDA IAP	1956	10	7	1990	9	26
12879	72224	CAPE SAN BLAS	1960	12	27	1970	5	28
12880	99999	DELTA 7/MARCO ISLAND	1960	12	23	1962	11	2
12881	99999	VALKARIA	1962	2	14	1970	5	27
12884	72232	BOOTHVILLE	1965	2	13	1988	6	21
12906	72243	HOUSTON/ELLINGTON AFB	1953	3	1	1963	6	21
12912	72255	VICTORIA	1966	7	1	1989	11	7
12916	72231	NEW ORLEANS	1948	1	1	1950	1	31
12919	72250	BROWNSVILLE	1948	1	1	1990	9	26
12921	72253	SAN ANTONIO	1948	1	1	1966	6	20
12924	72251	CORPUS CHRISTI	1989	9	22	1990	9	26
12926	72251	CORPUS CHRISTI NAS	1953	2	1	1966	6	30
12930	72233	SLIDELL	1989	1	1	1990	9	26
12948	76491	CIUDAD VICTORIA	1948	1	1	1951	12	23
13025	8449	ROTA NAS	1988	10	3	1988	10	31
13601	78016	BERMUDA/MCKINDLEY AFB	1946	1	27	1990	9	26
13723	72317	GREENSBORO	1948	1	1	1990	9	26
13737	72308	NORFOLK	1955	11	15	1965	8	2
13743	72405	WASHINGTON/NAT APT	1948	1	1	1950	9	30
13745	72304	HATTERAS	1948	1	1	1957	2	28
13750	72308	NORFOLK	1946	2	1	1955	11	15
13760	74574	DAHLGREN	1946	1	2	1959	11	13
13801	72226	MONTGOMERY/GUNTER	1954	12	17	1956	6	1
13802	72433	BELLEVILLE/SCOTT AFB	1954	5	16	1959	9	30
13803	72436	COLUMBUS/BAKALAR AFB	1955	5	15	1955	9	11
13807	72423	FT KNOX/GODMAN AFB	1954	5	16	1954	10	2
13814	72340	BLYTHEVILLE AFB	1957	3	1	1964	7	31
13815	72216	ALBANY/TURNER AFB	1956	2	15	1960	5	17
13821	72226	MONTGOMERY/MAXWELL	1949	1	1	1954	12	17
13840	72429	DAYTON	1951	12	1	1990	9	26
13841	72721	WILMINGTON/CLINTON AFB	1947	11	1	1948	4	30
13858	72221	VALPARAISO/ELGIN AFB	1949	1	1	1990	9	26
13860	72217	WARNER ROBINS	1949	9	1	1954	4	30
13861	72213	WAYCROSS	1969	4	15	1990	9	26
13862	72334	MEMPHIS	1953	3	1	1959	5	23
13873	72311	ATHENS	1955	9	4	1990	9	26
13874	72219	ATLANTA	1948	1	1	1955	9	3
13880	72208	CHARLESTON	1948	1	1	1990	9	26
13889	72206	JACKSONVILLE	1955	11	1	1969	4	14
13895	72226	MONTGOMERY MAXWELL FLD	1956	6	1	1974	11	11
13897	72327	NASHVILLE/BERRY FLD	1948	1	1	1990	9	26
13901	72260	STEPHENVILLE	1973	11	3	1990	9	26
13902	72352	ALTUS AFB	1954	2	1	1961	5	31
13903	72350	ARDMORE/GENE AUTRY AFB	1961	3	17	1961	5	31
13905	72244	BRYAN AFB	1954	2	1	1958	5	18
13909	72353	ENID/VANCE AFB	1950	3	16	1952	7	9
13910	72266	ABILENE/DYESS AFB	1957	3	1	1961	6	4
13911	72259	FT WORTH/CARSWELL AFB	1949	9	1	1973	10	29
13919	72353	OKLAHOMA CITY/TINKER AFB	1952	5	1	1971	3	31
13920	72456	TOPEKA/FORBES AFB	1953	12	21	1955	9	29
13921	72457	FT LEAVENWORTH/SHERMAN A	1949	9	29	1953	10	19

APPENDIX B(1) (Continued)

Record Inventory for North American Upper-air Stations

13922	72458	SALINA/SMOKY HILL AFB	1953	3	1	1958	10	15
13927	72235	JACKSON/HAWKINS FLD	1953	3	1	1955	4	30
13931	72351	WICHITA FALLS/SHEPPARD	1950	3	16	1950	5	31
13934	72246	ALEXANDRIA	1955	2	15	1955	4	30
13939	72238	GREENVILLE	1954	2	26	1954	4	30
13941	72240	LAKE CHARLES	1948	1	1	1961	12	31
13944	72248	SHREVEPORT/BARKSDALE AFB	1949	7	1	1956	1	10
13945	72355	FT SILL	1952	3	1	1960	3	30
13947	72455	FT RILEY/MARSHALL AAF	1958	4	5	1958	10	12
13956	72235	JACKSON/HAWKINS FLD	1956	2	1	1968	10	15
13957	72248	SHREVEPORT MUN AP	1956	1	11	1975	7	7
13962	72266	ABILENE	1963	2	4	1973	5	26
13963	72340	LITTLE ROCK	1948	1	1	1975	12	19
13967	72353	OKLAHOMA CITY/WILL ROGER	1948	1	1	1989	3	22
13983	72445	COLUMBIA	1948	1	1	1970	8	27
13985	72451	DODGE CITY	1948	1	1	1990	9	26
13996	72456	TOPEKA	1955	9	30	1990	9	26
14503	71815	STEPHENVILLE/HARMON AFB	1946	1	1	1990	9	26
14505	71198	ST JOHNS/PEPPERRELL AFB	1950	6	8	1952	7	31
14508	71807	ARGENTIA	1946	1	2	1970	4	30
14531	71801	TORBAY/ST JOHNS	1971	4	27	1990	9	26
14607	72712	CARIBOU	1948	1	1	1990	9	26
14611	74392	BRUNSWICK	1953	3	3	1955	5	19
14642	71600	SABLE ISLAND	1958	1	1	1990	9	26
14684	74494	CHATHAM	1970	11	18	1990	9	26
14685	71701	GAGETOWN	1971	1	4	1990	9	26
14688	71399	SHELBURNE	1972	11	1	1976	12	31
14693	71399	SHELBURNE	1977	1	1	1986	12	31
14704	72506	FALMOUTH	1964	7	15	1965	8	1
14708	74498	NEW YORK/HEMPSTEAD	1952	3	22	1956	9	18
14714	74482	NEWBURGH/STEWART AFB	1949	7	3	1951	12	31
14717	72518	ROME/GRIFFISS AFB	1949	8	1	1955	10	11
14733	72528	BUFFALO/GRTR ARPT	1948	1	1	1990	9	26
14735	72518	ALBANY	1948	1	1	1990	9	26
14756	72506	NANTUCKET	1948	1	1	1970	11	3
14762	72520	PITTSBURGH/ALLEGHENY	1948	1	1	1952	9	14
14764	72606	PORTLAND	1948	1	1	1990	9	26
14779	99999	RED BANK	1947	12	1	1948	2	29
14780	72409	LAKEHURST	1946	1	1	1955	7	15
14804	72537	MT CLEMENS	1949	1	1	1956	9	18
14806	72531	RANTOUL/CHANUTE AFB	1949	1	1	1956	9	11
14826	72637	FLINT/BISHOP ARPT	1956	9	19	1990	9	26
14834	72534	JOLIET	1948	1	1	1953	3	14
14842	72532	PEORIA	1956	9	12	1990	9	26
14847	72734	SAULT STE MARIE	1948	1	1	1990	9	26
14849	72536	TOLEDO	1948	1	1	1951	11	30
14898	72645	GREEN BAY	1953	3	17	1990	9	26
14918	72747	INTERNATIONAL FALLS	1948	1	1	1990	9	26
14926	72655	ST CLOUD/WHITNEY APT	1948	1	1	1990	9	26
14936	72654	HURON	1963	6	6	1990	9	26
14942	72553	OMAHA	1948	1	1	1954	9	15
15045	99016	OCEAN WEATHER STATION P	1961	1	1	1981	6	23
15601	71816	GOOSE/GOOSE BAY	1946	1	1	1990	9	26
15604	71188	MINGAN	1946	9	16	1949	9	30
15605	71906	FT CHIMO	1947	4	26	1985	10	31
15613	71811	SEVEN ISLES	1955	7	1	1967	12	31
15636	71811	SEPT ILES (UA)	1968	1	1	1990	9	26
15641	71906	KUUJJUAQ (UA)	1985	11	1	1990	9	26
15703	71826	NITCHEQUON	1955	7	1	1985	11	30
15704	71907	PORT HARRISON/INUK[illegible]K	1950	1	1	1990	9	26
15708	71823	LA GRANDE IV	1985	12	1	1990	9	26
15803	71836	MOOSONEE	1955	7	1	1990	9	26
15806	71848	TROUT LAKE	1955	7	1	1990	9	26
15901	71913	CHURCHILL	1950	1	1	1990	9	26
16201	4018	KEFLAVIK	1946	1	1	1988	12	31
16204	4018	KEFLAVIK/MEEKS	1948	1	1	1951	8	31
16302	4353	IKATEQ	1946	10	1	1947	8	29
16405	4270	NARSARSSUAK	1946	1	3	1958	10	30
16503	4255	MARRAK POINT	1947	12	17	1948	9	18
16504	4231	SONDRESTROM	1946	7	1	1950	4	10
16603	71909	FROBISHER BAY	1946	1	1	1987	1	31
16607	71909	IQALUIT (UA)	1987	2	1	1990	9	26
16801	71915	CORAL HARBOUR	1961	1	1	1990	9	26
16895	71081	HALL BEACH/HALL LK	1961	1	1	1990	9	26
16903	71926	BAKER LAKE	1961	1	1	1980	10	31
16910	71926	BAKER LAKE (UA)	1980	4	30	1990	9	26
17202	4342	WALRUS BAY	1946	6	19	1948	2	29
17601	71090	CLYDE	1961	1	1	1970	7	31
17602	4202	W. THULE	1946	10	1	1952	7	31
17605	4202	W. THULE	1952	8	1	1971	2	28
17802	71918	ARCTIC BAY	1948	1	1	1957	7	31
17901	71924	RESOLUTE	1948	1	1	1990	9	26
18601	71082	ALERT	1950	9	10	1990	9	26
18801	71917	EUREKA	1948	1	1	1990	9	26
21001	76654	MANZANILLO	1976	7	16	1990	7	14
21101	76723	SOCORRO ISLAND	1973	11	1	1990	7	6
21504	91285	HILO	1950	2	18	1990	9	26
22001	72261	DEL RIO/LAUGHLIN AFB	1954	1	28	1963	3	4
22007	76225	CHIHUAHUA	1964	8	5	1990	9	26
22009	76180	MAZATLAN SINALOA	1948	1	1	1990	8	21
22010	72261	DEL RIO	1963	3	4	1990	9	26
22012	76394	MONTERREY	1964	9	25	1990	8	19
22013	76612	GUADALAJARA	1979	3	1	1990	9	26
22104	76256	EMPALME SONORA	1964	11	22	1990	8	7
22105	76151	GUADALUPE ISLAND	1971	1	16	1990	9	26
22258	71957	INUVIK (UA)	1973	4	1	1990	9	26
22501	91162	BARKING SANDS	1963	8	1	1965	7	28
22504	91182	HONOLULU/(HICKAM FLD)	1946	1	1	1946	4	22
22517	91199	PEARL HARBOR	1950	6	19	1952	6	30
22521	91182	HONOLULU/JOHN ROGERS FLD	1948	1	1	1953	5	15
22536	91165	LIHUE/KAUAI	1950	2	25	1990	9	26
22545	91162	BARKING SANDS	1965	8	2	1983	1	31
22604	99999	FRENCH FRIGATE SHOAL	1962	9	18	1962	10	30
22701	91066	N. MIDWAY ISLAND	1971	12	1	1990	9	26
23002	74732	ALAMOGORDO/HOLLOMAN AFB	1949	10	1	1990	9	26
23003	72363	AMARILLO	1952	7	1	1956	11	30
23012	72469	DENVER/LOWRY	1948	10	16	1956	3	14
23017	72263	SAN ANGELO/GOODFELLOW	1964	1	20	1971	1	28
23021	72267	LUBBOCK/REESE AFB	1950	3	16	1964	5	16
23022	72264	MARFA AAF	1959	2	15	1959	5	20
23023	72265	MIDLAND	1953	11	15	1990	9	26
23039	72269	WHITE SANDS/LAS CRUCES	1949	8	1	1989	11	9
23041	72265	BIG SPR USING	1948	1	1	1953	11	13
23044	72270	EL PASO	1948	1	1	1990	9	26
23047	72363	AMARILLO	1956	12	1	1990	9	26
23050	72365	ALBUQUERQUE	1948	1	1	1990	9	26
23062	72469	DENVER/STAPLETON ARPT	1956	8	15	1990	9	26
23066	72476	GRAND JUNCTION	1948	1	1	1990	9	26
23106	72389	FRESNO	1955	2	8	1955	4	9
23109	72274	TUSCON/DAVIS MONTHAN AFB	1951	9	1	1956	2	29
23114	72381	MUROC/EDWARDS AFB	1951	3	1	1990	9	26
23118	72488	RENO/STEAD AFB	1953	10	15	1957	9	23
23128	72485	TONOPAH	1953	3	10	1955	5	15
23129	72297	LONG BEACH	1948	12	1	1956	4	16
23154	72486	ELY	1948	1	1	1990	9	26
23160	72274	TUCSON	1956	3	1	1990	9	26
23169	72386	LAS VEGAS	1952	8	1	1966	10	9
23173	72386	LAS VEGAS	1948	1	1	1952	7	31
23174	72295	LOS ANGELES	1970	7	1	1971	4	30
23183	72278	PHOENIX	1948	1	1	1958	1	15
23194	72374	WINSLOW	1961	11	1	1990	9	26
23201	72497	CHICO	1962	2	6	1971	3	26

APPENDIX B(1) (Continued)

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23203	72481	MERCED/CASTLE AFB	1952	11	15	1963	1	31
23230	72493	OAKLAND	1948	1	1	1990	9	26
23236	72394	SANTA MARIA	1948	1	1	1954	10	21
23273	72394	SANTA MARIA	1954	10	22	1959	6	30
24007	72566	SCOTTSBLUFF	1953	6	1	1961	9	25
24011	72764	BISMARCK	1948	1	1	1990	9	26
24021	72576	LANDER	1948	1	1	1990	9	26
24023	72562	NORTH PLATTE	1948	1	1	1990	9	26
24090	72662	RAPID CITY	1970	7	1	1990	9	26
24127	72572	SALT LAKE CITY	1969	11	1	1990	9	26
24128	72583	WINNEMUCCA	1970	7	1	1990	9	26
24131	72681	BOISE	1970	7	1	1990	9	26
24143	72775	GREAT FALLS	1970	7	1	1990	9	26
24157	72785	SPOKANE	1967	9	19	1990	9	26
24211	72698	PORTLAND	1946	1	2	1956	5	31
24225	72597	MEDFORD	1948	1	1	1990	9	26
24227	72792	OLYMPIA	1962	6	1	1964	1	31
24232	72694	SALEM	1956	6	1	1990	9	26
24233	72793	SEATTLE/TACOMA APT	1956	6	29	1962	5	31
24240	72798	TATOOSH ISLAND	1948	1	1	1966	8	1
24244	72793	SEATTLE/NAS	1946	1	2	1956	6	28
25004	71867	THE PAS	1955	7	1	1990	9	26
25111	71879	EDMONTON/MUN AP	1946	12	1	1966	2	28
25145	71119	EDMONTON/STONY PLAIN	1966	2	15	1990	9	26
25152	71115	VERNON	1971	10	5	1990	9	26
25154	71124	PRIMROSE LAKE	1989	1	4	1989	8	9
25159	71928	ROCKY MTN HOUSE (UA)	1969	6	1	1976	9	11
25206	71896	PRINCE GEORGE	1955	7	1	1990	9	26
25218	71945	FORT NELSON	1955	7	1	1982	12	31
25223	71109	PORT HARDY	1955	7	1	1990	9	26
25262	71945	FORT NELSON UA	1983	1	1	1990	9	26
25302	70361	YAKUTAT	1946	1	1	1948	7	28
25308	70398	ANNETTE ISLAND	1948	1	1	1990	9	26
25309	70381	JUNEAU	1948	1	1	1953	5	15
25339	70361	YAKUTAT	1948	8	11	1990	9	26
25501	70350	KODIAK	1946	1	1	1990	9	26
25503	70326	NAKNEK	1953	5	5	1990	9	26
25603	70316	COLD BAY AFB	1946	1	22	1954	2	28
25611	70489	DUTCH HARBOR	1952	7	14	1954	7	24
25620	70489	DUTCH HARBOR	1950	12	21	1952	5	24
25624	70316	COLD BAY	1955	8	20	1990	9	26
25701	70454	ADAK/DAVIS AFB	1946	1	1	1950	8	31
25704	70454	ADAK	1950	9	1	1989	12	3
25713	70308	ST PAUL ISLAND	1948	1	1	1990	9	26
26005	71925	CAMBRIDGE BAY	1970	2	17	1990	9	26
26102	71934	FT SMITH	1955	7	1	1971	9	30
26107	71938	COPPERMINE	1947	11	10	1970	2	17
26118	71934	FT SMITH (UA)	1968	2	29	1990	9	26
26202	71043	NORMAN WELLS	1955	7	1	1984	10	31
26214	71043	NORMAN WELLS (UA)	1984	11	1	1990	9	26
26316	71964	WHITEHORSE	1955	7	1	1990	9	26
26317	71968	AKLAVIK	1950	1	1	1960	9	12
26323	71957	INUVIK	1960	9	12	1973	3	31
26406	70263	FORT GREELY	1950	11	11	1958	1	9
26409	70273	ANCHORAGE	1948	1	1	1990	9	26
26411	70261	FAIRBANKS	1948	1	1	1990	9	26
26412	70291	NORTHWAY	1948	1	1	1955	5	12
26510	70231	MCGRATH	1948	1	1	1990	9	26
26604	70200	NOME AAB	1946	1	2	1946	3	27
26615	70219	BETHEL	1948	1	1	1990	9	26
26616	70133	KOTZEBUE	1948	1	1	1990	9	26
26617	70200	NOME FED BLDG	1948	1	1	1990	9	26
26636	70107	CAPE THOMPSON	1962	3	25	1962	5	20
26703	70204	GAMBELL	1948	1	1	1953	6	30
27001	71074	ISACHSEN	1948	8	13	1978	6	19
27101	71072	MOULD BAY	1948	6	5	1990	9	26
27201	71051	SACHS HARBOUR	1955	11	1	1986	7	15
27401	70086	BARTER ISLAND AWS	1953	4	4	1988	12	31
27502	70026	POINT BARROW	1948	1	1	1990	9	26
45702	70439	AMCHITKA ISLAND	1946	1	1	1965	10	30
45708	70414	SHEMYA ISLAND	1946	6	7	1954	6	20
45709	70409	ATTU ISLAND	1947	7	1	1958	6	24
45714	70414	SHEMYA	1958	6	28	1959	8	31
45715	70414	SHEMYA	1959	9	1	1980	12	30
54706	71625	PETAWAWA	1989	1	1	1990	9	26
54724	71716	VALCARTIER	1989	1	9	1990	8	8
93056	72465	GOODLAND	1952	7	18	1961	9	30
93060	72269	JALLEN SITE	1955	11	1	1961	1	31
93061	74630	STALLION SITE	1956	1	19	1961	1	31
93062	99999	FRYE SITE	1960	2	17	1961	1	6
93104	74612	INYOKERN/CHINA LAKE NAF	1946	1	7	1990	9	25
93111	72391	POINT MUGU	1952	1	3	1990	9	26
93112	72290	NORTH ISLAND/SAN DIEGO	1946	1	1	1956	6	15
93116	72291	SAN NICOLAS ISLAND	1952	9	16	1990	9	26
93117	72293	SAN CLEMENTE ISLAND	1972	3	30	1982	9	1
93197	72288	SANTA MONICA/CLOVER FLD	1956	4	17	1965	8	31
93214	72392	VANDENBERG AFB	1958	7	1	1990	9	26
93215	72392	POINT ARGUELLO	1959	7	1	1965	10	31
93216	72483	SACRAMENTO/BEALE AFB	1965	12	1	1966	2	28
93218	72396	JOLON	1965	6	28	1967	2	23
93219	74606	VANDENBERG/BOATHOUSE	1966	8	8	1990	9	26
93220	72393	VANDENBERG SOUTH	1969	8	1	1970	5	15
93221	74606	VANDENBERG/SUDDEN RANCH	1969	3	8	1969	8	19
93222	74504	PILLAR POINT	1969	11	5	1990	6	26
93223	74606	VANDENBERG AFB S	1969	9	30	1970	5	27
93722	72405	SILVER HILL	1950	10	1	1960	10	10
93729	72304	CAPE HATTERAS	1957	3	1	1990	9	26
93734	72403	STERLING	1962	1	10	1990	9	26
93738	72403	WASHINGTON/DULLES	1960	10	11	1962	1	9
93739	72402	WALLOPS ISLAND	1963	10	14	1990	9	26
93743	72309	BOGUE FLD MCALF/SWANSBO	1970	2	5	1970	4	23
93755	72407	ATLANTIC CITY	1980	9	3	1990	9	26
93818	72425	HUNTINGTON	1948	1	1	1948	8	31
93829	72222	PENSACOLA	1946	9	2	1955	5	18
93837	72206	JACKSONVILLE/NAS	1950	8	2	1955	10	31
94005	72469	AKRON DET R2	1952	7	16	1952	9	26
94008	72768	GLASGOW	1955	10	1	1990	9	26
94018	72468	FORT CARSON/ARMY	1989	1	4	1990	9	26
94240	72797	QUILLAYUTE	1966	8	2	1990	9	26
94620	71603	YARMOUTH	1989	1	1	1990	9	26
94789	74486	NEW YORK/IDLEWILD	1956	9	18	1980	9	2
94823	72520	PITTSBURGH/PITTSBGH AP	1952	9	15	1990	9	26
94829	72539	BATTLE CREEK/FT CUSTER	1954	5	16	1954	10	2
94848	72535	SOUTH BEND	1959	5	29	1961	9	15
94913	72654	HURON/HOWES APT	1953	6	1	1961	9	25
94917	72545	CEDAR RAPIDS	1954	5	16	1961	9	30
94918	72553	N OMAHA	1954	9	16	1990	9	26
94921	71853	SHILO/CAMP SHILO	1966	11	1	1990	9	26
94922	99999	WAVERLY	1964	5	24	1964	7	31
94925	72465	GRAND FORKS AFB	1961	6	13	1964	7	31
110010	72434	ST. LOUIS/ARCH SITE(EMSU)	1969	4	14	1971	12	30
110011	72434	ST. LOUIS/MOBILE SITE #1	1970	6	12	1970	12	2
110013	72434	ST. LOUIS/MOBILE SITE #1	1970	9	24	1971	5	14
110020	72534	CHICAGO/MIDWAY AP (EMSU)	1969	4	14	1979	9	28
110021	72534	CHICAGO/MIDWAY AP (EMSU)	1970	6	11	1970	12	17
110030	72405	WASHINGTON (EMSU)	1969	5	16	1971	12	30
110031	72405	WASH/SITE 1 (EMSU)	1970	7	10	1971	4	20
110032	72405	ARLINGTON/SITE 3 (EMSU)	1970	10	6	1970	10	13
110034	72405	WASH/CAMP STN/SITE 1 (EM	1970	10	26	1970	10	26
110035	72405	WASH/SITE 5 (EMSU)	1971	7	8	1971	10	15
110040	72503	NY/LAGUARDIA AP (EMSU)	1969	6	17	1971	12	30
110041	72503	NY/PARK SITE (EMSU)	1970	8	11	1970	8	19

