Radiosonde Data: NOAA (FIFE)

Summary:

The NOAA Radiosonde Observations Data Set contains data that were extracted from the NOAA operational analysis system and transmitted to the FIS. Data are available from July 1985 to October 1988, there are 1123 days of data during this period with data at twelve hour intervals. These data were collected using sondes released in Dodge City and Topeka, Kansas, 337 km and 68 km, respectively, from the FIFE site. Radiosonde observations were made to determine the pressure, temperature, and humidity from the surface to the point where the sounding was terminated.

Table of Contents:

1. Data Set Overview:

Data Set Identification:

Radiosonde Data: NOAA (FIFE)
(NOAA Radiosonde Observations).

Data Set Introduction:

The NOAA Radiosonde Observations Data Set contains atmospheric pressure, geopotential height, and temperature extracted from the NOAA operational analysis system.

Objective/Purpose:

The FIFE Staff Science effort covered those activities which were FIFE community level activities, or required uniform data collection procedures across sites and time. These activities included the acquisition, processing and archiving of meteorological parameters of the atmosphere above the FIFE site. These data can be used as input to numerical models, as well as, verification data for simulation studies.

Summary of Parameters:

Atmospheric pressure, geopotential height, and temperature.

Discussion:

The radiosonde data were extracted from the NOAA operational analysis system and transmitted to the FIS. Data are available from July 1985 to October 1988, there are 1123 days of data during this period with data at twelve hour intervals. Unlike the radiosonde data collected at the FIFE study area (see FIFE Radiosonde Data.), these data were collected using sondes released in Dodge City and Topeka, Kansas, 337 km and 68 km, respectively, from the FIFE site.

Related Data Sets:

- NOAA Radiosonde Observations-1989 (NCDC).
- Upper Air Derivative Data from NMC.
- NOAA Regional Surface Data - 1989 (NCDC).
- NOAA Regional Surface Data.
- FIFE Radiosonde Data.
- Automated Meteorological Stations (AMS).

FIS Data Base Table Name:

NOAA_RADIOSONDE_DATA.

2. Investigator(s):

Investigator(s) Name and Title:

Staff Science.

Title of Investigation:

Staff Science Meteorological Data Acquisition Program.

Contact Information:

Contact 1:
Dan Tarpley
NOAA/NESDIS
Tel.: (301) 763-8042
Email: dtarpley@omnet

Requested Form of Acknowledgment.

3. Theory of Measurements:

Radiosonde observations are made to determine the pressure, temperature, and humidity from the surface to the point where the sounding is terminated.

4. Equipment:

Sensor/Instrument Description:

The radiosonde is a balloon-borne, battery-powered instrument used together with the ground-receiving equipment to delineate the vertical profile of the atmosphere. The radiosonde consists of meteorological measuring elements coupled to a radio transmitter and assembled into a small lightweight box. The device is carried aloft by a balloon filled with hydrogen, natural gas, or helium gas. Included in the train is a small parachute to slow the descent of the instrument after the balloon bursts, thereby minimizing the danger of injury to life and property.

Collection Environment:

Airborne.

Source/Platform:

Balloon filled with hydrogen.

Source/Platform Mission Objectives:

To measure pressure, and temperature profiles in the atmosphere.

Key Variables:

Pressure level, height, and temperature.

Principles of Operation:

Pressure is measured by means of a baroswitch which employs an expanding aneroid pressure cell to move a contact arm across a commutator bar as the pressure decreases. Temperature is measured by a thermistor. The electrical resistance of the thermistor is a function of temperature.

As the radiosonde ascends, the thermistor and hygristor are switched sequentially into the modulator circuit by the baroswitch. The amplitude of the received signal, therefore, is alternately a function of temperature or humidity. Because of the translation done by the modulator circuit the signal may be any value from 0 to 200 Hz. Periodically, the thermistor and hygristor