APPENDIX B(1) (Continued)

Record Inventory for North American Upper-air Stations

110050	72408	PHILADELPHIA (EMSU)	1969	6	27	1977	5	18
110052	72408	PHILADELPHIA (EMSU)	1970	8	11	1970	11	10
110053	72408	PHILADELPHIA (EMSU)	1970	7	23	1971	9	2
110060	72524	CLEVELAND (EMSU)	1971	4	1	1971	12	30
110070	72423	LOUISVILLE (EMSU)	1971	4	29	1971	12	30
110080	74530	DENVER (EMSU)	1971	4	23	1971	12	30
110090	74704	EL MONTE (EMSU)	1971	4	1	1979	9	28
110100	72295	LOS ANGELES (EMSU)	1971	5	1	1979	9	30
110110	74505	SAN JOSE (EMSU)	1971	8	30	1971	12	30
110111	74505	SAN JOSE/BRENTWOOD (EMS	1972	6	19	1972	6	23
110112	74505	SAN JOSE/SANTA ROSA (EMS	1972	9	6	1972	9	8
110120	72509	BOSTON (EMSU)	1971	8	24	1971	12	30
110130	72243	HOUSTON (EMSU)	1971	8	16	1979	6	29
110140	72793	SEATTLE (EMSU)	1971	10	18	1971	12	30
110141	72793	SEATTLE/BOEING FLD (EMSU	1971	9	15	1971	10	14
110150	74479	PITTSBURGH (EMSU)	1971	11	15	1971	12	30
110170	72414	CHARLESTON (EMSU)	1975	1	2	1979	11	29
110180	72228	BIRMINGHAM (EMSU)	1975	1	2			

Station History for North American Upper-air Stations

DRA	3109	72387	36.56	116.04	1259	510811	520428	MERCURY/TEST SITE	NV	US				
DRA	3109	72387	36.36	115.58	1155	520429	521204	MERCURY/TEST SITE	NV	US				
DRA	3109	72387	36.57	116.03	1197	521204	530605	MERCURY/TEST SITE	NV	US				
DRA	3109	72387	36.57	116.05	1196	550201	551105	MERCURY/TEST SITE	NV	US		3133		
NID	3120	72388	35.47	117.47	687	470709	540309	N CHINA LAKE/B-1 RANGE	CA	US				
NID	3120	72388	35.47	117.47	670	540310	561231	N CHINA LAKE/G-1 RANGE	CA	US				
NID	3120	72388	35.47	117.47	666	570101	640229	N CHINA LAKE/G-1 RANGE	CA	US		93104		
SGU	3121	99999	37.06	113.36	895	570417	570928	ST GEORGE	UT	US				
OCS	3123	72292?	33.24	117.30	69	540721	541015	CAMP PENDLETON	CA	US				
FHU	3124	72273	31.34	110.20	1425	550104	550108	FT HUACHUCA	AZ	US				inter obs throughout
FHU	3124	72273	31.34	110.20	1428	550109	580611	FT HUACHUCA	AZ	US				
FHU	3124	72273	31.34	110.20	1420	580612	580617	FT HUACHUCA	AZ	US				
FHU	3124	72273	31.34	110.20	1422	580618	590226	FT HUACHUCA	AZ	US				
FHU	3124	72273	31.34	110.20	1423	590227	590325	FT HUACHUCA	AZ	US				
FHU	3124	72273	31.34	110.20	1432	590326	611028	FT HUACHUCA	AZ	US				
FHU	3124	72273	31.34	110.20	1439	611029		FT HUACHUCA	AZ	US				
YUN	3125	72280	32.51	114.24	106	540511	560831	YUMA	AZ	US				
YUN	3125	72280	32.50	114.24	106	560901	580917	YUMA	AZ	US				
YUN	3125	72280	32.52	114.20	131	580918	610906	YUMA	AZ	US				
YUN	3125	72280	32.52	114.20	98	610907	630607	YUMA	AZ	US				
YUN	3125	72280	32.50	114.24	98	630608	630630	YUMA	AZ	US				
YUN	3125	72280	32.52	114.20	131	650601	710727?	YUMA/US ARMY MET TEAM	AZ	US				
SAN	3131	72290	32.49	117.08	124	560616	890913	SAN DIEGO MONTGOMERY	CA	US	93112	3190		NO SAN DIEGO OB 9/14/90!
TPH	3132	72485	38.04	117.06	1650	560920	581031	TONOPAH	NV	US	23128			
UCC	3133	72385	36.57	116.03	1196	560916	590428	YUCCA FLAT	NV	US	3109	3143		
UCC	3133	72385	36.57	116.03	1196	590815	600714	YUCCA FLAT	NV	US	3143	3143		
UCC	3133	72385	36.57	116.03	1196	610914	660920	YUCCA FLAT	NV	US				1 OB PER DAY
UCC	3133	72385	36.57	116.03	1196	660921	681110	YUCCA FLAT	NV	US				BEGAN 2 OBS PER DAY
UCC	3133	72385	36.57	116.03	1198	681111	790514	YUCCA FLAT	NV	US	23169	3160		
	3134	99999	35.16	116.05	284	570423	570928	BAKER	CA	US				
4JA	3143	72385	36.48	116.16	1100	590429	590815	JACKASS FLATS	NV	US	3133	3133		
4JA	3143	72385	36.48	116.16	1100	600526	610420	JACKASS FLATS	NV	US	3133	3133		
4JA	3143	72385	36.48	116.16	1102	610421	671219	JACKASS FLATS	NV	US				INTER OBS FEW 8-9/62
NJK	3146	72281	32.58	115.49	73	620228	680830	EL CENTRO	CA	US				INTER OBS
GBN	3148	74724	32.57	112.40	262	999999		GILA BEND AAF	AZ	US				W PPBB ONLY
PHX	3149	72278	33.26	112.22	295	630813	631022	PHOENIX/LITCHFIELD PARK	AZ	US	23183			
NSI	3158	72291	33.16	119.33	9	730901	830107	SAN NICOLAS/SITE #2	CA	US			93116	2 SITES USED
DRA	3160	72387	36.37	116.01	1007	780516		DESERT ROCK/MERCURY	NV	US	3133			
4SU	3176	74619	35.20	117.06	962?	999999		SUPERIOR VALLEY GUN RANGE	CA	US				W PPBB ONLY
BYS	3182	74611	35.17	116.37	716?	999999		BICYCLE LAKE AAF	CA	US				W PPBB ONLY
NKX	3190	72293	32.52	117.09	147	890913		MIRAMAR NAS	CA	US	3131			NO SAN DIEGO OB 9/14/90
PAH	3816	72435	37.04	88.46	126	881128		PADUCAH	KY	US	3879			
TYS	3851	72326	35.49	83.59	301	550215	560618	KNOXVILLE/McGHEE-TYSON	TN	US				
PNS	3855	72222	30.21	87.19	10	550523	680630	PENSACOLA/F. SHERMAN FLD	FL	US	93829			
HTS	3860	72425	38.22	82.33	246	611201		HUNTINGTON	WV	US	93818			
SLO	3879	72433	38.39	88.58	174	690625	700130	SALEM	IL	US				
SLO	3879	72433	38.39	88.58	175	700131	881128	SALEM	IL	US		3816		
CKL	3881	72229	32.54	87.15	140	741116		CENTERVILLE	AL	US	13895			
FSM	3926	72344	35.20	94.18	146	530317	550930	FT SMITH	AR	US				
FSM	3926	72344	35.18	94.19	147	560215	560630	FT SMITH	AR	US				
FSM	3926	72344	35.20	94.22	140	570201	570831	FT SMITH	AR	US				
FSM	3926	72344	35.18	94.18	146	580201	581031	FT SMITH	AR	US				
FSM	3926	72344	35.19	94.16	142	590201	640518	FT SMITH	AR	US				
LCH	3937	72240	30.07	93.13	5	611231		LAKE CHARLES	LA	US	13941			
JAN	3940	72235	32.19	90.05	100	681018	780917	JACKSON/THOMPSON FLD	MS	US	13956			archive mis 2 yrs
JAN	3940	72235	32.19	90.04	91	780918		JACKSON/THOMPSON FLD	MS	US				
UMN	3946	72349	36.53	93.54	438	700905		MONETT	MO	US	13983			
OUN	3948	72357?	35.14	97.28	362	740101	750106	NORMAN	OK	US	13919	13967		
OUN	3948	72357	35.14	97.28	362	890328		NORMAN	OK	US	13967			
GGG	3951	72247	32.21	94.39	124	750713		LONGVIEW	TX	US	13957			
1M1	3952	72340	34.50	92.16	172	751219		N LITTLE ROCK	AR	US	13963			
YMW	4734	72722	46.23	75.58	170	530701	770630	MANIWAKI	PQ	CN				
YMW	4734	71722	46.23	75.58	170	770701		MANIWAKI	PQ	CN				
IAG	4738	72528	43.07	78.55	182	540315	600820	NIAGARA FALLS	NY	US	14733	14733		
YPI	4740	99999?	43.59	77.09	98?	601199	610499	PICTON	ON	CN				no data in archive
BLB	10701	78806	8.59	79.36	66	431199		BALBOA/ALBROOK AFB		PN				

CBO	10717	80222	4.42	74.09	2547	600817	630317	BOGOTA		CO			
CBO	10717	80222	4.42	74.09	2541	630318		BOGOTA		CO			
ROL	10809	78762	9.59	84.13	0	830601		SAN JOSE/JUAN SANTA MARIA		CR			
BDI	11501	78954	13.04	59.30	56	650730	711026	SEAWELL APT		BA			
BDI	11501	78954	13.04	59.30	47	711027		SEAWELL APT		BA			
ANU	11604	78861	17.07	61.47	4	440199	490720	ST JOHNS/COOLIDGE AAFB		AN		11647	
	?11608	78526	18.27	66.06	6	440505	451209?	SAN JUAN	PR	US		11631	
CGU	11610	78967	10.35	61.20	41	490527	491219	TRINIDAD/WALLER FLD		TR	11621	11621	
CGU	11621	78967	10.41	61.37	21	420501	490430	TRINIDAD NAS		TR		11610	
CGU	11621	78967	10.41	61.37	21	500101	501031	TRINIDAD NAS		TR	11610		
CGU	11621	78967	10.41	61.37	18	501101	520831	TRINIDAD NAS		TR			
CGU	11621	78967	10.41	61.37	2	520901	670615	TRINIDAD NAS		TR			
CGU	11621	78967	10.41	61.37	2	670616	691208	TRINIDAD/CHAGUARAMAS		TR		11634	
SDQ	11629	78486	18.28	69.53	14	620806		SANTO DOMINGO		DR	11646		
JNR	11630	78535	18.15	65.34	20	881001	881207	ROOSEVELT ROADS	PR	US			
	?11631	78526	18.27	66.06	6	451210	491108	SAN JUAN	PR	US	11608		
	?11631	78526	18.28	66.07	6	491109	500131	SAN JUAN	PR	US		11636	
KPP	11634	78970	10.35	61.21	12	691212		TRINIDAD/PIARCO IAP		TR	11621		
SIG	11636	78526	18.27	66.06	19	500201	560210	SAN JUAN/ISLA GRANDE	PR	US	11631	11641	
JSJ	11641	78526	18.26	66.00	23	550701	560331	SAN JUAN/ISLA VERDE	PR	US			
JSJ	11641	78526	18.26	66.00	19	560210	550630	SAN JUAN/ISLA VERDE	PR	US	11636		
JSJ	11641	78526	18.26	66.00	6	560401	750223	SAN JUAN/ISLA VERDE	PR	US			
JSJ	11641	78526	18.26	66.00	3	750224		SAN JUAN/ISLA VERDE	PR	US			
FFR	11642	78897	16.16	61.32	8	560221	590430	POINT À PITRE/RAIZET		GU			
FFR	11642	78897	16.16	61.31	8	590501	721231	POINT À PITRE/RAIZET		GU			
FFR	11642	78897	16.16	61.31	8	890101		POINT À PITRE/RAIZET		GU			
ACC	11643	78988	12.11	68.58	8	560605	610311	CURACAO/WILLEMSTAD		NA			
ACC	11643	78988	12.11	68.58	9	610312	700521	CURACAO/WILLEMSTAD		NA			
ACC	11643	78988	12.12	68.58	9	700522	760522	CURACAO/WILLEMSTAD		NA			
ACC	11643	78988	12.12	68.58	54	760523		CURACAO/WILLEMSTAD		NA			
SLU	11644	78949	13.45	60.59	30	560720	571099	ST LUCIA AAFB		SL			
ACM	11645	78866	18.02	63.07	3	561002	660628	SINT MAARTEN/JULIANA		NA			
ACM	11645	78866	18.03	63.07	3	660629		SINT MARTIN/JULIANA		NA			
SDM	11646	78467	19.03	69.23	11	560919	620804	SABANA DE LA MAR		DR		11629	
KPA	11647	78861	17.07	61.47	4	570901	890501	ST JOHN/COOLIDGE AAFB		AN	11604		close data from archive
KJP	11704	78397	17.53	77.18	34	431099	490920	KINGSTON/VERNON FLD		JA		11715	
UGM	11706	78367	19.54	75.09	20	460801	520731	GUANTANAMO NAS		CU			
UGM	11706	78367	19.54	75.09	16	520801	550228	GUANTANAMO NAS		CU			
UGM	11706	78367	19.54	75.09	29	550301	660113	GUANTANAMO NAS		CU			
UGM	11706	78367	19.54	75.09	32	660114	760630	GUANTANAMO NAS		CU			
UGM	11706	78367	19.54	75.09	6	760701		GUANTANAMO NAS		CU			
KJP	11715	78397	17.56	76.47	7	560903	630514	KINGSTON/PALISADOES		JA	11704		
KJP	11715	78397	17.56	76.47	1	630515		KINGSTON/PALISADOES		JA			
SWA	11807	78501	17.24	83.56	10	390720	600419	SWAN ISLAND/ISLAS DEL CISNE		HO			
SWA	11807	78501	17.24	83.56	11	600420	610116	SWAN ISLAND/ISLAS DEL CISNE		HO			
SWA	11807	78501	17.24	83.56	10	610117	800206	SWAN ISLAND/ISLAS DEL CISNE		HO			
KCR	11813	78384	19.18	81.22	3	560814		GRAND CAYMAN		CI			
	11816	78724	13.18	87.11	49	730117	751223	CHOLSTECA		HN			close date fron archive
HTG	11817	78720	14.02	87.14	1014?	760603		TEGUCIGALAPA, D.C.		HO			AF/WMO ELE=1007m
ZBZ	11818	78583	17.32	88.18	5	820601		BELIZE		BE			
GUA	11901	78641	14.32	90.34	1496	731108	890219	GUATEMALA CITY		GU			close date fron archive
MEX	11903	76679	19.24	99.12	2306	430210	671212	MEXICO CITY/TACUYA		MX			
MEX	11903	76679	19.26	99.05	2234	671213	700820	MEXICO CITY/INT APT		MX			
MEX	11903	76679	19.26	99.04	2234	700821		MEXICO CITY/INT APT		MX			
VER	11904	76692	19.11	96.07	12	520125	521215	VERACRUZ		MX	12948		
VER	11904	76692	19.11	96.07	13	521216	640228	VERACRUZ		MX			
VER	11904	76692	19.10	96.07	13	640301		VERACRUZ		MX			
CMW	12711	78355	21.25	77.52	122	480401	601031	CAMAGUAY		CU			
CMW	12711	78355	21.25?	77.52?	122?	890101		CAMAGUAY		CU			NO INFO ON REOPENING
YGM	12712	78063	26.37	78.22	6	510125	701216	GRAND BAHAMA/GOLD ROCK CK		BM			
YEM	12713	78076	25.16	76.18	26	520215	570699	ELEUTHERA I/COFFIN HILLS AA		BM			
YEM	12713	78076	25.16	76.18	25	570799	631299	ELEUTHERA I/COFFIN HILLS AA		BM			
YEM	12713	78076	25.16	76.18	27	640199	701217	ELEUTHERA I/COFFIN HILLS AA		BM			
KJT	12714	78118	21.27	71.09	9	541116	830622	GRAND TURK IS AFB		BM			INTER OBS SPECIAL PURP
	?12715	78107	22.22	73.02	21	551110	571002	FLAMINGO HILL/MAYAGUAN AAFB		BI			
YSM	12716	78089	24.04	74.31	5	560112	641215	SAN SALVADOR AAFB/BONEFISH		BM			

APPENDIX B(2) (Continued)

Station History for North American Upper-air Stations

YNN	12717	78073	25.03	77.28	2	771214		NASSAU APT		BM					
MIA	12829	72202	25.48	80.16	4	450620	460122	MIAMI	FL	US			12839	W	
AQQ	12832	72220	29.44	85.02	23	421024	480831	APALACHICOLA	FL	US					
AQQ	12832	72220	29.44	85.02	7	740701	910611	APALACHICOLA	FL	US		93805			
MIA	12839	72202	25.49	80.17	12	390712	541130	MIAMI	FL	US					
MIA	12839	72202	25.49	80.17	4	541201	570430	MIAMI	FL	US					
MIA	12839	72202	25.48	80.16	4	570501	770222	MIAMI/INT AP	FL	US		12844			
TPA	12842	72211	27.58	82.32	9	430526	521299	TAMPA	FL	US					
TPA	12842	72211	27.58	82.32	7	521299	570315	TAMPA	FL	US					
TPA	12842	72211	27.58	82.32	8	570316	750626	TAMPA	FL	US					
TPA	12842	72210	27.58	82.32	8	750627	750722	TAMPA	FL	US					CHANGED WMO NUMBER
TBW	12842	72210	27.42	82.24	13	750723		TAMPA BAY/RUSKIN	FL	US					STA MOVE SAME WBAN #
PBI	12844	72203	26.41	80.07	6	770303		W. PALM BEACH	FL	US	12839				
NQX	12850	72201	24.35	81.42	3	540426	590731	KEY WEST/BOCA CHICA NAS	FL	US					
NQX	12850	72201	24.35	81.41	3	590801	720628	KEY WEST/BOCA CHICA NAS	FL	US					
EYW	12836	72201	24.33	81.45	1	720629		KEY WEST INT AP	FL	US					NAVY TO NWS CONTROL
	?12863	72232	28.58	89.23	2	450810	461209	BURRWOOD	LA	US		12916			
	?12863	72232	28.58	89.22	3	500815	601130	BURRWOOD	LA	US	12916				
	?12863	72232	28.58	89.23	3	601201	650212	BURRWOOD	LA	US		12884			
HAV	12864	78325	23.09	82.21	49	440901	601101	HAVANA		CU					CASTRO CLOSED/WMO -OPEN
MID	12866	76106	20.58	89.31	27	440822	471231	MERIDA		MX					
MID	12866	76644	20.58	89.31	27	480101	561006	MERIDA		MX		12878			
COF	12867	74795	28.14	80.36	4	500204	561117	COCOA BEACH /PATRICK	FL	US		12868			
XMR	12868	74794	28.29	80.33	5	561118	631299	CAPE CANAVERAL	FL	US	12867				
XMR	12868	74794	28.29	80.33	5	631299		CAPE KENNEDY	FL	US					RENAMED
MID	12878	76644	20.56	89.41	11	561007	570731	MERIDA IAP		MX	12866				
MID	12878	76644	20.56	89.40	11	570801	681220	MERIDA IAP		MX					
MID	12878	76644	20.57	89.39	11	681221		MERIDA IAP		MX					
CSB	12879	72224	29.41	85.21	3	601227	700528	CAPE SAN BLAS	FL	US					
	?12880	99999?	25.54	81.43	4	601223	621102	DELTA 7/MARCO ISLAND	FL	US					
	?12881	99999?	27.57	80.34	8	620214	700527	VALKARIA	FL	US					close date from archive
BVE	12884	72232	29.20	89.24	1	650213	650908	BOOTHVILLE	LA	US	12863	12958			DESTROYED BY HURRICANE
BVE	12884	72232	29.20	89.24	1	660101	690810	BOOTHVILLE	LA	US	12958	93868			DESTROYED BY HURRICANE
BVE	12884	72232	29.20	89.24	1	710426	880621	BOOTHVILLE	LA	US	93868	53813			REESTABLISHED
EFD	12906	72243	29.36	95.10	12	460199	630621	HOUSTON/ELLINGTON AFB	TX	US					
VCT	12912	72255	28.51	96.55	33	660701	891107	VICTORIA	TX	US	12921	12924			
MSY	12916	72231	29.59	90.15	3	461218	500731	NEW ORLEANS	LA	US	12863	12863			
BRO	12919	72250	25.55	97.28	6	400805	501231	BROWNSVILLE	TX	US					
BRO	12919	72250	25.54	97.26	7	510101		BROWNSVILLE	TX	US					
SAT	12921	72253	29.32	98.28	240	390707	511015	SAN ANTONIO	TX	US					
SAT	12921	72253	29.32	98.28	243	511016	530911	SAN ANTONIO	TX	US					
SAT	12921	72253	29.32	98.28	248	530912	531104	SAN ANTONIO	TX	US					
SAT	12921	72253	29.32	98.28	243	531105	660630	SAN ANTONIO	TX	US		12912			
CRP	12924	72251	29.46	97.30	14	891111		CORPUS CHRISTI	TX	US	12912				
NGP	12926	72251	27.41	97.17	6	530201	570220	CORPUS CHRISTI NAS	TX	US					
NGP	12926	72251	27.41	97.17	18	570221	590201	CORPUS CHRISTI NAS	TX	US					
NGP	12926	72251	27.41	97.17	11	590202	620915	CORPUS CHRISTI NAS	TX	US					
NGP	12926	72251	27.41	97.17	6	620916	660630	CORPUS CHRISTI NAS	TX	US					
CVM	12948	76491	23.44	99.07	335	451201	520115	CIUDAD VICTORIA		MX		11904			
	?12958	72231	30.00	90.00	1	650921	651011	ALVIN CALLENDER NAS	LA	US	12884	12884			OBS APPARENTLY LOST
ERT	13025	8449	36.39	6.21	27	581103		ROTA NAS		SP					
XKF	13601	78016	32.21	64.42	3	440517	690830	BERMUDA/MCKINDLEY AFB		BE	13602				
XKF	13601	78016	32.22	64.41	25	690831		BERMUDA/(MCKINDLY AFB)		BE					
XKF	13602	78016	32.16	64.51	13	390499	460199	BERMUDA/ST GEORGE		BE		13601			
ADW	13705	74594	38.49	76.51	83	490726	521231	ANDREWS AFB	MD	US			13743	W	
BOF	13710	72405	38.50	77.01	18	431299	440799	WASHINGTON/BOLLING AFB ?	DC	US			13743	W	
NHK	13721	72404	38.17	76.25	10	450599	540299	PATUXENT RIVER NAS	MD	US					RUMORS OF STA REOPEN 89
GSO	13723	72317	36.05	79.57	275	430917	500607	GREENSBORO	NC	US					
GSO	13723	72317	36.05	79.57	273	500608	691114	GREENSBORO	NC	US					
GSO	13723	72317	36.05	79.57	275	691115	801223	GREENSBORO	NC	US					
GSO	13723	72317	36.05	79.57	277	801224		GREENSBORO	NC	US					
ORF	13737	72308	36.53	76.12	9	551115	650802	NORFOLK	VA	US	13750	93739			
PHL	13739	72408	39.53	75.15	23	550101	571112	PHILADELPHIA	PA	US				W	
DCA	13743	72405	38.51	77.02	25	340799	500930	WASHINGTON/NAT APT	DC	US		93722			
HAT	13745	72304	35.16	75.40	15	431122	570228	HATTERAS	NC	US		93729			
NGU	13750	72308	36.56	76.18	6	450201	521199	NORFOLK	VA	US					

Station History for North American Upper-air Stations

NGU	13750	72308	36.56	76.17	6	521116	551115	NORFOLK	VA	US		13737		
NDY	13760	74574	38.20	77.01	30	451001	560202	DAHLGREN	VA	US				
NDY	13760	74574	38.20	77.02	6	560203	591113	DAHLGREN	VA	US				
GUN	13801	72226	32.25	86.14	53	541218	560601	MONTGOMERY/GUNTER AFB	AL	US	13821	13895		
BLV	13802	72433	38.33	89.59	136	500705	520331	BELLEVILLE/SCOTT AFB	IL	US				
BLV	13802	72433	38.33	89.59	133	520401	550911	BELLEVILLE/SCOTT AFB	IL	US				
BLV	13802	72433	38.33	89.31	133	590528	590930	BELLEVILLE/SCOTT AFB	IL	US				
BAK	13803	72436	39.16	85.54	199?	550515	550911	COLUMBUS/BAKALAR AFB	IN	US				
FTK	13807	72423	37.54	85.58	230	540516	541002	FT KNOX/GODMAN AFB	KY	US			93821	
BYH	13814	72340	35.58	89.57	77	570301	580531	BLYTHEVILLE AFB	AR	US				
BYH	13814	72340	35.58	89.57	80	600215	600522	BLYTHEVILLE AFB	AR	US				
BYH	13814	72340	35.58	89.57	82	610299	640799	BLYTHEVILLE AFB	AR	US				
NAB	13815	72216	31.35	84.06	61	560215	560531	ALBANY/TURNER AFB	GA	US				
NAB	13815	72216	31.35	84.06	66	590215	590531	ALBANY/TURNER AFB	GA	US				
NAB	13815	72216	31.35	84.07	65	600201	600517	ALBANY/TURNER AFB	GA	US				
MXF	13821	72226	32.24	86.21	50	460301	500131	MONTGOMERY/MAXWELL	AL	US	13895			(380701-450123 MISG)
MXF	13821	72226	32.24	86.21	52	500201	541217	MONTGOMERY/MAXWELL	AL	US		13801		
DAY	13840	72429	39.52	84.07	297	511201	560430	DAYTON/WRIGHT PATTERSON	OH	US	14849			simul w/14849 2 mo
DAY	13840	72429	39.52	84.07	297	560501	691114	DAYTON/SULPHUR GOVE (WB)	OH	US				
DAY	13840	72429	39.52	84.07	299	691115	710708	DAYTON/SULPHUR GROVE	OH	US				af to wb 560501
DAY	13840	72429	39.52	84.07	298	710709		DAYTON/SULPHUR GROVE	OH	US				
IIN	13841	72721	39.26	83.48	323	461001	491007	WILMINGTON/CLINTON AFB	OH	US				
VPS	13858	72221	30.31	86.35	28	451201	511021	VALPARAISO/ELGIN AFB	FL	US				
VPS	13858	72221	30.31	86.35	18	511021	540314	VALPARAISO/ELGIN AFB	FL	US				
VPS	13858	72221	30.31	86.35	20	540315		VALPARAISO/ELGIN AFB	FL	US				
WRB	13860	72217	32.38	83.38	86	481115	490125	WARNER ROBINS	GA	US				
WRB	13860	72217	32.36	83.34	90	490125	540228	WARNER ROBINS	GA	US				
WRB	13860	72217	32.36	83.34	86	540301	540430	WARNER ROBINS	GA	US				
AYS	13861	72213	31.15	82.24	44	690415		WAYCROSS	GA	US	13889			
MEM	13862	72334	35.03	89.59	78	530301	530514	MEMPHIS	TN	US				
MEM	13862	72334	35.03	89.59	83	540201	550430	MEMPHIS	TN	US				
MEM	13862	72334	35.09	90.03	80	560215	560630	MEMPHIS	TN	US				
MEM	13862	72334	35.03	89.58	88	590215	590523	MEMPHIS	TN	US				
AHN	13873	72311	33.57	83.19	246	550904		ATHENS	GA	US	13874			
ATL	13874	72219	33.39	84.25	309	390706	550903	ATLANTA	GA	US		13873		
CHS	13880	72208	32.54	80.02	18	390714	500715	CHARLESTON	SC	US				
CHS	13880	72208	32.54	80.02	15	500716		CHARLESTON	SC	US				
JAX	13889	72206	30.25	81.39	6	551101	600215	JACKSONVILLE	FL	US	93837			
JAX	13889	72206	30.25	81.39	5	600216	690414	JACKSONVILLE	FL	US		13861		
MGM	13895	72226	32.24	86.14	50	340703	380630	MONTGOMERY MAXWELL FLD	AL	US		13821		
MGM	13895	72226	32.18	86.24	61	560601	690520	MONTGOMERY DONNELLY FLD	AL	US	13801			
MGM	13895	72226	32.18	86.24	57	690521	741111	MONTGOMERY DONNELLY FLD	AL	US		3881		
BNA	13897	72327	36.07	86.41	180	380713	491231	NASHVILLE/BERRY FLD	TN	US				
BNA	13897	72327	36.07	86.41	178	500101	630918	NASHVILLE/BERRY FLD	TN	US				
BNA	13897	72327	36.15	86.34	181	630919	631027	NASHVILLE	TN	US				
BNA	13897	72327	36.15	86.34	180	631028		NASHVILLE	TN	US				
SEP	13901	72260	32.13	98.11	399	731103		STEPHENVILLE	TX	US	13911			
LTS	13902	72352	34.39	99.16	414	540201	580530	ALTUS AFB	OK	US				
LTS	13902	72352	34.39	99.16	420	610201	610531	ALTUS AFB	OK	US				
ADM	13903	72350	34.18	97.01	222	610317	610531	ARDMORE/GENE AUTRY AFB	?OK	US				
	?13905	72244	30.40	96.33	81	540201	560630	BRYAN AFB	TX	US				
	?13905	72244	30.40	96.33	84	570205	580518	BRYAN AFB	TX	US				
END	13909	72353	36.20	97.40	396	441101	520709	ENID/VANCE AFB	OK	US				
DYS	13910	72266	32.26	99.51	545	570301	570531	ABILENE/DYESS AFB	TX	US				
DYS	13910	72266	32.26	99.51	539	580301	580531	ABILENE/DYESS AFB	TX	US				
DYS	13910	72266	32.26	99.51	547	590215	590531	ABILENE/DYESS AFB	TX	US				
DYS	13910	72266	32.26	99.51	550	600215	610604	ABILENE/DYESS AFB	TX	US		13962		
FWH	13911	72259	32.46	97.27	194	480823	490720	FT WORTH/CARSWELL AFB	TX	US				
FWH	13911	72259	32.46	97.27	178	490721	570303	FT WORTH/CARSWELL AFB	TX	US				
FWH	13911	72259	32.46	97.27	180	570304	731029	FT WORTH/CARSWELL AFB	TX	US		13901		
TIK	13919	72354	35.26	97.23	383	490915	490918	OKLAHOMA CITY/TINKER AFB	OK	US				
TIK	13919	72354	35.26	97.23	376	490919	510114	OKLAHOMA CITY/TINKER AFB	OK	US				
TIK	13919	72354	35.26	97.23	380	510115	520214	OKLAHOMA CITY/TINKER AFB	OK	US				
TIK	13919	72354	35.26	97.23	375	520215	531229	OKLAHOMA CITY/TINKER AFB	OK	US				
TIK	13919	72354	35.26	97.23	390	531230	590825	OKLAHOMA CITY/TINKER AFB	OK	US				
TIK	13919	72354	35.26	97.23	387	590826	670630	OKLAHOMA CITY/TINKER AFB	OK	US				some obs simul w/okc

APPENDIX B(2) (Continued)

Station History for North American Upper-air Stations

TIK	13919	72354	35.25?	97.23?	386?	670701	731231	OKLAHOMA CITY/TINKER AFB	OK	US	13967	3948		archive mis 710331-731231
FOE	13920	72456	38.57	95.40	329	531221	540201	TOPEKA/FORBES AFB	KS	US	13921			
FOE	13920	72456	38.57	95.40	321	540202	550929	TOPEKA/FORBES AFB	KS	US		13996		
FLV	13921	72457	39.20	94.55	267	440599	480826	FT LEAVENWORTH/SHERMAN A	KS	US				
FLV	13921	72457	39.19	94.55	274	480827	510531	FT LEAVENWORTH/SHERMAN A	KS	US				
FLV	13921	72457	39.19	94.55	327	510601	531019	FT LEAVENWORTH/SHERMAN A	KS	US		13920		
SLN	13922	72458	38.48	97.38	383	440799	550999	SALINA/SMOKY HILL AFB	KS	US				
SLN	13922	72458	38.48	97.38	386	560214	560999	SALINA/SMOKY HILL AFB	KS	US				
SLN	13922	72458	38.48	97.38	385	570301	581015	SALINA/SMOKY HILL AFB	KS	US				close date from archive
HKS	13927	72235	32.20	90.14	105	530301	530531	JACKSON/HAWKINS FLD	MS	US				
HKS	13927	72235	32.20	90.13	98	540126	540430	JACKSON/HAWKINS FLD	MS	US			13939	
HKS	13927	72235	32.20	90.13	96	550215	550430	JACKSON/HAWKINS FLD	MS	US		13956		
	?13928	72256	31.38	97.04	145	450199	450599	WACO/JAMES CONNALLY AFB	TX	US				
	?13928	72256	31.38	97.16	145	510117	510416	WACO/JAMES CONNALLY AFB	TX	US				
	?13928	72256	31.38	97.04	138	520229	520615	WACO/JAMES CONNALLY AFB	TX	US				
SPS	13931	72351	33.59	98.30	326	500316	500531?	WICHITA FALLS/SHEPPARD	TX	US				
AEX	13934	72246	31.19	92.33	27	550215	550430?	ALEXANDRIA	LA	US				
GLH	13939	72238	33.28	90.59	41	540226	540430	GREENVILLE	MS	US			13927	
LCH	13941	72240	30.13	93.09	5	410724	611231	LAKE CHARLES	LA	US		3937		
BAD	13944	72248	32.30	93.41	49	480824	520211	SHREVEPORT/BARKSDALE AFB	LA	US				
BAD	13944	72248	32.30	93.41	53	520212	560110	SHREVEPORT/BARKSDALE AFB	LA	US		13957		
FSI	13945	72355	34.39	98.23	357	441101	520624	FT SILL	OK	US				
FSI	13945	72355	34.39	98.24	365	600215	600330	LAWTON	OK	US				APPARENTLY RENAMED
FRI	13947	72455	39.03	96.46	324	580404	581012	FT RILEY/MARSHALL AAF	KS	US				
FRI	13947	72455	39.03	96.46	324	690799		FT RILEY/MARSHALL AAF	KS	US				
HKS	13956	72235	32.20	90.13	101	560201	600219	JACKSON/HAWKINS FLD	MS	US	13927			
HKS	13956	72235	32.20	90.13	94	600220	681015	JACKSON/HAWKINS FLD	MS	US		3940		
SHV	13957	72248	32.28	93.49	77	560111	560426	SHREVEPORT MUN AP	LA	US	13944			
SHV	13957	72248	32.28	93.49	76	560427	600319	SHREVEPORT MUN AP	LA	US				
SHV	13957	72248	32.28	93.49	79	600320	750707	SHREVEPORT MUN AP	LA	US		3951		
ACT	13959	72256	31.37	97.13	157	530599	530599	WACO	TX	US			13928 W	
ABI	13962	72266	32.26	99.41	534	630204	730526	ABILENE	TX	US	13910			FEB-MAY ONLY
LIT	13963	72340	34.44	92.14	79	431010	550128	LITTLE ROCK	AR	US				
LIT	13963	72340	34.44	92.14	87	550129	561222	LITTLE ROCK	AR	US				
LIT	13963	72340	34.44	92.14	79	561223	751219	LITTLE ROCK	AR	US		3952		
OKC	13967	72353	35.24	97.36	391	380717	550799	OKLAHOMA CITY/WILL ROGER	OK	US				
OKC	13967	72353	35.24	97.36	392	550799	670630	OKLAHOMA CITY/WILL ROGER	OK	US		13919		
OKC	13967	72353	35.24	97.36	392	750107	890327	OKLAHOMA CITY/WILL ROGER	OK	US	3948	3948		
COU	13983	72445	38.58	92.22	239	460202	510199	COLUMBIA	MO	US	13994			
COU	13983	72445	38.58	92.22	238	510116	700827	COLUMBIA	MO	US		3946		
DDC	13985	72451	37.46	99.58	800	430828	551225	DODGE CITY	KS	US				
DDC	13985	72451	37.46	99.58	792	551226	631227	DODGE CITY	KS	US				
DDC	13985	72451	37.46	99.58	791	631228		DODGE CITY	KS	US				
STL	13994	72434	38.45	90.23	181	390901	460129	ST LOUIS	MO	US		13983		
TOP	13996	72456	39.04	95.37	269	550930	681231	TOPEKA	KS	US	13920			
TOP	13996	72456	39.04	95.37	268	690101		TOPEKA	KS	US				
YQX	14501	72803	48.57	54.34	147	431208	450831	GANDER	NF	CN			14509 W	
YJT	14503	72815	48.33	58.34	5	440599	530107	STEPHENVILLE/HARMON AFB	NF	CN				
YJT	14503	72815	48.33	58.34	59	530108	580727	STEPHENVILLE/HARMON AFB	NF	CN				
YJT	14503	72815	48.33	58.34	30	580728	661210	STEPHENVILLE/HARMON AFB	NF	CN				
YJT	14503	72815	48.32	58.33	58	661211	690899	STEPHENVILLE/HARMON AFB	NF	CN				
YJT	14503	72815	48.32	58.33	60	690916	770630	STEPHENVILLE/HARMON AFB	NF	CN				AES ELE-60m WMO ELE-61m
YJT	14503	71815	48.32	58.33	60	770701	901231	STEPHENVILLE/HARMON AFB	NF	CN		14539		AES ELE-60m WMO ELE-61m
YYT	14505	74198	47.36	52.41	79	500608	520731	ST JOHNS/PEPPERRELL AFB	NF	CN	14508	14508		
YAR	14508	72807	47.18	53.59	17	410501	500607	ARGENTIA	NF	CN		14505		AES OPEN DATE 450399
YAR	14508	72807	47.18	53.59	17	520801	590731	ARGENTIA	NF	CN	14505			
YAR	14508	72807	47.18	53.59	19	590801	700430	ARGENTIA	NF	CN		14531		AES CLOSE DATE 700599
YQX	14509	72803	48.57	54.34	140	410699	440899	GANDER	NF	CN		14510		
YQX	14510	72803	49.09	55.21	3	440899	460699	BOTWOOD	NF	CN	14509			
YYT	14531	72801	47.40	52.45	140	710427	770630	TORBAY/ST JOHNS	NF	CN	14508			
YYT	14531	71801	47.40	52.45	140	770701		TORBAY/ST JOHNS	NF	CN				
YJT	14539	71815	48.32	58.33	60	910101		STEPHENVILLE	NF	CN	14503			
PQI	14604	72713	46.41	68.03	148	450401	460211	PRESQUE ISLE	ME	US			14607 W	
CAR	14607	72712	46.52	68.01	192	420403	481130	CARIBOU	ME	US				
CAR	14607	72712	46.52	68.01	194	481201	501031	CARIBOU	ME	US				
CAR	14607	72712	46.52	68.01	191	501101	530525	CARIBOU	ME	US				

CAR	14607	72712	46.52	68.01	197	530526.	540903	CARIBOU	ME	US					
CAR	14607	72712	46.52	68.01	191	540904		CARIBOU	ME	US					
NHZ	14611	74392	43.53	69.56	36	530303	550519	BRUNSWICK	ME	US					
YSA	14642	72600	43.56	60.01	3	440899	570799	SABLE ISLAND	NS	CN					
YSA	14642	72600	43.56	60.02	3	570801	620930	SABLE ISLAND	NS	CN					
YSA	14642	72600	43.56	60.01	4	621001	770630	SABLE ISLAND	NS	CN					AES LON CHANGE 610999?
YSA	14642	71600	43.56	60.01	4	770701		SABLE ISLAND	NS	CN					AES LON CHANGE 610999?
CHH	14684	74494	41.40	69.58	16	701118		CHATHAM	MA	US	14756				
YCX	14685	72701	45.51?	66.27?	36?	710104	720499	GAGETOWN	NB	CN					
YCX	14685	72701	45.50	66.26	52	720501	770630	GAGETOWN	NB	CN					
YCX	14685	71701	45.50	66.26	52	770701		GAGETOWN	NB	CN					
WOS	14688	74399	43.43	65.15	30	721101	761231	SHELBURNE	NS	CN		14693			
WOS	14693	74399	43.43	65.15	30	770101	770630	SHELBOURNE	NS	CN	14688				
WOS	14693	71399	43.43	65.15	30	770701	880831	SHELBOURNE	NS	CN		94620			
AGC	14701	72520	40.21	79.56	388	440829	450228	PITTSBURGH/ALLEGHENY APT	PA	US		14809	14762	W	
FMH	14704	72506	41.39	70.31	41	640714	650801	FALMOUTH	MA	US					
NY9?	14708	74498	40.44	73.36	23	520309	560918	NEW YORK/HEMPSTEAD	NY	US		94789			
SWF	14714	74482	41.30	74.06	141	470516	500317	NEWBURGH/STEWART AFB	NY	US					
SWF	14714	74482	41.30	74.06	138	500318	520308	NEWBURGH/STEWART AFB	NY	US					
RME	14717	72518	43.14	75.25	146	470520	530312	ROME/GRIFFISS AFB	NY	US			14735		SOME OBS SIMUL W/14735
RME	14717	72518	43.14	75.25	152	530313	551011	ROME/GRIFFISS AFB	NY	US		14735			
PWM	14724	72606	43.39	70.15	23	440104	450702	PORTLAND/FT WILLIAMS	ME	US			14764	W	
BUF	14733	72528	42.56	78.44	220	390901	540314	BUFFALO/GRTR ARPT	NY	US		4738			
BUF	14733	72528	42.56	78.44	218	600820		BUFFALO/GRTR ARPT	NY	US	4738				
ALB	14735	72518	42.45	73.48	94	430424	511130	ALBANY	NY	US			14717		SOME OBS SIMUL W/14717
ALB	14735	72518	42.45	73.48	86	551019		ALBANY	NY	US	14717				
ACK	14756	72506	41.15	70.04	14	460416	501121	NANTUCKET	MA	US					
ACK	14756	72506	41.15	70.04	20	501122	510228	NANTUCKET	MA	US					
ACK	14756	72506	41.15	70.04	14	510301	691114	NANTUCKET	MA	US					
ACK	14756	72506	41.15	70.04	13	691115	701103	NANTUCKET	MA	US		14684			
AGC	14762	72520	40.21	79.56	382	430430	520914	PITTSBURGH/ALLEGHENY	PA	US		94823			
PWM	14764	72606	43.39	70.19	23	390701	550607	PORTLAND	ME	US					
PWM	14764	72606	43.39	70.19	20	550608		PORTLAND	ME	US					
	?14779	99999	40.18	74.03	16	471201	480229	RED BANK	NJ	US					
NEL	14780	72409	40.02	74.19?	39	391001	441199	LAKEHURST	NJ	US					
NEL	14780	72409	40.02	74.19	40	450399	550715	LAKEHURST/NAS	NJ	US					LON MAY HAVE CHANGED
NCO	14788	72507	41.35	71.25	10	431299	540799?	QUONSET POINT	RI	US					5204 CLOSING?..W#54742?
MTC	14804	72537	42.37	82.50	176	451201	520229	MT CLEMENS	MI	US					
MTC	14804	72537	42.36	82.51	178	520301	560918	MT CLEMENS	MI	US		14826			
RAN	14806	72531	40.18	88.09	227	440902	560911	RANTOUL/CHANUTE AFB	IL	US		14842			
	?14809	72520	40.32	80.14	353	450301	540426	PITTSBURGH/CORAOPOLIS	PA	US	14701		14762	W	SEE ALSO 94823
FNT	14826	72637	42.58	83.44	234	560919	681231	FLINT/BISHOP ARPT	MI	US	14804				
FNT	14826	72637	42.58	83.44	236	690101		FLINT/BISHOP ARPT	MI	US					
JOT	14834	72534	41.30	88.10	179	390701	530314	JOLIET	IL	US					
PIA	14842	72532	40.40	89.41	201	560912	590930	PEORIA	IL	US	14806				
PIA	14842	72532	40.40	89.41	200	591001		PEORIA	IL	US					
SSM	14847	72734	46.28	84.22	225	380718	531204	SAULT STE MARIE	MI	US					
SSM	14847	72734	46.28	84.22	221	531205	910618	SAULT STE MARIE	MI	US					
Y62	14847	72734	46.28	84.22	221	910619		SAULT STE MARIE	MI	US					CALL LETTER CHANGE
TOL	14849	72536	41.34	83.28	191	440104	511130	TOLEDO	OH	US	14853	13840			
YIP	14853	72537?	42.14	83.32	218	420715	431230	DETROIT/WILLOW RUN	MI	US	94847	14849			CURRENT WMO#
GRB	14898	72645	44.29	88.08	210	450403	631122	GREEN BAY	WI	US					
GRB	14898	72645	44.29	88.08	209	631123	640813	GREEN BAY	WI	US					
GRB	14898	72645	44.29	88.08	210	640814		GREEN BAY	WI	US					
INL	14918	72747	48.36	93.14	343	420928	460719	INTERNATIONAL FALLS	MN	US					
INL	14918	72747	48.34	93.23	360	460720	521130	INTERNATIONAL FALLS	MN	US					
INL	14918	72747	48.34	93.23	368	521201	541130	INTERNATIONAL FALLS	MN	US					
INL	14918	72747	48.34	93.23	360	541201	691031	INTERNATIONAL FALLS	MN	US					
INL	14918	72747	48.34	93.23	359	691101		INTERNATIONAL FALLS	MN	US					
STC	14926	72655	45.35	94.11	317	470524	511099	ST CLOUD/WHITNEY APT	MN	US	14927				
STC	14926	72655	45.35	94.11	316	511099	720209	ST CLOUD/WHITNEY APT	MN	US					
STC	14926	72655	45.33	94.05	315	720215		ST CLOUD/MUNICIPAL APT	MN	US					
STP	14927	72657	44.56	93.04	224	401231	470520	ST PAUL	MN	US		14926			
HON	14936	72654	44.23	98.13	391	630606	630817	HURON	SD	US	94913				
HON	14936	72654	44.23	98.13	393	630818	690601	HURON	SD	US					JUN-SEP 63-73 ONLY
HON	14936	72654	44.23	98.13	392	690602		HURON	SD	US					

APPENDIX B(2) (Continued)

Station History for North American Upper-air Stations

OMA	14942	72550	41.18	95.54	308	380716	520499	OMAHA/EPPLEY	NE	US				
OMA	14942	72553	41.18	95.54	300	520499	540915	OMAHA	NE	US		94918		CURRENT WMO #
OTM	14948	72546?	41.06	92.26	256	430999	470627	OTTUMWA NAS	IA	US			14942 W	
OFF	14949	72553	41.07	95.54	318	501204	520605	?OMAHA/OFFUTT AFB	NE	US				
OFF	14949	72553	41.07	95.54	305	520607	540516	?OMAHA/OFFUTT AFB	NE	US				
4YP	15045	99016	50.00	145.00	0	610101		OCEAN WEATHER STATION P						
YYR	15601	72816	53.18	60.27	46	430399	591031	GOOSE/GOOSE BAY	NF	CN				AES OPEN DATE 470199
YYR	15601	72816	53.18	60.22	36	591101	770630	GOOSE/GOOSE BAY	NF	CN				
YYR	15601	71816	53.18	60.22	36	770701		GOOSE/GOOSE BAY	NF	CN				
YLP	15604	74188	50.17	64.10	23	440899	500826	MINGAN	PQ	CN				
YVP	15605	72906	58.05	68.25	29	440199	500831	FT CHIMO	PQ	CN				
YVP	15605	72906	58.06	68.26	36	500901	770630	FT CHIMO (KUUJJUAQ)	PQ	CN				
YVP	15605	71906	58.06	68.26	36	770701	851031	FT CHIMO (KUUJJUAQ)	PQ	CN		15641		
YZV	15613	72811	50.13	66.16	53?	520199	581099	SEVEN ISLES	PQ	CN				
YZV	15613	72811	50.13	66.16	52?	581199	671231	SEPT ILES	PQ	CN		15636		
YZV	15636	72811	50.13	66.16	52	680101	770630	SEPT ILES (UA)	PQ	CN	15613			
YZV	15636	71811	50.13	66.16	52	770701		SEPT ILES (UA)	PQ	CN				
YVP	15641	71906	58.06	68.25	60	851101		KUUJJUAQ (UA)	PQ	CN	15605			
YNI	15703	72826	53.12	70.35	515	430899	570930	NITCHEQUON	PQ	CN				
YNI	15703	72826	53.12	70.54	515	571001	621011?	NITCHEQUON	PQ	CN				
YNI	15703	72826	53.12	70.54	539	621012	770630	NITCHEQUON	PQ	CN				
YNI	15703	71826	53.12	70.54	539	770701	851130	NITCHEQUON	PQ	CN				
YPH	15704	72907	58.27	78.08	17	431099	690299	PORT HARRISON/INUKJUAK	PQ	CN				
YPH	15704	72907	58.27	78.07	7	690399	770630	INUKJUAK	PQ	CN				AES ELE-4m
YPH	15704	71907	58.27	78.07	7	770701		INUKJUAK	PQ	CN				AES ELE-4m
YAH	15708	71823	53.45	73.40	307	851201		LA GRANDE IV	PQ	CN				
YMO	15803	72836	51.13	80.39	10	421299	530399	MOOSONEE	PQ	CN				
YMO	15803	72836	51.16	80.39	10	530499	770630	MOOSONEE	PQ	CN				
YMO	15803	71836	51.16	80.39	10	770701		MOOSONEE	PQ	CN				
YTL	15806	72848	53.50	89.52	219	521299	530212	TROUT LAKE	ON	CN				
YTL	15806	72848	53.50	89.52	222?	530213	770630	TROUT LAKE	ON	CN				AES ELE-224m WMO-220m
YTL	15806	71848	53.50	89.52	222?	770701		TROUT LAKE	ON	CN				AES ELE-224m WMO-220m
YYQ	15901	72913	58.45	94.07	35	430699	450899	CHURCHILL	MB	CN				AES OPEN DATE 450899
YYQ	15901	72913	58.47	94.11	13	450899	521199	CHURCHILL	MB	CN				
YYQ	15901	72913	58.45	94.04	29	521299	770630	CHURCHILL	MB	CN				WBAN NUMBER CHANGE
YYQ	15901	71913	58.45	94.04	29	770701	901231	CHURCHILL	MB	CN		15932		WBAN NUMBER CHANGE
YYQ	15932	71913	58.44	94.05	29	910101		CHURCHILL	MB	CN	15901			
IKF	16201	4018	63.58	22.36	50	460101		KEFLAVIK		IL				
	16204	4018	63.57	22.37	59	480101	540831	KEFLAVIK/MEEKS		IL				
IKA	16302	4353	65.56	36.41	56	431101	470829	IKATEQ		GL				
GBW	16405	4270	61.11	45.25	4	431108	581030	NARSARSSUAK		GL				
MKA	16503	4255	63.26	51.11	41	440100	480918	MARRAK POINT		GL				
GSF	16504	4231	67.00	50.48	46	440101	500410	SONDRESTROM		GL				
YFB	16603	72909	63.44	68.22	21	430399	500899?	FROBISHER BAY	NW	CN				AES OPEN DATE 500999
YFB	16603	72909	63.45	68.32	21	500999	770630	FROBISHER BAY	NW	CN				
YFB	16603	71909	63.45	68.32	21	770701	870131	FROBISHER BAY	NW	CN		16607		
YVN	16607	71909	63.45	68.33	21	870201		IQALUIT (UA)	NW	CN	16603			
YZS	16801	72915	64.11	83.21	59	431099	450831	CORAL HARBOUR	NW	CN				AES OPEN DATE 450999
YZS	16801	72915	64.12	83.22	62	450901	761031	CORAL HARBOUR	NW	CN				
YZS	16801	72915	64.12	83.22	63	761101	770630	CORAL HARBOUR	NW	CN				DATE ELE CHG ????
YZS	16801	71915	64.12	83.22	63	770701	850731	CORAL HARBOUR	NW	CN				DATE ELE CHG ????
YZS	16801	71915	64.12	83.22	57	850801	901231	CORAL HARBOUR	NW	CN		16805		WBAN NUMBER CHANGE
YZS	16805	71915	64.12	83.22	57	910101		CORAL HARBOUR	NW	CN	16801			
YUX	16806	71081	68.46	81.13	6	910101		HALL BEACH	NW	CN	16895			
YUX	16895	74081	68.47	81.15	10	570801	640908	HALL BEACH/HALL LK	NW	CN				
YUX	16895	74081	68.47	81.15	7?	640909	770630	HALL BEACH/HALL LK	NW	CN				AES ELE-6m WMO 7m
YUX	16895	71081	68.47	81.15	7?	770701	901231	HALL BEACH/HALL LK	NW	CN		16806		AES ELE-6m WMO 7m
YBK	16903	72926	64.28	96.00	9	490210	541118	BAKER LAKE	NW	CN				
YBK	16903	72926	64.18	96.00	9	541119	770630	BAKER LAKE	NW	CN				
YBK	16903	71926	64.18	96.00	9	770701	801031	BAKER LAKE	NW	CN		16910		
YBK	16910	71926	64.18	96.00	49	800403		BAKER LAKE (UA)	NW	CN	16903			APPT SIMUL OBS 8004-8010
	17202	4342	70.30	21.58	7	440800	490731	WALRUS BAY		GL				
YCY	17601	74090	70.25	68.17	3	431099	480999?	CLYDE	NW	CN				AES OPEN DATE 480999
YCY	17601	74090	70.27	68.33	8	481099	540499	CLYDE	NW	CN				
YCY	17601	74090	70.27	68.33	3	550201	581130	CLYDE	NW	CN				
YCY	17601	74090	70.27	68.33	25	581201	700731	CLYDE	NW	CN				

Station History for North American Upper-air Stations

	17602	4202	76.33	68.49	39	461001	520731	W. THULE		GL		17605	
GTL	17605	4202	76.33	68.49	34	520801	601031	W THULE		GL	17602		
GTL	17605	4202	76.33	68.43	31	601101		W THULE		GL			
YAB	17801	72918	73.00	85.17	5	430499	440899	ARCTIC BAY	NW	CN			
YEU	17801	71917	79.59	85.56	10	910101		EUREKA	NW	CN	18801		
YAB	17802	72918	73.00	85.18	11	450999	570731	ARCTIC BAY	NW	CN			
YRB	17901	72924	74.41	94.55?	175?	471024	491199	RESOLUTE	NW	CN			DESCREPANCIES IN HISTORY
YRB	17901	72924	74.41	94.54	62	491199	500899	RESOLUTE	NW	CN			
YRB	17901	72924	74.41	94.55	17	500899	531199	RESOLUTE	NW	CN			
YRB	17901	72924	74.41	94.54	62	531199	570999	RESOLUTE	NW	CN			
YRB	17901	72924	74.43	94.59	62	570999	600199	RESOLUTE	NW	CN			
YRB	17901	72924	74.43	94.59	64	600199	631011	RESOLUTE	NW	CN			CANADIAN CONTROL 610101
YRB	17901	72924	74.43	94.59	40	631012	770630	RESOLUTE	NW	CN			WBAN NUMBER CHANGE
YRB	17901	71924	74.43	94.59	40	770701	901231	RESOLUTE	NW	CN		17906	WBAN NUMBER CHANGE
YRB	17906	71924	74.42	94.59	40	910101		RESOLUTE	NW	CN	17901		
YLT	18601	74082	82.32	62.42	66	500910	601229	ALERT	NW	CN			
YLT	18601	74082	82.30	62.20	66	601230	770630	ALERT	NW	CN			WBAN NUMBER CHANGE
YLT	18601	71082	82.30	62.20	66	770701	901231	ALERT	NW	CN		18605	WBAN NUMBER CHANGE
YLT	18605	71082	82.30	62.20	66	910101		ALERT	NW	CN	18601		
YEU	18801	72917	80.13	86.11	4	470601	481221	EUREKA	NW	CN			
YEU	18801	72917	79.59?	85.56?	4	481222	491105	EUREKA	NW	CN			
YEU	18801	72917	79.59	85.57	4	491106	580910	EUREKA	NW	CN			
YEU	18801	72917	80.00	85.56	4	580911	601229	EUREKA	NW	CN			
YEU	18801	72917	80.06	85.57	7	601230	631203	EUREKA	NW	CN			("CN CONTROL" 610101)
YEU	18801	72917	79.59	85.56	10	631204	770630	EUREKA	NW	CN			WBAN NUMBER CHANGE
YEU	18801	71917	79.59	85.56	10	770701	901231	EUREKA	NW	CN		17801	WBAN NUMBER CHANGE
	?21001	76654	19.04	104.20	3	760716		MANZANILLO		MX			
SIC	21101	76723	18.14	111.03	35	731016	800701?	SOCORRO ISLAND		MX			
SIC	21101	76723	18.43	110.57	34	800701		SOCORRO ISLAND		MX			
ITO	21504	91285	19.44	155.04	9	500218	540202	HILO	HI	US			
ITO	21504	91285	19.44	155.04	11	540203	570731	HILO	HI	US			
ITO	21504	91285	19.43	155.04	11	570801	700128	HILO	HI	US			
ITO	21504	91285	19.43	155.04	10	700129		HILO	HI	US			
DLF	22001	72261	29.20	100.53	333	540128	540718	DEL RIO/LAUGHLIN AFB	TX	US			
DLF	22001	72261	29.22	100.47	333	540718	551231	DEL RIO/LAUGHLIN AFB	TX	US			
DLF	22001	72261	29.22	100.46	333	560101	630304	DEL RIO/LAUGHLIN AFB	TX	US		22010	
MCV	22007	76225	28.38	106.04	1428	640805	670630	CHIHUAHUA		MX			CALL LETTERS "CUU" ASO
MCV	22007	76225	28.42	106.04	1428	670701		CHIHUAHUA		MX			
MZT	22009	76180	23.11	106.25	14	430301	471231	MAZATLAN SINALOA		MX			
MZT	22009	76458	23.11	106.25	14	480101	630830	MAZATLAN SINALOA		MX			
MZT	22009	76458	23.11	106.25	4	630831		MAZATLAN SINALOA		MX			
DRT	22010	72261	29.22	100.55	313	630304		DEL RIO	TX	US	22001		
MTY	22012	76394	25.52	100.15	423	640925	700731	MONTERREY		MX			
MTY	22012	76394	25.52	100.12	450	700801		MONTERREY		MX			
	?22013	76612	20.41	103.20	1551	790301		GUADALAJARA		MX			
GYM	22104	76256	27.57	110.49	12	641122	650204	EMPALME SONORA		MX			
GYM	22104	76256	27.57	110.48	12	650205		EMPALME SONORA		MX			
IGP	22105	76151	28.52	118.15	23	710116		GUADALUPE ISLAND		MX			
YEV	22258	72957	68.19	133.32	103	730401	770630	INUVIK (UA)	NW	CN	26323		
YEV	22258	71957	68.19	133.32	103	770701		INUVIK (UA)	NW	CN			
BKH	22501	91162	22.02	159.47	5	630801	650801	BARKING SANDS	HI	US		22545	
HIK	22504	91182	21.20	157.57	8	450701	460710	HONOLULU/(HICKAM FLD)	HI	US		22521	
NPS	22517	91199	21.21	157.57	7	280701	450399	PEARL HARBOR	HI	US			
NPS	22517	91199	21.21	157.57	3	500699	520630	PEARL HARBOR	HI	US	22521	22521	
HNL	22521	91182	21.20	157.55	4	460711	490531	HONOLULU/JOHN ROGERS FLD	HI	US	22504		
HNL	22521	91182	21.20	157.55	3	490601	500619	HONOLULU/JOHN ROGERS FLD	HI	US		22517	
HNL	22521	91182	21.20	157.55	4	520701	530531	HONOLULU INT AP	HI	US	22517	22536	
LIH	22536	91165	21.58	159.22	36	500225	500399	LIHUE/KAUAI	HI	US	22521		
LIH	22536	91165	21.59	159.21	36	500399		LIHUE/KAUAI	HI	US			
BKH	22545	91162	22.02	159.47	8	650802	670625	BARKING SANDS	HI	US	22501		
BKH	22545	91162	22.02	159.47	5	670626	830131	BARKING SANDS	HI	US			
FFS	22604	91115	23.52	166.17	6	620918	621030	FRENCH FRIGATE SHOAL	HI	US			
MDY	22701	91066	28.13	177.22	13	451101	461006	MIDWAY ISLAND (NAVY)	PC	US		22702	
MDY	22701	91066	28.13	177.22	13	480501	500606	MIDWAY ISLAND (NAVY)	PC	US	22702	22703	
MDY	22701	91066	28.13	177.22	13	520527	530430	MIDWAY ISLAND (NAVY)	PC	US	22703		
MDY	22701	91066	28.13	177.21	8	530430	561229	MIDWAY ISLAND (NAVY)	PC	US			

Station History for North American Upper-air Stations

MDY	22701	91066	28.13	177.21	12	561230	570124	MIDWAY ISLAND (NAVY)	PC	US				
MDY	22701	91066	28.13	177.21	3	570125		MIDWAY ISLAND (NAVY)	PC	US				
MDY	22702	91066	28.13	177.22	13	461007	480430	MIDWAY ISLAND (ARMY)	PC	US	22701	22701		
MDY	22703	91066	28.13	177.22	13	500606	520527	MIDWAY ISLAND (WB)	PC	US	22701	22701		
HMN	23002	74732	32.51	106.05	1247	480301		ALAMOGORDO/HOLLOMAN AFB	NM	US			23039	
AMA	23003	72363	35.13	101.50	1099	520215	521008	AMARILLO	TX	US				
AMA	23003	72363	35.13	101.50	1096	521009	561008	AMARILLO	TX	US				
AMA	23003	72363	35.13	101.50	1099	561009	561124	AMARILLO	TX	US				
AMA	23003	72363	35.14	101.42	1096	561125	561201	AMARILLO	TX	US		23047		
LRY	23012	72469	39.43	104.53	1640	481015	490220	DENVER/LOWRY	CO	US				
LRY	23012	72469	39.43	104.53	1643	490221	500107	DENVER/LOWRY	CO	US				
LRY	23012	72469	39.43	104.53	1640	500108	521212	DENVER/LOWRY	CO	US				
LRY	23012	72469	39.43	104.52	1661	521213	560814	DENVER/LOWRY	CO	US		23062		
GOF	23017	72263	31.24	100.24	569	530399	690999	SAN ANGELO/GOODFELLOW	TX	US				
GOF	23017	72263	31.24	100.24	573	700201	710131	SAN ANGELO/GOODFELLOW	TX	US				
ELP	23019	72270	31.50	106.24	1207	440617	460522	EL PASO/BIGGS AFB	?TX	US			23044 W	
REE	23021	72267	33.35	102.14	1015	500301	500613	LUBBOCK/REESE AFB	TX	US				
REE	23021	72267	33.36	102.15	1014	520215	520625	LUBBOCK/REESE AFB	TX	US				
REE	23021	72267	33.36	102.02	1017	600315	640518	LUBBOCK/REESE AFB	TX	US				
MRF	23022	72264	30.22	104.01	1478	590215	590520	MARFA AAF	TX	US				
MAF	23023	72265	31.56	102.12	871	531115	591231	MIDLAND	TX	US	23041			
MAF	23023	72265	31.56	102.12	880	600101	600419	MIDLAND	TX	US				
MAF	23023	72265	31.56	102.12	874	600420	720229	MIDLAND	TX	US				
MAF	23023	72265	31.57	102.12	873	720301	720412	MIDLAND	TX	US				
MAF	23023	72265	31.56	102.12	870	720413	720417	MIDLAND	TX	US				
MAF	23023	72265	31.56	102.12	873	720418		MIDLAND	TX	US				
GJT	23032	72476	39.04	108.34	1404	440501	440999	GRAND JUNCTION	CO	US		23066		US ARMY CONTROL
	?23037	99999?	32.24	106.09	1260	460523	480430	OROGRANDE	NM	US				
	?23038	99999?	31.47	106.25	1184	480323	481204	FT. BLISS	TX	US				
	?23039	72269	32.22	106.28	1381	461107	470515	WHITE SANDS/LAS CRUCES	NM	US			23002	
	?23039	72269	32.24	106.24	1211	470516	471021	WHITE SANDS/LAS CRUCES	NM	US				
	?23039	72269	32.24	106.21	1216	471023		WHITE SANDS/LAS CRUCES	NM	US				
HCA	23041	72265	32.14	101.30	774	431010	501231	BIG SPR USING	TX	US				
HCA	23041	72265	32.14	101.30	784	510101	531113	BIG SPR USING	TX	US		23023		
ELP	23044	72270	31.49	106.24	1195	390712	570630	EL PASO	TX	US				
ELP	23044	72270	31.49	106.24	1197	570701	600731	EL PASO	TX	US				
ELP	23044	72270	31.48	106.24	1193	600801	831202	EL PASO	TX	US				
ELP	23044	72270	31.48	106.24	1199	831203		EL PASO	TX	US				
AMA	23047	72363	35.14	101.42	1098	561201	561230	AMARILLO	TX	US	23003			
AMA	23047	72363	35.14	101.42	1095	561231		AMARILLO	TX	US				
ABQ	23050	72365	35.03	106.37	1620	390318	510904	ALBUQUERQUE	NM	US				
ABQ	23050	72365	35.03	106.37	1619	510905		ALBUQUERQUE	NM	US				
DEN	23062	72469	39.46	104.53	1608	560815	561113	DENVER/STAPLETON ARPT	CO	US	23012			
DEN	23062	72469	39.46	104.53	1611	561114		DENVER/STAPLETON ARPT	CO	US				
GLD	23065	72465	39.21	101.42	1124	590699	590999	GOODLAND	KS	US			93056 W	
GJT	23066	72476	39.07	108.32	1474	441130	530810	GRAND JUNCTION	CO	US	23032			
GJT	23066	72476	39.07	108.32	1481	530811	561101	GRAND JUNCTION	CO	US				
GJT	23066	72476	39.07	108.32	1474	561102	681231	GRAND JUNCTION	CO	US				
GJT	23066	72476	39.07	108.32	1472	690101		GRAND JUNCTION	CO	US				
FAT	23106	72389	36.46	119.42	103	450799	451299	FRESNO	CA	US				
FAT	23106	72389	36.49	119.42	103	520208	550409	FRESNO	CA	US				
DMA	23109	72274	32.10	110.54	811	450721	560301	TUSCON/DAVIS MONTHAN AFB	AZ	US		23160		
LSV	23112	72386	36.15	115.02	572	450799	460199	NELLIS AFB	NV	US			23169 W	
LSV	23112	72386	36.15	115.02	569	500829	540201	NELLIS AFB	NV	US				
EDW	23114	72381	34.54	117.53	695	500301	560320	MUROC/EDWARDS AFB	CA	US				
EDW	23114	72381	34.55	117.54	725	560321		MUROC/EDWARDS AFB	CA	US				INTERMIT OBS
RAA	23118	72488	39.40	119.52	1555	531015	531212	RENO/STEAD AFB	NV	US				
RAA	23118	72488	39.40	119.52	1530	550201	550207	RENO/STEAD AFB	NV	US				
RAA	23118	72488	39.40	119.52	1545	550208	570923	RENO/STEAD AFB	NV	US				
LAX	23124	72295	34.04	118.26	147	441099	450999	LOS ANGELES	CA	US		23129		
TPH	23128	72485	38.04	117.05	1652	511008	550515	TONOPAH	NV	US		3132		
LGB	23129	72297	33.49	118.09	20	470310	511199	LONG BEACH	CA	US	23124			
LGB	23129	72297	33.49	118.09	22	511199	520499	LONG BEACH	CA	US				
LGB	23129	72297	33.49	118.09	18	520499	530416	LONG BEACH	CA	US				
LGB	23129	72297	33.50?	118.09	20	530417	551231	LONG BEACH	CA	US				
LGB	23129	72297	33.50	118.09	18	560101	560416	LONG BEACH	CA	US		93197		

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LAX	23145	72295	33.56	118.23	29	450399	451099	LOS ANGELES	CA	US			23124 W	
ELY	23154	72486	39.17	114.52	1908	390724	531028	ELY	NV	US				
ELY	23154	72486	39.17	114.51	1908	540601		ELY	NV	US				
TUS	23160	72274	32.08	110.57	781	560301	581020	TUCSON	AZ	US	23109			
TUS	23160	72274	32.07	110.56	789	581021	600420	TUCSON	AZ	US				
TUS	23160	72274	32.08	110.57	789	600421	601231	TUCSON	AZ	US				
TUS	23160	72274	32.07	110.56	789	610101	860327	TUCSON	AZ	US				
TUS	23160	72274	32.07	110.56	788	860328		TUSCON	AZ	US				
LAS	23169	72386	36.05	115.10	660	520801	661009	LAS VEGAS	NV	US	23173	3133		
LAS	23173	72386	36.05	115.10	660	450925	520731	LAS VEGAS	NV	US		23169		
LAX	23174	72295	33.56	118.23	39	650902	650916	LOS ANGELES	CA	US	93197			
LAX	23174	72295	33.56	118.23	32	650917	650924	LOS ANGELES	CA	US				
LAX	23174	72295	33.56	118.24	32	650925	710430	LOS ANGELES	CA	US				
PHX	23183	72278	33.26	112.02	338	390721	521130	PHOENIX	AZ	US				
PHX	23183	72278	33.26	112.02	341	521201	540431	PHOENIX	AZ	US				
PHX	23183	72278	33.26	112.01	341	540501	580115	PHOENIX	AZ	US				
PHX	23183	72278	33.26	112.02	341	541210	580115	PHOENIX	AZ	US		3149		
INW	23194	72374	35.01	110.44	1492	611101	681231	WINSLOW	AZ	US				
INW	23194	72374	35.01	110.44	1487	690101		WINSLOW	AZ	US				
CIC	23201	72497	39.48	121.51	71	620206	710326	CHICO	CA	US				IRREGULAR OBS
MER	23203	72481	37.22	120.34	57	440401	630131	MERCED/CASTLE AFB	CA	US				
OAK	23230	72493	37.44	122.12	8	360901	501231	OAKLAND	CA	US				
OAK	23230	72493	37.44	122.12	6	510101	661220	OAKLAND	CA	US				
OAK	23230	72493	37.45	122.13	6	661221		OAKLAND INT AP	CA	US				
SMX	23236	72394	34.56	120.25	71	430513	541021	SANTA MARIA	CA	US		23273		
SMX	23273	72394	34.54	120.27	74	541022	590630	SANTA MARIA	CA	US	23236	93215		
BFF	24007	72566	41.52	103.36	1204	530601	610925	SCOTTSBLUFF	NE	US				
BIS	24011	72764	46.46	100.45	505	390707	551031	BISMARCK	ND	US				
BIS	24011	72764	46.46	100.45	511	551101	561130	BISMARCK	ND	US				
BIS	24011	72764	46.46	100.45	505	561201	681231	BISMARCK	ND	US				
BIS	24011	72764	46.46	100.45	503	690101		BISMARCK	ND	US				
LND	24021	72576	42.48	108.43	1698	450901	590831	LANDER	WY	US				
LND	24021	72576	42.49	108.44	1696	590901	691031	LANDER	WY	US				
LND	24021	72576	42.49	108.44	1697	691101	730919	LANDER	WY	US				
LND	24021	72576	42.49	108.44	1695	730920		LANDER	WY	US				
LBF	24023	72562	41.08	100.42	849	450106	520814	NORTH PLATTE	NE	US				
LBF	24023	72562	41.08	100.41	848	520815	681231	NORTH PLATTE	NE	US				
LBF	24023	72562	41.08	100.41	847	690101		NORTH PLATTE	NE	US				
RAP	24026	72662	44.09	103.06	980	431006	501012	RAPID CITY	SD	US		24090		
GGW	24034	72768	48.11	106.38	648	430606	551026	GLASGOW	MT	US		94008		dup dat w/94008 551001-26
RAP	24090	72662	44.09	103.06	966	501013	501031	RAPID CITY	SD	US	24026			
RAP	24090	72662	44.02	103.02	966	501101	510930	RAPID CITY	SD	US				
RAP	24090	72662	44.02	103.03	966	511001	610321	RAPID CITY	SD	US				
RAP	24090	72662	44.03	103.04	966	610322		RAPID CITY	SD	US				
HIF	24101	72575	41.07	112.01	1451	481105	500818	OGDEN/HILL AFB	UT	US	24126			
HIF	24101	72575	41.07	112.01	1448	500819	511231	OGDEN/HILL AFB	UT	US				
HIF	24101	72575	41.07	112.01	1450	520101	560807	OGDEN/HILL AFB	UT	US		24127		
DPG	24103	72581	40.10	113.00	1325	491015	520215	TOOELE/DUGWAY PG	UT	US	24111			
DPG	24103	72581	40.10	113.00	1329	520216	530430	TOOELE/DUGWAY PG	UT	US				
DPG	24103	72581	40.11	112.55	1329	530501	570731	TOOELE/DUGWAY PG	UT	US				
ENV	24111	72581	40.43	114.04	1292	470102	480909	WENDOVER AFB	UT	US		24103		
GTF	24112	72775	47.31	111.10	1077	450599	531299	GREAT FALLS/MALMSTROM AF	MT	US			24143 W	
OGD	24126	72575	41.12	112.01	1355	430899	480831	OGDEN	UT	US		24101		
SLC	24127	72572	40.46	111.58	1288	560807		SALT LAKE CITY	UT	US	24101			
WMC	24128	72583	40.54	117.48	1310	560501	680201	WINNEMUCCA	NV	US				
WMC	24128	72583	40.54	117.48	1312	680202		WINNEMUCCA	NV	US				
BOI	24131	72681	43.34	116.13	868	390901	670811	BOISE	ID	US				
BOI	24131	72681	43.34	116.13	867	670811	690808	BOISE	ID	US				
BOI	24131	72681	43.34	116.13	871	690809		BOISE	ID	US				
GTF	24143	72775	47.30	111.21	1128	400801	530831	GREAT FALLS	MT	US				
GTF	24143	72775	47.30	111.21	1123	530901	540430	GREAT FALLS	MT	US				
GTF	24143	72775	47.29	111.21	1123	540501	681231	GREAT FALLS	MT	US				
GTF	24143	72775	47.29	111.21	1118	690101		GREAT FALLS	MT	US				
GEG	24157	72785	47.40	117.20	600	470126	471207	SPOKANE	WA	US				
GEG	24157	72785	47.37	117.31	726	471208	510125	SPOKANE	WA	US				
GEG	24157	72785	47.37	117.31	722	510126	651219	SPOKANE	WA	US				

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GEG	24157	72785	47.37	117.31	717	651220	681231	SPOKANE	WA	US					
GEG	24157	72785	47.37	117.31	720	690101	690122	SPOKANE	WA	US					
GEG	24157	72785	47.38	117.32	720	690123		SPOKANE	WA	US					
GRF	24201	74207	47.07	122.33	87	691001		FT LEWIS/GRAY AFB	WA	US					
TCM	24207	72793	47.09	122.29	88	520404	540115	TACOMA/McCHORD AFB	WA	US			24244	W	
NEJ	24208	72793	47.32	122.18	7	440901	450702	SEATTLE/BOEING FLD	WA	US				W	
MFR	24209	72597	42.23	122.52	402	440901	460209	MEDFORD AFB	OR	US			24225	W	
IAP	24211	72698	45.36	122.36	6	460101	460228	PORTLAND	OR	US					
IAP	24211	72698	45.36	122.36	7	530202	560531	PORTLAND	OR	US		24232			
MFR	24225	72597	42.22	122.52	401	390901	840813	MEDFORD	OR	US					
MFR	24225	72597	42.22	122.52	397	840814		MEDFORD	OR	US					
OLM	24227	72792	46.58	122.54	58	620601	640131	OLYMPIA	WA	US	24233	24240			
SLE	24232	72694	44.55	123.01	61	560601		SALEM	OR	US	24211				
SEA	24233	72793	47.27	122.18	124	560629	560913	SEATTLE/TACOMA APT	WA	US	24244				
SEA	24233	72793	47.27	122.18	125	560914	620531	SEATTLE/TACOMA APT	WA	US		24227			
TTI	24240	72798	48.23	124.44	33	430315	541014	TATOOSH ISLAND	WA	US					
TTI	24240	72798	48.23	124.44	31	541015	660801	TATOOSH ISLAND	WA	US	24227	94240			
NEJ	24244	72793	47.41	122.16	10	450399	490499	SEATTLE/NAS	WA	US					
NEJ	24244	72793	47.41	122.16	19	490499	540201	SEATTLE/NAS	WA	US					
NEJ	24244	72793	47.41	122.16	10	540202	560628	SEATTLE/NAS	WA	US		24233			
YQD	25004	72867	53.58	101.06	273	470499	770630	THE PAS	MB	CN					
YQD	25004	71867	53.58	101.06	273	770701	901231	THE PAS	MB	CN		25051			
YPA	25013	72869	53.13	105.41	428?	421299	450799	PRINCE ALBERT	SK	CN					
YQD	25051	71867	53.58	101.06	274	910101		THE PAS	SK	CN	25004				
YXD	25102	72879	53.34	113.31	667	431299	440899	EDMONTON	AB	CN					
YXD	25108	72879	53.40	113.29	697	440899	451099	EDMONTON/NAMAO AAB	AB	CN					
YYC	25110	72877	51.06	114.01	1084?	610799	680999	CALGARY	AB	CN					NCDC HAS NO RECORD HERE
YYC	25110	71877	51.07	114.01	1084?	860401		CALGARY	AB	CN				W	PPBB ONLY
YXD	25111	72879	53.38	113.29	666	460299	531014	EDMONTON/MUN AP	AB	CN					AES OPEN DATE 460199
YXD	25111	72879	53.34	113.31	668	531015	660228	EDMONTON/MUN AP	AB	CN		25145			sim obs w 25145 880215-28
WSE	25145	74119	53.33	114.06	766	660215	770630	EDMONTON/STONY PLAIN	AB	CN	25111				sim obs w 25111 660215-28
WSE	25145	71119	53.33	114.06	766	770701		EDMONTON/STONY PLAIN	AB	CN					sim obs w 25111 660215-28
YVR	25152	74115	50.14	119.17	556?	711005	770630	VERNON	BC	CN					NCDC ELE-555m
YVR	25152	71115	50.14	119.17	556?	770701		VERNON	BC	CN					NCDC ELE-555m
WIQ	25154	74124	54.48	110.05	703	670499	770630	PRIMROSE LAKE	AB	CN					(ROCKETSONDE STN)
WIQ	25154	71124	54.48	110.05	703	770701		PRIMROSE LAKE	AB	CN					(ROCKETSONDE STN)
YRM	25159	72928	52.26	114.54	988	690601	760911	ROCKY MTN HOUSE (UA)	AB	CN					AES CLOSE DATE 760799
YXS	25206	72896	53.50	122.48	678?	440799	441199	PRINCE GEORGE	BC	CN					AES ELE-676m,OPEN-441199
YXS	25206	72896	53.54	122.40	676	441199	551299	PRINCE GEORGE	BC	CN					
YXS	25206	72896	53.53	122.41	676	560199	720499	PRINCE GEORGE	BC	CN					
YXS	25206	72896	53.53	122.40	676	720599	770630	PRINCE GEORGE	BC	CN					
YXS	25206	71896	53.53	122.40	676	770701	860699	PRINCE GEORGE	BC	CN					
YXS	25206	71896	53.53	122.41	675	860699		PRINCE GEORGE	BC	CN					
YYE	25218	72945	58.50	122.35	375?	460499	490899	FORT NELSON	BC	CN					AES OPEN DATE 420399
YYE	25218	72945	58.50	122.35	373?	490999	581231	FORT NELSON	BC	CN					
YYE	25218	72945	58.50	122.35	379?	590101	770630	FORT NELSON	BC	CN					
YYE	25218	71945	58.50	122.35	379?	770701	821231	FORT NELSON	BC	CN		25262			
YZT	25223	74109	50.41	127.22	23	460699	500899	PORT HARDY	BC	CN					FROM COAL HARBOUR
YZT	25223	74109	50.41	127.22	19	500999	640503	PORT HARDY	BC	CN					
YZT	25223	74109	50.41	127.22	17	640504	770630	PORT HARDY	BC	CN					WBAN # CHANGE
YZT	25223	71109	50.41	127.22	17	770701	901231	PORT HARDY	BC	CN		25273			WBAN # CHANGE
YYE	25262	71945	58.50	122.36	377	830101		FORT NELSON UA	BC	CN	25218				
YZT	25273	71109	50.41	127.22	17	910101		PORT HARDY	BC	CN	25233				
ANN	25301	70048	55.02	131.34	35	440414	470729	ANNETTE ISLAND	AK	US		25308			
YAK	25302	70361	59.30	139.40	9	440417	460521	YAKUTAT	AK	US					
YAK	25302	70361	59.30	139.41	9	460522	480731	YAKUTAT	AK	US		25339			
ANN	25308	70398	55.02	131.34	35	470730	510630	ANNETTE ISLAND	AK	US	25301		25325		
ANN	25308	70398	55.02	131.34	37	510701		ANNETTE ISLAND	AK	US					
JNU	25309	70381	58.22	134.33	6	390901	430630	JUNEAU	AK	US					
JNU	25309	70381	58.22	134.35	6	430701	530515	JUNEAU APT	AK	US					
KET	25325	70952	55.21	131.39	25	400920	470728	KETCHIKAN	AK	US			25308		CURRENT WMO# 70395
YAK	25339	70361	59.31	139.40	10	480801	490531	YAKUTAT	AK	US	25302				
YAK	25339	70361	59.31	139.40	12	490601	490930	YAKUTAT	AK	US					
YAK	25339	70361	59.31	139.40	10	491001		YAKUTAT	AK	US					
ADQ	25501	70350	57.44	152.31	34	420801	450499?	KODIAK	AK	US					
ADQ	25501	70350	57.45	152.30	20	450901	521209	KODIAK	AK	US					

Station History for North American Upper-air Stations

ADQ	25501	70350	57.45	152.30	28	521210	530802	KODIAK	AK	US			
ADQ	25501	70350	57.45	152.30	20	530803	570806	KODIAK	AK	US			
ADQ	25501	70350	57.45	152.30	5	570807	600430	KODIAK	AK	US			
ADQ	25501	70350	57.45	152.30	6	600501	630919	KODIAK	AK	US			
ADQ	25501	70350	57.45	152.30	4	630920	730131	KODIAK	AK	US			
ADQ	25501	70350	57.45	152.29	4	730201		KODIAK	AK	US			
AKN	25503	70326	58.41	156.39	19	530505	540630	NAKNEK	AK	US			
AKN	25503	70326	58.41	156.39	16	540701	551212	NAKNEK	?AK	US			
AKN	25503	70326	58.41	156.39	15	551213		KING SALMON	AK	US			RENAMED KING SALMON
	?25602	70485	53.23	167.54	58	460614	470929	UMNAK/CAPE AFB/FT GLENN	AK	US			
	?25602	70485	53.23	167.54	22	470930	501121	UMNAK/CAPE AFB/FT GLENN	AK	US		25620	
CDB	25603	70316	55.12	162.42	33	451119	490812	COLD BAY AFB	AK	US			
CDB	25603	70316	55.12	162.42	28	490813	500523	COLD BAY AFB	AK	US			
CDB	25603	70316	55.12	162.42	25	500524	500930	COLD BAY AFB	AK	US			
CDB	25603	70316	55.12	162.42	29	501001	521211	COLD BAY AFB	AK	US			
CDB	25603	70316	55.12	162.42	24	530326	530831	COLD BAY AFB	AK	US			
CDB	25603	70316	55.12	162.42	26	530901	540228	COLD BAY AFB	AK	US		25624	
ADU	25611	70489	53.54	166.32	7	520624	540724	DUTCH HARBOR	AK	US	25620		
ADU	25620	70489	53.54	166.32	12	501211	520524	DUTCH HARBOR	AK	US	25602	25611	
CDB	25624	70316	55.12	162.43	27	550820	610421	COLD BAY	AK	US	25603		
CDB	25624	70316	55.12	162.43	30	610422		COLD BAY	AK	US			
ADK	25701	70454	51.53	176.31	4	440301	480624	ADAK/DAVIS AFB	AK	US		25704	
ADK	25701	70454	51.53	176.39	4	480625	500831	ADAK/DAVIS AFB	AK	US			
ADK	25704	70454	51.53	176.38	38	421299	440299	ADAK	AK	US			
ADK	25704	70454	51.53	176.39	20	500901	530615	ADAK/DAVIS AFB	AK	US	25701		
ADK	25704	70454	51.53	176.39	8	530616		ADAK/DAVIS AFB	AK	US			
SNP	25705	70308	57.08	170.16	29	431199	450999	ST PAUL ISLAND	AK	US			
SNP	25713	70308	57.07	170.16	29	451016	470623	ST PAUL ISLAND	AK	US			
SNP	25713	70308	57.09	170.13	7	470701	480430	ST PAUL ISLAND	AK	US			
SNP	25713	70308	57.09	170.13	9	480501	520131	ST PAUL ISLAND	AK	US			
SNP	25713	70308	57.09	170.13	10	520201	560930	ST PAUL ISLAND	AK	US			
SNP	25713	70308	57.09	170.13	15	561001	561130	ST PAUL ISLAND	AK	US			
SNP	25713	70308	57.09	170.13	10	561201		ST PAUL ISLAND	AK	US			
YCB	26005	72925	69.06	105.07	25	700217	770630	CAMBRIDGE BAY	NW	CN	26107		
YCB	26005	71925	69.06	105.07	25	770701	901231	CAMBRIDGE BAY	NW	CN		26010	
YCB	26010	71925	69.08	105.04	27	910101		CAMBRIDGE BAY	NW	CN	26005		
YSM	26102	72934	60.03	112.00	203	431299	441199?	FT SMITH	NW	CN			DESCREPANCY ON WHEN OPEN
YSM	26102	72934	60.01	111.58	203	460199	710930	FT SMITH	NW	CN		26118	AES OPEN 441299-480599
YCO	26107	72938	67.49	115.05	9	471110	700217	COPPERMINE	NW	CN		26005	
YSM	26118	72934	60.02	111.57	203	680201	770630	FT SMITH (UA)	NW	CN	26102		
YSM	26118	71934	60.02	111.57	203	770701		FT SMITH (UA)	NW	CN			
YVQ	26202	74043	65.17	126.47	111	440399	441299	NORMAN WELLS	NW	CN			AES OPEN DATE 480899
YVQ	26202	74043	65.18	126.51	75	450199	511114	NORMAN WELLS	NW	CN			
YVQ	26202	74043	65.18	126.51	62	511115	670999	NORMAN WELLS	NW	CN			
YVQ	26202	74043	65.17	126.48	60	671099	770630	NORMAN WELLS	NW	CN			
YVQ	26202	71043	65.17	126.48	60	770701	841031	NORMAN WELLS	NW	CN			
YVQ	26214	71043	65.17	126.45	95	841101		NORMAN WELLS (UA)	NW	CN			
YXY	26311	72964	60.42	135.07	638?	440699	460399	WHITEHORSE	YK	CN			AES OPEN DATE 460599
YXY	26316	72964	60.42	135.07	756?	460599	460999	WHITEHORSE	YK	CN			
YXY	26316	72964	60.43	135.04	698?	461099	620399	WHITEHORSE	YK	CN			
YXY	26316	72964	60.43	135.04	704	620499	770630	WHITEHORSE	YK	CN			WBAN NUMBER CHANGE
YXY	26316	71964	60.43	135.04	704	770701	901231	WHITEHORSE	YK	CN		26338	WBAN NUMBER CHANGE
YAK	26317	72968	68.14	135.00	10	420999	600912	AKLAVIK	NW	CN		26323	
YEV	26323	72957	68.18	133.29	58?	600912	730331	INUVIK	NW	CN	26317	22258	AES ELE=68m WMO 61m
YXY	26338	71964	60.43	135.04	704	910101		WHITEHORSE	YK	CN	26316		
ANC	26401	70273	61.15	149.48	60	451011	460521	ANCHORAGE	AK	US	26409	26409	
FGJ	26406	70263	63.59	145.43	386	501111	510228	FORT GREELY	AK	US			
FGJ	26406	70263	63.59	145.43	392	510301	720314	FORT GREELY	AK	US		26459	
ANC	26409	70273	61.13	149.50	51	430202	451010	ANCHORAGE	AK	US		26401	
ANC	26409	70273	61.13	149.50	51	460522	520714	ANCHORAGE	AK	US	26401		
ANC	26409	70273	61.13	149.50	42	520715	531028	ANCHORAGE	AK	US			
ANC	26409	70273	61.10	149.59	32	531029	541203	ANCHORAGE INT APT	AK	US			
ANC	26409	70273	61.10	149.59	30	541204	590630	ANCHORAGE INT APT	AK	US			
ANC	26409	70273	61.10	149.59	29	590701	640708	ANCHORAGE INT APT	AK	US			
ANC	26409	70273	61.10	150.01	45	640709		ANCHORAGE IAP/PT. CAMPBE	AK	US			
FAI	26411	70261	64.50	147.43	134	371009	510822	FAIRBANKS	AK	US			

Station History for North American Upper-air Stations

FAI	26411	70261	64.49	147.52	139	510823	520112	FAIRBANKS	AK	US				
FAI	26411	70261	64.49	147.52	135	520113		FAIRBANKS	AK	US				
ORT	26412	70291	62.58	141.58	524	421201	550512	NORTHWAY	AK	US				
5TK	26459	70192	65.07	147.29	197	720602	999999?	POKER FLAT	AK	US	26406			
MCG	26510	70231	62.58	155.37	103	420411		MCGRATH	AK	US				
OME	26604	70200	64.30	165.26	13	440417	460327	NOME AAB	AK	US	26617			
OME	26604	70200	64.30	165.28	14	460606	461009	NOME AAB	AK	US		26617		
BET	26615	70219	60.47	161.41	8	401019	541031	BETHEL	AK	US				
BET	26615	70219	60.47	161.43	4	541101	561106	BETHEL	AK	US				
BET	26615	70219	60.47	161.43	11	561107	561231	BETHEL	AK	US				
BET	26615	70219	60.47	161.48	4	570101	581110	BETHEL	AK	US				
BET	26615	70219	60.47	161.48	39	581111	811101	BETHEL	AK	US				
BET	26615	70219	60.47	161.48	36	811101		BETHEL	AK	US				
OTZ	26616	70133	66.52	162.38	5	421026		KOTZEBUE	AK	US				
OME	26617	70200	64.30	165.24	7	400915	421014	NOME FED BLDG	AK	US		26604		
OME	26617	70200	64.30	165.24	7	461020	481231	NOME FED BLDG	AK	US	26604			
OME	26617	70200	64.30	165.26	7	490101	501204	NOME AP	AK	US				
OME	26617	70200	64.30	165.26	10	501205	520831	NOME AP	AK	US				
OME	26617	70200	64.30	165.26	7	520901	660428	NOME AP	AK	US				
OME	26617	70200	64.30	165.26	5	660429		NOME AP	AK	US				12/1/-12/20/69 LOST
CTH	26636	70107	68.06	165.46	13	620325	620520	CAPE THOMPSON	AK	US				
GAM	26703	70204	63.51	171.36	10	421111	530630	GAMBELL	AK	US				
YIC	27001	74074	78.47	103.32	31	480818	590699	ISACHSEN	NW	CN				
YIC	27001	74074	78.47	103.32	30?	590699	770630	ISACHSEN	NW	CN				WMO/AES ELE-25m
YIC	27001	71074	78.47	103.32	30?	770701	780619	ISACHSEN	NW	CN				WMO/AES ELE-25m
YMD	27101	74072	76.17	119.28	20	480601	601229	MOULD BAY	NW	CN				AES OPEN DATE 480899
YMD	27101	74072	76.14	119.20	58	601230	770630	MOULD BAY	NW	CN				WBAN NUMBER CHANGE
YMD	27101	71072	76.14	119.20	58	770701	901231	MOULD BAY	NW	CN		27107		WBAN NUMBER CHANGE
YMD	27107	71072	76.14	119.20	58	910101		MOULD BAY	NW	CN	27101			
YSY	27201	74051	71.57	124.44	84	551101	680630	SACHS HARBOUR	NW	CN				
YSY	27201	74051	71.59	125.17	84	680701	770630	SACHS HARBOUR	NW	CN				
YSY	27201	71051	71.59	125.17	84	770701	860715	SACHS HARBOUR	NW	CN				
BTI	27401	70086	70.07	143.40	6	530327	561203	BARTER ISLAND AWS	AK	US				
BTI	27401	70086	70.07	143.40	15	561210	571005	BARTER ISLAND	AK	US				
BTI	27401	70086	70.07	143.43	15	571006	571106	BARTER ISLAND	AK	US				
BTI	27401	70086	70.08	143.38	15	571107	890102	BARTER ISLAND	AK	US				
BRW	27502	70026	71.18	156.47	10	400915	500531	POINT BARROW	AK	US				
BRW	27502	70026	71.18	156.47	8	500601	770615	POINT BARROW	AK	US				
BRW	27502	70026	71.18	156.47	12	770616		POINT BARROW	AK	US				
AMC	45702	70439	51.24	179.16	46	440606	481104	AMCHITKA ISLAND	AK	US				
AMC	45702	70439	51.23	179.15	68	481110	651030	AMCHITKA ISLAND	AK	US				close date from archive
SYA	45708	70414	52.43	174.04	20	450301	501231	SHEMYA ISLAND	AK	US				
SYA	45708	70414	52.44	174.07	80	510101	540620	SHEMYA ISLAND AFB	AK	US		45714		
ATU	45709	70409	52.48	173.10	27	430904	570209	ATTU ISLAND	AK	US				
ATU	45709	70409	52.48	173.10	28	570210	580624	ATTU ISLAND	AK	US			45708	
SYA	45714	70414	52.43	174.06	34	580627	590314	SHEMYA ISLAND NAVY	AK	US				
SYA	45714	70414	52.43	174.06	34	580627	590314	SHEMYA ISLAND NAVY	AK	US	45708			
SYA	45714	70414	52.43	174.06	40	590315	590831	SHEMYA ISLAND NAVY	AK	US		45715		
SYA	45715	70414	52.43	174.06	37	590831	600118	SHEMYA (WB)	AK	US	45714		45709	
SYA	45715	70414	52.43	174.06	38	600118		SHEMYA	AK	US				
SIL	53813	72233	30.20	89.49	8	880619		SLIDELL	LA	US	12884			wban# 12930 is erroneous
YWA	54706	72625	45.57	77.19	130?	690699	770630	PETAWAWA	ON	CN				UPPER AIR SCHOOL OCCL OBS
YWA	54706	71625	45.57	77.19	130?	770701		PETAWAWA	ON	CN				UPPER AIR SCHOOL OCCL OBS
YOY	54724	71716	46.54	71.30	178?	780101		VALCARTIER	QB	CN				
CIS	60701	91700	-02.46	171.43	4	450624	460199	CANTON ISLAND	HI	US	60702	60703		
CIS	60702	91700	-02.44	171.43	1	430517	450420	CANTON ISLAND	HI	US		60701		
CIS	60703	91700	-02.46	171.43	4	470507	670915	CANTON ISLAND	HI	US	60701			
GLD	93056	72465	39.22	101.42	1113	520718	570724	GOODLAND	KS	US				
GLD	93056	72465	39.22	101.42	1100	570725	580531	GOODLAND	KS	US				
GLD	93056	72465	39.22	101.42	1112	580601	600930	GOODLAND	KS	US				
GLD	93056	72465	39.22	101.42	1113	610501	610930	GOODLAND	KS	US				
	93060	72269	33.11	106.29	1236	551101	610131	JALLEN SITE	NM	US			23002	SEE ALSO 23039
	93061	74630?	33.48	106.40	1506	560119	610131	STALLION SITE	NM	US			23002	
	93062	99999?	32.30	106.25	1270	600299	610106	FRYE SITE	NM	US			23002	ALSO 93060,23039,23037
NID	93104	74612	35.41	117.41	676	450201	551103	INYOKERN/CHINA LAKE NAF	CA	US				
NID	93104	74612	35.41	117.41	677	551104	640531	INYOKERN/CHINA LAKE NAF	CA	US	3120			

NID	93104	74612	35.41	117.41	677	640601	730431	INYOKERN/CHINA LAKE NAF	CA	US				
NID	93104	74612	35.41	117.41	681	730501		INYOKERN/CHINA LAKE NAF	CA	US				
NTD	93111	72391	34.07	119.07	8?	471102	501299	POINT MUGU NAS	CA	US				
NTD	93111	72391	34.07	119.07	18	501299	590104	POINT MUGU	CA	US				
NTD	93111	72391	34.07	119.07	25	590105	600331	POINT MUGU	CA	US				
NTD	93111	72391	34.07	119.07	4	600401	630799	POINT MUGU	CA	US				
NTD	93111	72391	34.06	119.07	4	630799	770106	POINT MUGU	CA	US				
NTD	93111	72391	34.06	119.07	2	770107		POINT MUGU	CA	US				
NZY	93112	72290	32.43	117.13	15	450409	521231	NORTH ISLAND/SAN DIEGO	CA	US				
NZY	93112	72290	32.42	117.12	15	530101	560615	NORTH ISLAND/SAN DIEGO	CA	US		3131		
NSI	93116	72291	33.14	119.27	174	520916	730831	SAN NICOLAS ISLAND	CA	US				
NSI	93116	72291	33.15	119.27	172	730901	810228	SAN NICOLAS ISLAND/SITE	CA	US				
NSI	93116	72291	33.15	119.27	174	810301		SAN NICOLAS ISLAND/SITE	CA	US			3158	2 SITES USED
NUC	93117	72293	33.01	118.35	56	720330	810705	SAN CLEMENTE ISLAND	CA	US				
LIO	93117	72293	33.01	118.35	7	810706	820901	SAN CLEMENTE ISLAND	CA	US				72293 ALSO MIRAMAR
SNO	93197	72288	34.01	118.27	38	560417	650831	SANTA MONICA/CLOVER FLD	CA	US	23129	23174		close date from archive
VBG	93214	72392	34.43	120.34	123	580701	581130	VANDENBERG AFB	CA	US				
VBG	93214	72392	34.45	120.34	104	581201	591221	VANDENBERG AFB	CA	US				
VBG	93214	72392	34.45	120.34	98	591222	600321	VANDENBERG AFB	CA	US				
VBG	93214	72393	34.45	120.34	99	651015	651202	VANDENBERG AFB	CA	US	93215			
VBG	93214	72393	34.45	120.34	100	651203		VANDENBERG	CA	US				OPS SIMULT W/93223
PGU	93215	72392	34.40	120.35	113	590701	651031	POINT ARGUELLO	CA	US	23273	93214		RENAMED VANDENBURG
BAB	93216	72483	39.08	121.26	34	590701	660228	SACRAMENTO/BEALE AFB	CA	US				
HGT	93218	72396?	36.00	121.14	317	650628	811299?	JOLON	CA	US				
	?93219	74606	34.43	120.37	26	660801	700331	VANDENBERG/BOATHOUSE	CA	US			93221	
VBG	93220	72393	34.33	120.32	63	670501	700831	VANDENBERG SOUTH	CA	US				
	?93221	74606	34.35	120.38	101	690305	691130	VANDENBERG/SUDDEN RANCH	CA	US			93219	
	?93222	74504	37.30	122.30	43	691105	700527?	PILLAR POINT	CA	US			93214	
	?93222	74504	37.30	122.30	43	999999		PILLAR POINT	CA	US				HAVE SEEN GTS OBS 890124-
VBG	?93223	74606	34.40	120.35	112	690901		VANDENBERG AFB S	CA	US			93214	OBS SIMUL W/93214
	?93722	72405	38.50	76.57	88	501001	601010	SILVER HILL	MD	US	13743	93734		
HAT	93729	72304	35.16	75.33	4	570301		CAPE HATTERAS	NC	US	13745			
IAD	93734	72403	38.59	77.28	85	601011		STERLING(WASH DULLES)	VA	US	93722			wban 93738 never used
WAL	93739	72402	37.51	75.29	3	631014	691031	WALLOPS ISLAND	VA	US	13737			
WAL	93739	72402	37.51	75.29	4	691101	840531	WALLOPS ISLAND	VA	US				
WAL	93739	72402	37.56	75.29	13	840601		WALLOPS ISLAND	VA	US				
NJM	93743	72309?	34.41	77.01	7	700205	700423	BOGUE FLD MCALF/SWANSBO	NC	US				
ACY	93755	72407	39.45	74.40	23	800903		ATLANTIC CITY	NJ	US	94789			
TLH	93805	72214	30.23	84.22	25	910612		TALLAHASEE	FL	US	12832			
HTS	93818	72425	38.25	82.30	172	410716	480831	HUNTINGTON	WV	US		3860		
LOU	93821	72423	38.11	85.44	166	431124	460329	LOUISVILLE	KY	US				
NPA	93829	72222	30.21	87.16	3	450201	510499	PENSACOLA	FL	US	93859			
NPA	93829	72222	30.20	87.16	3	510499	521199	PENSACOLA	FL	US				
NPA	93829	72222	30.21	87.16	3	521199	550522	PENSACOLA	FL	US		3855		
NIP	93837	72206	30.14	81.41	3	430601	551031	JACKSONVILLE/NAS	FL	US		13889		
NPA	93859	72222	30.25	87.13	27	391201	441199	PENSACOLA	FL	US		93829		
	?93868	74768	30.22	89.35	9	690821	710425	MISS TEST SITE/BAY ST LO	MS	US	12884	12884		
AKO	94005	72469?	40.07	103.10	1408	520716	520926	AKRON DET R2	CO	US				CURRENT LISTED WMO #
SNY	94007	72563	41.13	103.06	1340	550515	570905	SIDNEY	NE	US				
GGW	94008	72768	48.13	106.37	695	551001	551121	GLASGOW	MT	US	24034			dup dat w/24032 551001-26
GGW	94008	72768	48.13	106.37	696	551122		GLASGOW	MT	US				
FCS	94018	72468	38.42	104.46	1789	690299		FORT CARSON/ARMY	CO	US				
YQL	94108	71874	49.38	112.48	920	999999		LETHERIDGE	AB	CN				W PPBB ONLY
UIL	94240	72797	47.57	124.33	58	660802	661009	QUILLAYUTE	WA	US	24240			
UIL	94240	72797	47.57	124.33	56	661010		QUILLAYUTE	WA	US				
WQI	94620	71603	43.52	66.03	9	880901		YARMOUTH	NS	CN	14693			
ILW	94789	74486	40.40	73.47	5	560918	640331	NEW YORK/IDLEWILD	NY	US	14708			
JFK	94789	74486	40.39	73.47	13	640401	730315	NEW YORK/JFK INT AP	NY	US				
	?94789	74486	40.47	73.46	8	730316	800902	NEW YORK/FT TCTTEN	NY	US		93755		SAME WBAN AS JFK
PIT	94823	72520	40.30	80.13	375	520915	561130	PITTSBURGH/PITTSBGH AP	PA	US	14762			
PIT	94823	72520	40.30	80.13	353	561201	631004	PITTSBURGH/PITTSBGH AP	PA	US				
PIT	94823	72520	40.32	80.14	361	631005	640107	PITTSBURGH/CORAOPOLIS	PA	US				
PIT	94823	72520	40.32	80.14	359	640108	700212	PITTSBURGH/MOON TOWNSHIP	PA	US				
PIT	94823	72520	40.32	80.14	360	700213		PITTSBURGH/MOON TOWNSHIP	PA	US				
BTL	94829	72539	42.15	85.10	273	540516	541002	BATTLE CREEK/FT CUSTER	MI	US				
DTW	94847	72537	42.14	83.19	201	410719	420714	DETROIT/METRO	MI	US		14853	14849	

Station History for North American Upper-air Stations

SBN	94848	72535	41.42	86.19	237	590529	590831	SOUTH BEND	IN	US				
SBN	94848	72535	41.42	86.19	234	600604	600916	SOUTH BEND	IN	US				
SBN	94848	72535	41.42	86.19	237	610601	610930	SOUTH BEND	IN	US				
HON	94913	72654	44.23	98.18	394	530601	530930	HURON/HOWES APT	SD	US				SEVERE WX SEASON ONLY
HON	94913	72654	44.25	98.13	392	540516	541002	HURON/HOWES APT	SD	US				
HON	94913	72654	44.23	98.13	392	550515	590527	HURON/HOWES APT	SD	US				
HON	94913	72654	44.23	98.13	398	590528	610925	HURON/HOWES APT	SD	US		14936		
ALO	94914	72548	42.33	92.24	264	530601	530930	WATERLOO	IA	US				
ALO	94914	72548	42.33	92.24	255	590528	590930	WATERLOO	IA	US			94922	
CID	94917	72545	41.53	91.43	263	540516	550911	CEDAR RAPIDS	IA	US				
CID	94917	72545	42.05	91.37	265	600520	610930	CEDAR RAPIDS	IA	US				
OMA	94918	72553	41.22	96.01	403	540916	740129	N OMAHA	NE	US	14942			ALSO REF TO AS 3NO
OMA	94918	72553	41.22	96.01	400	740130	891231	N OMAHA	NE	US				
OVN	94918	72553	41.22	96.01	400	900101		N OMAHA	NE	US				CHANGED CALL LETTERS
YLO	94921	72853	49.49	99.39	382	600899	650999	SHILO/CAMP SHILO	MB	CN				
YLO	94921	72853	49.49	99.23	358	650999	650999	SHILO/CAMP SHILO	MB	CN				
YLO	94921	72853	49.49	99.39	382	650999	710299?	SHILO/CAMP SHILO	MB	CN				AES CLOSE DATE REG OBS
YLO	94921	71853	49.49	99.39	382	999999		?SHILO	MB	CN				OCCL 12Z RAOBS
C25	94922	99999?	42.41	92.29	307	570601	640731	WAVERLY	IA	US			94914	
RDR	94925	72465	47.57	97.22	276	600614	640731	GRAND FORKS AFB	ND	US				
	?99999	?99999?	50.39	127.35	14?	440599	450899	COAL HARBOUR	BC	CN				TO PORT HARDY
	?10010	72434	38.37	90.11	139	690414	730427	ST. LOUIS/ARCH SITE (EMS	MO	US				
	10011	72434	38.46	90.14	161	700612	701202	ST LOUIS/MOBILE SITE1(EM	MO	US				
	10013	72434	38.45	90.23	172	700924	710514	ST LOUIS/MOBILE SITE (EM	MO	US				
MDW	10020	72534	41.28	87.45	188	690414	791001	CHICAGO/MIDWAY AP (EMSU)	IL	US				
MDW	10021	72534	41.26	87.59	216	700611	701217	CHICAGO/MIDWAY AP (EMSU)	IL	US				
	?10030	72405	38.51	77.02	25	690516	730511	WASHINGTON (EMSU)	DC	US				
	?10031	72405	38.51	77.02	3	700710	710420	WASH/SITE 1 (EMSU)	DC	US				
	?10032	72405	38.53	77.04	20	701006	701013	ARLINGTON/SITE 3 (EMSU)	VA	US				
	?10033	72405	38.48	77.02	3	710519	999999	WASH/ALEXANDRIA MARINA	DC	US				
	?10034	72405	38.54	77.01	15	701026	999999	WASH/CAMP STN/SITE 1 (EM	DC	US				
	?10035	72405	38.51	76.56	88	710708	711015	WASH/SITE 5 (EMSU)	DC	US				
LGA	10040	72503	40.46	73.54	13	690617	720612	NY/LAGUARDIA AP (EMSU)	NY	US				
LGA	10041	72503	40.46	73.59	33	700811	700819	NY/CENTRAL PARK SITE (EM	NY	US				
PHL	10050	72408	39.53	75.11	5	690627	711130	PHILADELPHIA (EMSU)	PA	US				
PHL	10050	72408	39.53	75.11	6	711201	790799	PHILADELPHIA (EMSU)	PA	US				
PHL	10051	72408	39.53	75.11	5	690627	700628	PHILADELPHIA (EMSU)	PA	US				
PHL	10052	72408	40.00	75.13	79	700811	701110	PHILADELPHIA (EMSU)	PA	US				
PHL	10053	72408	39.59	75.06	3	700723	710902	PHILADELPHIA (EMSU)	PA	US				
CLE	10060	72524	41.30	81.36	217	710401	730327	CLEVELAND (EMSU)	OH	US				
	?10070	72423	38.12	85.45	141	710429	730615	LOUISVILLE (EMSU)	KY	US				
DEN	10080	74530	39.47	104.59	1576	710423	730408	DENVER (EMSU)	CO	US				
DEN	10080	74530	39.46	104.53	1611	730409	730629	DENVER (EMSU)	CO	US				
EMT	10090	74704	34.05	118.02	91	710401	720102	EL MONTE (EMSU)	CA	US				
EMT	10090	74704	34.05	118.02	92	720103	791001	EL MONTE (EMSU)	CA	US				
LAX	10100	72295	33.56	118.23	34	710501	790930	LOS ANGELES (EMSU)	CA	US				
	10110	74505	37.19	121.52	32	710830	730608	SAN JOSE (EMSU)	CA	US				
4Q0	?10111	74505	37.56	121.41	21	720609	720623	SAN JOSE/BRENTWOOD (EMS	CA	US				(9 SOUNDINGS)
	?10112	74505	38.27	122.43	45	720906	720908	SAN JOSE/SANTA ROSA (EMS	CA	US				(5 SOUNDINGS)
	?10120	72509	42.21	71.05	30	710824	730426	BOSTON (EMSU)	MA	US				
EFD	10130	72243	29.46	95.22	17	710816	770207	HOUSTON (EMSU)	TX	US				
EFD	10130	72243	29.25	95.13	13	770208	770822	HOUSTON (EMSU)	TX	US				
EFD	10130	72243	29.46	95.22	12	770823	790630	HOUSTON (EMSU)	TX	US				
	10140	72793	47.39	122.18	8	711018	730701	SEATTLE (EMSU)	WA	US				
BFI	10141	72793	47.32	122.18	4	710915	711017	SEATTLE/BOEING FLD (EMSU	WA	US				
PIT	?10150	74479	40.26	80.00	224	711115	730513	PITTSBURGH (EMSU)	PA	US				
	?10160	72537	42.19	83.13	187	720703	730328	DETROIT (EMSU)	MI	US				
CRW	10170	72414	38.23	81.46	182	720727	791129	CHARLESTON (EMSU)	WV	US				
BHM	10180	72228	33.34	86.45	190	720801	781005	BIRMINGHAM (EMSU)	AL	US				
BHM	10180	72228	33.28	86.50	227	781016	800829	BIRMINGHAM (EMSU)	AL	US				
	?10190	72698	45.32	122.41	42	721030	730618	PORTLAND (EMSU)	OR	US				

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Station Equipment History for North American Upper-air Stations

DRA	3109	72387	3	G2 510811	G3 520429	G4 550201				
NID	3120	72388	2	G3 540617	G4 580909					
FHU	3124	72273	2	G4 550105	H1 610203					
YUM	3125	72280	4	G4 540511	H1 610606	G3 650601	H1 650601			
SAN	3131	72290	12	G3 560616	G4 570413	S2 650722	H1 651215	C2 691108	H3 720609	
				C3 750128	M3 790716	H4 810121	S3 810821	C5 861113	S4 881004	
TPH	3132	72485	1	G4 560920						
UCC	3133	72385	6	G4 560915	H1 661001	G5 681015	C2 710822	H3 720413	C3 770127	
???	3134	99999	1	G3 570422						
???	3143	72385	3	G4 590429	G4 600526	G4 610420				
NJK	3146	72281	1	G4 620228						
NSI	3158	72291	1	G5 730901						
DRA	3160	72387	5	G5 780516	C3 780516	C5 860422	C6 860828	S4 881004		
PNS	3855	72222	2	G4 570107	H1 610403					
HTS	3860	72425	11	G8 611201	S2 650414	H1 651223	C2 710313	H3 720317	C3 750304	
				S2 650414	S3 810821	H4 810821	C6 860708	S4 881009		
SLO	3879	72433	10	G4 690819	C2 690924	H3 720120	G8 750403	C3 760605	M3 790301	
				S3 801101	H4 801101	C6 861025	S4 881007			
CKL	3881	72229	8	G7 741116	C2 741116	H1 741116	C3 741217	H4 810123	S3 810715	
				C6 860408	S4 881031					
FSM	3926	72344	2	G2 530317	G4 530423					
LCH	3937	72240	8	G8 611230	H1 651231	C2 720114	H3 720129	S3 801031	H4 801031	
				C6 860821	S4 881019					
JAN	3940	72235	7	C2 711028	H3 720120	C3 760602	S3 810722	H4 810722	C6 860506	
				S4 880901						
UMN	3946	72349	9	G8 700905	S2 700905	C2 700905	H3 720620	C3 760123	H4 810403	
				S3 810707	C6 861108	S4 881008				
OUN	3948	72357	2	G8 740101	C2 740101					
GGG	3951	72247	8	G4 750713	C2 750713	C3 760408	S3 801109	H4 801109	C4 840704	
				C6 860411	S4 881025					
1M1	3952	72340	4	S3 810606	H4 810606	C6 860506	S4 880901			
YMW	4734	72722	2	G2 530701	G3 650525					
IAG	4738	72528	1	G4 540315						
???	L0010	72434	1	H3 720810						
???	L0030	72405	1	H3 720502						
PHL	L0050	72408	1	H3 720811						
CLE	L0060	72524	2	H1 710401	H3 720626					
???	L0070	72423	1	H3 720526						
DEN	99999	74530	1	C2 730409						
EMT	L0090	74704	3	H3 720526	C2 780920	M3 781215				
LAX	L0100	72295	2	H3 720722	C2 781002					
???	L0110	74505	1	H3 720426						
???	L0120	72509	1	H3 720419						
EFD	L0130	72243	2	H1 710816	H3 720501					
???	L0140	72793	1	H3 720731						
PIT	L0150	74479	1	H3 720518						
???	L0160	72537	2	H3 720703	M2 721101					
CRW	L0170	72414	1	H1 720727						
BHM	L0180	72228	1	H3 720801						
???	L0190	72698	1	H3 721030						
BLB	10701	78806	3	G2 471220	G4 531118	H1 611201				
BDI	11501	78954	8	G5 650730	H1 650730	H3 720510	M2 721101	C3 810514	M1 810514	
				C5 999999	S4 881020					
ANU	11604	78861	1	G2 450710						
???	11608	78526	1	G2 440505						
CGU	11610	78967	1	G2 490527						
CGU	11621	78967	3	G4 531209	H1 610516	G5 620101				
SDQ	11629	78486	6	G2 620806	H1 651124	H2 660810	H2 670103	G4 700524	G4 750525	
???	11631	78526	2	G2 451210	G2 491109					
KPP	11634	78970	2	G5 691212	H3 720301					
SIG	11636	78526	1	G2 500201						
JSJ	11641	78526	10	G2 550524	G2 550701	G7 610907	S1 631212	H1 631212	H3 720129	
				C3 740828	S3 801120	H4 801120	S4 881006			
FFR	11642	78897	4	G2 560221	H1 650817	G4 680311	H3 720516			
ACC	11643	78988	4	G2 560605	H1 650729	G4 700522	H3 720401			
ACM	11645	78866	5	G2 561002	H1 650817	G5 700517	H3 720321	M2 720907		

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SDM 11646 78467  1 G2 560919
KPA 11647 78861  2 G4 570901 G6 690310
KJP 11704 78397  1 G2 450718
UGM 11706 78367  4 G4 540722 H1 610213 G5 611004 M2 730224
KJP 11715 78397  4 G2 560903 H1 650623 G5 700423 H3 720314
SWA 11807 78501  6 G2 540923 G4 601123 H1 650528 S1 680101 H3 720518 C3 760120
KCR 11813 78384  8 G2 560814 H1 650906 G4 700919 H3 720404 M2 730218 C3 760221
                   H4 801224 S4 880901
GUA 11901 78640  4 G4 731108 H1 731108 H3 731108 M2 740125
MEX 11903 76679  4 G0 430210 G2 610111 M2 721001 G4 731213
VER 11904 76692  4 G2 610219 H1 660304 H3 720214 M2 721001
CMW 12711 78355  1 G2 531203
YGM 12712 78063  2 G4 610125 G6 690310
YEM 12713 78076  2 G3 520215 G6 690310
KJT 12714 78118  2 G4 541116 G6 690310
??? 12715 78107  1 G3 551010
YSM 12716 78089  1 G4 560112
NAS 12717 78073  4 G3 771214 C3 771214 S3 801225 H4 801225
MIA 12829 72202  1 G1 450620
AQQ 12832 72220  7 G5 740701 C2 740701 C3 751202 S3 801118 H4 801118 C5 860520
                   S4 881001
MIA 12839 72202  8 G1 460122 G2 461001 G7 591201 H1 630208 S1 630208 C2 710205
                   H3 720214 C3 740508
TPA 12842 72210 13 G0 430526 G2 540114 G4 600719 H1 631007 H1 651204 C2 710925
TBW                H3 720104 C3 740924 C3 750627 S3 801024 H4 801024 C5 860609
                   S4 881001
PBI 12844 72203  6 G7 770303 C3 770303 S3 801030 H4 801030 C6 860616 S4 881001
EYW 12850 72201 11 G4 540501 G5 601201 H1 610301 G4 610901 G5 640219 C2 720629
                   H3 720629 S3 801031 H4 801031 C5 860604 S4 881011
    12863 72232  5 G2 460224 G2 500815 G4 600217 H1 630927 S1 630927
HAV 12864 78325  1 G2 500401
COF 12867 74794  3 G2 500204 G3 510408 G4 530205
XMR 12868 74794  2 G4 561118 G6 690310
MID 12878 76644  5 G2 561007 H1 650907 H3 720215 M2 721001 G3 761001
CSB 12879 72224  1 G4 601227
    12880 99999  1 G4 601223
    12881 99999  1 G4 620299
BVE 12884 72232 10 G8 650213 S1 650213 H1 650213 G8 660101 S2 670217 H2 680208
                   S2 710426 H3 720106 C3 740716 M3 790715
EFD 12906 72243  1 G4 530399
VCT 12912 72255  9 G7 660701 H1 660701 H3 720111 C2 720409 C3 761015 S3 801110
                   H4 801110 C6 860821 S4 881003
MSY 12916 72231  1 G2 461218
BRO 12919 72250 10 G0 400805 G2 460510 G7 600511 H1 630815 S1 630815 S1 671201
                   C2 710822 C3 770120 C6 860722 S4 881001
SAT 12921 72253  3 G2 451112 G7 610308 H1 660113
NGP 12926 72251  5 G3 530201 G3 540828 G4 550919 H1 610401 G5 621204
SIL 12930 72233  4 C3 880622 S3 880622 H4 880622 S4 881006
??? 12958 72231  1 G4 650921
XKF 13601 78016  4 G1 440517 G2 450714 G4 530310 M2 721201
ADW 13705 72403  1 G1 490726
GSO 13723 72317 10 G2 480311 G7 600417 H1 650412 C2 710119 H3 720101 C3 750128
                   S3 801115 H4 801115 C6 860529 S4 881031
ORF 13737 72308  2 G4 551115 S2 650429
??? 13739 72408  1 G3 550101
DCA 13743 72405  1 G0 340799
HAT 13745 72304  2 G2 460223 G4 560916
NGU 13750 72308  2 G2 461201 G4 520609
NDY 13760 74574  1 G4 540113
GUN 13801 72226  1 G4 541218
BLV 13802 72433  2 G1 500705 G4 540516
BYH 13814 72340  2 G4 570301 G4 630322
NAB 13815 72216  3 G4 560215 G4 590215 G4 600201
MXF 13821 72226  3 G1 450124 G2 460322 G4 530509
DAY 13840 72429 11 G2 510901 G4 530211 H1 650408 S2 650922 C2 700120 C1 700424
                   H3 720322 C3 750211 M3 800915 C5 861110 S4 881101
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APPENDIX B(3) (Continued)

Station Equipment History for North American Upper-air Stations

ILN	13841	72721	1	G2 461001						
TOL	13849?	72536	1	G0 440104						
VPS	13858	72221	3	G1 451201	G2 471127	G4 521220				
WRB	13860	72217	2	G2 481115	G4 540102					
AYS	13861	72213	8	G7 690415	C2 700916	H3 720104	C3 760316	S3 801109	H4 801109	
				C6 860522	S4 881025					
MEM	13862	72334	2	G3 530307	G4 540201					
AHN	13873	72311	11	G3 550904	G2 571004	G7 590630	H1 650319	C2 710224	H3 711231	
				C3 750507	S3 801109	H4 801109	C6 860909	S4 881018		
ATL	13874	72219	2	G1 491214	G3 540226					
CHS	13880	72208	13	G0 390714	G2 470421	G3 571003	G7 590826	S2 650203	H1 651111	
				C2 701006	H3 720321	C3 741119	S3 810701	H4 810701	C6 860221	
				S4 881023						
JAX	13889	72206	5	G4 551101	H1 650617	S1 650617	S2 660123	H1 650617		
MGM	13895	72226	9	G4 560601	G7 591106	S2 650105	H1 650428	H2 660204	H1 660227	
				G4 560601	C2 720415	H3 720503				
BNA	13897	72327	14	G0 380713	G2 460213	G3 600201	G8 640315	S1 650411	S2 650416	
				H1 650419	C2 690923	H3 720399	C3 760111	H4 810221	S3 810710	
				C6 860622	S4 880901					
SEP	13901	72260	6	G4 731103	C2 731103	C3 741904	H4 810109	C5 860205	S4 881011	
LTS	13902	72352	1	G4 540201						
???	13905	72244	1	G3 540201						
END	13909	72353	1	G2 500316						
DYS	13910	72266	1	G4 570301						
FWH	13911	72259	8	G2 480823	G4 521211	H1 650312	H2 650813	H1 651006	S2 651022	
				C2 700803	H3 720516					
FOE	13920	72456	2	G4 531221	G4 540202					
FLV	13921	72457	2	G2 461022	G4 530305					
SLN	13922	72458	3	G1 440799	G2 530301	G4 530617				
HKS	13927	72235	2	G3 530301	G4 550215					
???	13928	72256	2	G3 510117	G2 520307					
LCH	13941	72240	3	G0 999999	G2 530301	G3 600519				
BAD	13944	72248	2	G2 480824	G3 520117					
BAD	99999	72248	1	G4 530926						
FSI	13945	72355	2	G3 520219	G4 600215					
FRI	13947	72455	1	G3 580404						
HKS	13956	72235	5	G7 600731	S2 650101	H1 650904	H2 660701	H1 660816		
SHV	13957	72248	5	H1 630423	S1 630423	S1 671201	C2 720112	H3 720120		
ABI	13962	72266	4	G3 630204	H1 650302	H3 720201	C2 730201			
LIT	13963	72340	9	G0 999999	G2 460621	G4 610126	G8 631121	S2 641229	H1 651129	
				C2 710827	H3 720816	C3 750710				
OKC	13967	72353	10	G0 380717	G2 470205	G7 591218	H1 650306	G3 750107	C3 750114	
				H4 810119	S3 810707	C5 860812	S4 880925			
COU	13983	72445	5	G2 460202	G3 531206	G7 610406	S2 650216	H1 650428		
DDC	13985	72451	10	G2 530319	G7 600411	H1 650403	C2 710114	H3 720125	C3 750911	
				S3 801103	H4 801103	C6 860820	S4 881013			
TOP	13996	72456	11	G4 550930	G8 610221	H1 650405	H3 720121	C2 730124	C3 760107	
				S3 801101	H4 801101	C4 840407	C6 860724	S4 881001		
YQX	14501	72803	1	G1 431208						
YJT	14503	72815	2	G2 450924	G4 520924					
YYT	14505	74198	1	G2 500608						
YAR	14508	72807	3	G5 520701	G4 630508	H1 610131				
YQX	99999	72803	1	G1 431208						
YYT	14531	71801	1	G3 710427						
PQI	14604	72713	1	G2 450401						
CAR	14607	72712	14	G0 420403	G2 460799	G4 550801	S1 650612	H1 650627	S2 651030	
				S1 671299	C2 711207	H3 720213	C3 740806	H4 810919	C4 840519	
				C6 860820	S4 881020					
NHZ	14611	74392	1	G3 530303						
YSA	14642	72600	2	G2 540212	G3 650622					
CHH	14684	74494	10	S2 701118	S1 710114	C2 710722	H3 720429	C3 740604	H4 810226	
				S3 810930	C4 840599	C6 860625	S4 881101			
YCX	14685	72701	2	G3 710199	G3 720501					
WOS	14688	74399	1	G3 721101						
AGC	14701	72520	1	G2 440829						
NY9?	14708	74498	2	G1 500209	G2 520322	G4 530211				

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SWF	14714	74482	2	G2 470516	G2 500318					
RME	14717	72518	3	G2 470520	G3 520808	G4 530701				
PWM	14724	72606	1	G1 440104						
BUF	14733	72528	11	G0 390901	G4 600820	H1 650406	C2 710824	H3 720101	C3 751104	
				M3 800901	S3 801109	H4 811109	C5 860731	S4 881024		
ALB	14735	72518	11	G4 551019	H1 650315	H2 650512	H1 651114	C2 710928	H3 720110	
				C3 741031	S3 810811	H4 810811	C5 860419	S4 880901		
ACK	14756	72506	7	G0 460416	G2 461113	G7 591211	S2 650512	S1 650605	H1 650619	
				S1 680101						
PWM	14764	72606	11	G4 550608	G3 551001	G8 611229	H1 651204	C2 700225	H3 720120	
				C3 750923	S3 801112	H4 801112	C6 860923	S4 881101		
MTC	14804	72537	2	G2 451201	G3 520623					
RAN	14806	72531	3	G1 440902	G2 470199	G4 530326				
???	14809	72520	2	G1 450301	G2 510801					
FNT	14826	72637	13	G4 560919	G8 610127	S2 650107	H1 650508	H2 660117	H1 660419	
				H3 720203	C2 730816	C3 760710	S3 810715	H4 810715	C6 860721	
				S4 881003						
JOT	14834	72534	1	G0 390701						
PIA	14842	72532	14	G4 560912	G8 610506	S2 650121	H1 650121	S1 650121	H1 650501	
				S1 680101	C2 710330	H3 720513	C3 760619	H4 810127	S3 810629	
				C6 860926	S4 881001					
SSM	14847	72734	15	G2 461005	G4 531206	G8 610119	S2 650210	S1 650210	H1 650604	
				S1 680101	C2 710723	H3 720313	C3 740409	H4 810225	S3 810707	
				H4 810225	C6 860603	S4 881005				
TOL	14849	72536	1	G0 440104						
GRB	14898	72645	10	G2 530317	G7 600302	H1 651120	C2 700303	H3 720123	C3 750129	
				S3 801101	H4 801101	C6 860529	S4 880901			
INL	14918	72747	12	G2 461115	G3 541004	G7 600125	H1 630405	S1 630405	S1 670799	
				H3 720202	C3 740626	S3 801105	H4 801105	C6 861202	S4 881030	
STC	14926	72655	9	G2 481099	G7 600222	S2 650225	H1 650229	H3 720101	C2 730301	
				C3 751118	C6 860611	S4 881101				
HON	14936	72654	11	G3 630606	G4 640601	H1 650604	C2 720502	H3 720505	M2 730601	
				C3 740731	S3 801107	H4 801107	C6 861205	S4 881001		
OMA	14942	72553	1	G2 380716						
OFF	14949	72553	1	G1 501204						
YYR	15601	72816	4	G1 440399	G2 450303	G2 460601	G3 521203			
YLP	15604	74188	2	G2 450899	G2 470799					
YVP	15605	72906	1	G2 490899						
YZV	15613	72811	2	G2 520199	G3 680128					
YNI	15703	72826	2	G2 560299	G3 700226					
YPH	15704	72907	2	G2 540499	G3 660217					
YMO	15803	72836	2	G2 530499	G3 661204					
YTL	15806	72848	2	G2 530213	G3 660903					
YYQ	15901	72913	3	G2 470199	G2 490199	G3 610799				
YFB	16603	72909	3	G2 451099	G2 500999	G3 651199				
YZS	16801	72915	2	G2 541011	G3 651002					
YUX	16895	72031	2	G2 570899	G3 640909					
YBK	16903	72926	2	G2 541119	G3 650719					
YCY	17601	74090	2	G2 481099	G3 661004					
YRB	17901	71924	1	G2 471024						
YLT	18601	74082	2	G2 500910	G4 600219					
YEU	18801	72917	2	G2 470918	G3 611001					
???	21001	76654	1	G5 760717						
SIC	21101	76723	2	G2 731016	G5 760427					
ITO	21504	91285	10	G2 500218	G4 610713	H1 650227	C2 700801	H3 720502	C3 740518	
				S3 801025	H4 801025	C5 999999	S4 881015			
DLF	22001	72261	1	G4 540128						
MCV	22007	76225	5	G4 640805	G4 650525	G4 670701	H3 720328	M2 721001		
MZT	22009	76458	4	G2 640129	H1 660210	H3 720415	M2 721001			
DRT	22010	72261	9	G8 630304	S2 650126	H1 651112	H3 720102	C3 750415	S3 801101	
				H4 801101	C6 860520	S4 881001				
MTY	22012	76394	4	G4 641001	H1 650706	H3 720410	M2 721001			
???	22013	76612	1	G5 790301						
GYM?	22104	76256	5	G4 641122	G4 650205	H1 650719	H3 720313	M2 721001		
IGP?	22105	76151	5	G2 710116	H1 710116	H3 720307	M2 721101	G5 740227		
BKH	22501	91162	1	G5 630801						

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HIK	22504	91182	1	G1 440109	G2 450701					
LIH	22536	91165	12	G2 500514	G4 600526	H1 630611	S1 630611	S1 680101	C2 710601	
				H3 720611	C3 741112	S3 801125	H4 801125	C5 999999	S4 881016	
BKH	22545	91162	2	G5 650802	G5 670626					
HMN	23002	72269	2	G2 480301	G4 520702					
AMA	23003	72363	1	G2 520215	G4 530214					
LRY	23012	72469	1	G4 531115						
GOF	23017	72263	1	G4 640120						
ELP	23019	72270	1	G1 440617						
REE	23021	72267	2	G3 520215	G4 600315					
MAF	23023	72265	11	G2 531115	G7 600421	H1 630404	S1 630404	C2 691030	H3 711229	
				C3 760415	S3 801112	H4 801112	C6 860624	S4 881014		
???	23037	99999	1	G2 460523						
???	23038	99999	1	G2 480323						
???	23039	72269	4	G2 461107	G1 480518	G3 530106	G4 531017			
HCA	23041	72265	1	G2 451209						
ELP	23044	72270	11	G0 390712	G2 550325	G7 600801	H1 651207	H3 720125	C2 720220	
				C3 741121	S3 801105	H4 801105	C6 860911	S4 881001		
AMA	23047	72363	8	H1 650415	C2 711207	H3 720119	C3 760209	S3 801219	H4 801219	
				C5 860325	S4 881001					
ABQ	23050	72365	13	G2 460109	G7 600530	S2 650106	H1 651124	H2 660924	H1 660999	
				C2 700707	H3 720406	C3 750510	H4 810208	S3 810713	C6 860909	
				S4 881001						
DEN	23062	72469	10	G4 560815	G8 610126	H1 650406	C2 710914	H3 720105	C3 760318	
				S3 801111	H4 801111	C6 860828	S4 881001			
GJT	23066	72476	12	G2 460910	G7 591103	S2 641217	S1 641217	H1 650507	C2 711027	
				H3 720317	C3 740501	H4 810318	S3 810614	C6 861019	S4 881019	
DMA	23109	72274	2	G2 450721	G4 511204					
LSV	23112	72386	1	G4 450799						
EDW	23114	72381	3	G2 500308	G3 520211	G4 530924				
RAA	23118	72488	3	G4 531015	G4 550201	G4 550208				
TPH	23128	72485	2	G3 511008	G4 550201					
LGB	23129	72297	2	G2 470310	G4 530401					
ELY	23154	72486	11	G1 390724	G2 531029	G2 540601	G7 600118	S2 650123	H1 660416	
				H3 720526	C3 760406	H4 810902	C6 860607	S4 881006		
TUS	23160	72274	12	G4 560301	S1 650610	H1 650615	S2 650722	S1 671130	C2 710111	
				H3 720518	C3 740911	H4 810219	S3 810708	C5 860205	S4 881004	
LAS	23169	72386	4	G3 540201	G4 610204	G8 640528	H1 651215			
PHX	23183	72278	1	G2 541210						
INW	23194	72374	10	G8 611101	S2 650225	H1 660108	H3 720120	C2 721205	C3 741204	
				H4 810227	S3 810817	C6 860925	S4 881004			
CIC	23201	72497	1	G5 620206						
MER	23203	72481	2	G2 501202	G4 531101					
OAK	23230	72493	13	G2 510199	G4 541002	H1 630403	S1 630403	S2 690529	C2 700120	
				H3 720312	C3 750916	M3 790618	H4 801217	S3 810201	C6 861209	
				S4 881001						
SMX	99999	72394	1	G2 460908						
BFF	24007	72566	1	G4 530601						
BIS	24011	72764	12	G2 460423	G7 591209	S2 650107	H1 650501	S1 680101	H3 720517	
				C2 720913	C3 741017	H4 810314	S3 810814	C6 860403	S4 881001	
LND	24021	72576	13	G0 450901	G2 541030	G7 591130	H1 651128	H2 660122	H1 660222	
				C2 711120	H3 720104	C3 740529	S3 801119	H4 801119	C6 861218	
				S4 881001						
LBF	24023	72562	13	G0 450106	G2 530499	G7 591201	S2 641230	S1 641230	H1 650426	
				C2 691202	H3 720605	C3 750111	H4 810305	S3 810728	C6 860514	
				S4 880901						
RAP	24026	72662	1	G2 460928						
GGW	24034	72768	1	G1 430606						
RAP	24090	72662	11	G2 501013	G4 550402	G8 610214	H1 651226	C2 700714	H3 720107	
				C3 750313	S3 801115	H4 801115	C6 861208	S4 881017		
HIF	24101	72575	3	G2 481105	G3 521206	G4 530919				
DPG	24103	72581	2	G2 491015	G4 531001					
ENV	24111	72213	1	G7 480399						
SLC	24127	72572	11	G4 560807	G8 610201	S2 650124	H1 650425	C2 690930	H3 720430	
				C3 740408	H4 810203	S3 810810	C6 860203	S4 881008		
WMC	24128	72583	9	G4 560501	G8 610304	S2 650201	H1 660219	H3 720201	C3 760519	

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				H4 990929	C6 860725	S4 880901				
BOI	24131	72681	14	G0 390901	G2 460305	G0 460999	G2 490729	G7 591218	H1 651203	
				S2 660602	H3 720210	C2 720718	C3 740422	H4 810401	S3 810626	
				C6 860409	S4 881015					
GTF	24143	72775	17	G0 400801	G1 530402	G1 530999	G3 531218	G3 540599	G8 610624	
				G7 611223	S2 650127	H1 650406	H1 690101	H3 720119	C3 751202	
				S3 811114	H4 811114	C4 850509	C6 860906	S4 881025		
GEG	24157	72785	11	G2 470126	G4 540430	S2 651002	H1 660128	H3 720601	C2 730109	
				C3 741105	H4 810201	S3 810703	C5 850726	S4 881004		
TCM	24207	72793	1	G1 520404						
NEJ	24208	72793	1	G2 440901						
MFR	24209	72597	1	G2 440901						
IAP	24211	72698	2	G2 460101	G3 530202					
MFR	24225	72597	13	G2 460210	G7 591121	S2 650211	S1 650516	H1 650617	S1 680101	
				C2 700721	H3 720612	C3 740716	H4 810924	S3 811025	C6 860418	
				S4 881006						
OLM	24227	72792	1	G8 620601						
SLE	24232	72694	10	G4 560601	G8 610312	H1 660104	C2 710601	H3 711231	C3 741119	
				S3 801209	H4 801209	C6 860601	S4 881005			
SEA	24233	72793	1	G4 560629						
TTI	24240	72798	4	G2 451125	G4 541001	H1 630426	S1 630426			
NEJ	24244	72793	2	G1 450301	G4 540115					
YQD	25004	72867	2	G2 560199	G3 650831					
YXD	25111	72879	2	G2 461099	G2 531015					
WSE	25145	74119	1	G3 660215						
YVR	25152	74115	1	G2 711008						
YXS	25206	72896	2	G2 460599	G7 641022					
YYE	25218	72945	2	G2 560199	G3 650805					
YZT	25223	74109	2	G2 540419	G3 640504					
ANN	25301	70398	1	G2 440414						
YAK	25302	70361	1	G2 440818						
ANN	25308	70398	10	G7 600226	S1 630521	S1 671201	H1 630521	H3 720509	C3 751111	
				S3 801025	H4 801025	C6 860423	S4 881001			
YAK	25339	70361	9	G2 480801	G7 600720	H1 650408	H3 720313	C3 740619	S3 801019	
				H4 801019	C6 860721	S4 881001				
ADQ	25501	70350	8	G4 520922	H1 611002	G5 620112	C3 740502	S3 801208	H4 801208	
				C6 860514	S4 881001					
AKN	25503	70326	9	G4 530505	G7 591115	H1 650411	H3 720513	C3 740411	H4 810806	
				S3 820903	C6 861113	S4 881001				
???	25602	70485	1	G2 460614						
CDB	25603	70316	2	G2 451119	G3 530328					
ADU	25620	70489	1	G2 510128						
CDB	25624	70316	9	G2 550820	G7 600410	H1 630528	S1 630528	S1 671201	H3 720521	
				C3 740829	C6 860610	S4 881006				
ADK	25701	70454	1	G1 440301	G2 460626					
ADK	25704	70454	5	G4 530616	G5 610722	G5 610722	H1 610930	M2 731128		
SNP	25713	70308	10	G2 481101	G7 600422	H1 650416	S1 680111	H3 720505	C3 740608	
				S3 801101	H4 801101	C6 860629	S4 881004			
YCB	26005	72925	1	G3 700217						
YSM	26102	72934	3	G1 461199	G2 530299	G3 651011				
YCO	26107	72938	1	G2 570799						
YVQ	26202	74043	2	G2 550199	G3 550613					
YXY	26311	72964	1	G2 451199						
YXY	26316	72964	2	G2 461099	G3 650630					
ANC	26401	70273	1	G2 451011						
FGJ	26406	70263	2	G2 510607	G4 570614					
ANC	26409	70273	14	G0 430202	G2 460522	G7 590701	G7 640709	H1 650324	S1 680111	
				C2 710824	H3 720315	C3 740328	M3 801001	S3 801211	H4 801211	
				C6 860203	S4 881006					
FAI	26411	70261	11	G2 451101	G7 600201	H1 630426	S1 630426	S1 671201	H3 720516	
				C3 740523	S3 801024	H4 801024	C6 860206	S4 881004		
MCG	26510	70231	10	G0 420411	G2 561019	G7 600722	H1 650409	H3 720414	C3 740918	
				S3 801202	H4 801202	C6 861125	S4 881002			
OME	26604	70200	1	G2 450301						
BET	26615	70219	8	G0 999999	G2 550704	G7 600913	H1 650404	H3 720326	C3 750601	
				C6 860930	S4 881001					

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OTZ	26616	70133	10	G0 421026	G2 541015	G7 591016	H1 650406	H3 720618	C3 741211	
				S3 801110	H4 801110	C6 860529	S4 881001			
OME	26617	70200	9	G7 461020	H1 650407	S1 680116	H3 720501	C3 741206	S3 801112	
				H4 801112	C6 860327	S4 880901				
YIC	27001	74074	2	G2 541005	G4 611017					
YMD	27101	74072	2	G2 531022	G4 600403					
YSY	27201	74051	2	G2 551101	G3 660830					
BTI	27401	70086	11	G2 530327	G4 530822	G7 591211	H1 650425	H3 720506	M2 721022	
				C3 750419	S3 801109	H4 801109	C6 861021	S4 881001		
BRW	27502	70026	11	G2 451101	G7 591112	S1 630519	S1 671211	H1 630519	H3 720423	
				C3 750425	S3 991202	H4 991202	C6 860903	S4 881001		
AMC	45702	70439	2	G1 440606	G2 451105					
SYA	45708	70414	4	G1 440401	G2 451005	G2 510101	G4 521216			
ATU	45709	70409	1	G4 550614						
SYA	45715	70414	5	G4 580627	G7 600624	H1 650327	S1 680120	H3 720602		
GLD	93056	72465	2	G3 520718	G4 530601					
???	93060	72269	1	G4 560103						
???	93061	99999	1	G4 560119						
???	93062	99999	1	G4 600299						
NID	93104	74612	1	G4 640399						
NTD	93111	72391	2	G4 560905	G5 610614					
NZY	93112	72290	2	G2 510206	G3 530201					
NSI	93116	72291	4	G2 520917	G4 521204	G5 600405	H1 620125			
SMO	93197	72288	3	G4 560417	H1 650506	S2 650625				
VBG	93214	72393	5	G3 580701	C2 700701	C3 750601	S3 810109	H4 810109		
PGU	93215	72392	5	G3 590701	H3 620115	S1 640108	H1 640108	G3 650121		
HGT	93218	72396	2	G4 650628	H1 650628					
???	93722	72405	3	G2 501001	G4 530101	G7 590601				
HAT	93729	72304	11	G5 570301	S1 650529	H1 650607	G4 650804	S2 650813	C2 700712	
				H3 720206	C3 740511	S3 810311	C5 860115	S4 881022		
IAD	93734	72403	12	G4 601011	G4 610101	G8 620110	S2 650316	H1 650316	C2 701009	
				H3 720213	C3 740416	H4 801221	S3 810702	C6 860910	S4 880901	
WAL	93739	72402	8	G5 631014	S1 631014	H1 650803	C2 720417	G9 740518	C3 750314	
				M3 791001	H4 830127					
ACY	93755	72407	6	C3 800903	G7 800903	S3 801111	H4 801111	C6 860718	S4 881027	
HTS	93818	72425	1	G2 460199						
NIP	93837	72206	2	G3 530117	G4 530401					
???	93868	74768	1	G3 690821						
SNY	94007	72563	1	G3 550515						
GGW	94008	72768	11	G1 551026	G2 551027	G2 551122	G7 600229	H1 650430	H3 720116	
				C3 760303	S3 991111	H4 991111	C6 860626	S4 880901		
UIL	94240	72797	11	G4 660802	H1 660802	S1 660802	G8 661211	H3 720113	C3 760914	
				S3 801106	H4 801106	M3 810701	C6 861017	S4 881029		
JFK	94789	74486	11	G4 560918	H1 650320	S2 650719	S2 650719	H2 650831	H1 651010	
				C2 690101	H3 711229	G9 730316	C3 770621	M3 790827		
PIT	94823	72520	14	G1 520915	G4 540427	G8 631005	S2 650108	S1 650202	H1 650402	
				S1 680101	C2 691007	H3 720312	C3 760106	S3 810716	H4 810716	
				C6 860821	S4 881001					
SBN	94848	72535	3	G4 590529	G4 600604	G4 610601				
HON	94913	72654	2	G4 530601	G4 600615					
ALO	94914	72548	2	G4 530601	G4 590528					
CID	94917	72545	1	G4 540599						
OMA	94918	72553	12	G3 540916	G4 590202	G3 600612	G8 610304	H1 650404	H3 720113	
				C2 730106	C3 760224	S3 801105	H4 801105	C6 860201	S4 880901	

APPENDIX C

Example of the Hydrostatic Checking and Correction Computer Procedure

NOTE: The complete code is available by contacting Barry Schwartz at (303)497-6481, or in writing at: NOAA/ERL/FSL, Mail Code: R/E/FS1, 325 Broadway, Boulder, CO 80303.

```
      PROGRAM HYCHECK
      IMPLICIT NONE
CCCCC
C     1. REARRANGED BY XIAOPING ZHONG ON MAR. 17, 1989.
C     2. MAIN PROGRAM HAS BEEN MODIFIED BY XIAOPING ZHONG ON MAR. 19, 1989.
C----------------------------------------------------------------------
CCCCC PURPOSE:
C        THIS ROUTINE READS KANSAS CITY FORMATTED RADIOSONDE DATA
C     USING SUBROUTINE READKC.  MANATORY DATA IS EXTRACTED FROM THE
C     RADIOSONDE AND CHECKED HYDROSTATICALLY BY COMPUTATION OF
C     DELTAS.  DELTAS ARE COMPARED AND HYDROSTATIC CORRECTIONS ARE
C     PERFORMED WHERE POSSIBLE.  IN ADDITION, THIS ROUTINE WILL
C     CALL SUBPROGRAMS TO COMPUTE MISSING 1000 AND 850 MB HEIGHTS
C     FOR STATIONS WHERE THE SURFACE PRESSURE IS LESS THAN 1000 OR
C     850 MB. TROPOPAUSE LEVEL AND MAX WIND LEVEL ARE ALSO
C     IDENTIFIED.  POTENTIAL TEMPERATURE IS USED FOR P<700 MB
C     WHERE POSSIBLE
C----------------------------------------------------------------------
CCCCC
      INTEGER HEIGHT(100),PRESSURE(100),IFRAME(100),TEMP(100),DP(100)
      INTEGER NDIR(100),NSPD(100),PML(11)
      INTEGER IFR(2),IHR(2),IDY(2),IMO(2),IYR(2),F(11),ITS(11),
     .        ITSH(11)
      INTEGER IFR1(2),ID1(2),IBLK(2),IELE(2),IFLG(2)
      INTEGER H1000,H850,TROPL,IHYL,TRINDEX
      REAL LAT,LON
      CHARACTER*32 NID,IFILE
CCCCC*
      INTEGER II,ICOUNT,ILAT,ILON,IFLAG,NUMPTS,NSND,MAXL,IERR,NWBAN,
     .        NKCT,IDUM2,IMW,INUM,I,IHY,IFR2,IC,IFR3,K,M,N,NML,NN,J,
     .        NHC,NTC,NTHC,NSC,NSDM,IR
      REAL    COUNT,TSP,TSHP,CH
CCCCC*
      COMMON /ONE/ HEIGHT,PRESSURE,IFRAME,TEMP,DP
      COMMON /TWO/ NDIR,NSPD,I,NWBAN
      COMMON /THREE/ IFR,IHR,IDY,IMO,IYR
      COMMON /FOUR/ IFR1,ID1,IBLK,IELE
      COMMON /FIVE/ LAT,LON,NID,ICOUNT,ILAT,ILON,IFR2,NUMPTS
      COMMON /SIX/ IR,IC,IFR3,IFLAG,IHY,IMW,IDUM2,INUM
      COMMON /SEVEN/ NML,NHC,NTC,NTHC,NSC,J,NSDM
CCCCC
      DATA PML/1099,1000,850,700,500,400,300,250,200,150,100/
CCCCC
C--
      PRINT*,'PLEASE INPUT THE NAME OF INPUT FILE. IFILE=? (A, <=32)'
      ACCEPT'(A)',IFILE

      OPEN(UNIT=11,FILE='HYCHECK.OUT1',STATUS='NEW')
      OPEN(UNIT=13,FILE='HYCHECK.OUT2',STATUS='NEW')
C      OPEN(UNIT=11,FILE='WRP1:[SCHWARTZ]RAOB.OUTPUT',STATUS='NEW')
C      OPEN(UNIT=13,FILE='ESG_SCRATCH:[SCHWARTZ]RAOB.DT',STATUS='NEW')
C--
      OPEN(UNIT=12,FILE=IFILE,STATUS='OLD')
CCCCC
      DATA NML/0/,NHC/0/,NTC/0/,NTHC/0/,NSC/0/,NSDM/0/,NSND/0/
      DO 10 II=1,11
        ITS(II)=0
        ITSH(II)=0
10    CONTINUE
CCCCC READ A KC FORMATTED SOUNDING
      ICOUNT=0
      ILAT=32767
      ILON=32767
      IFLAG=0
      CALL READKC()
CCCCC
```

[Page 1 of 38 pages of Code]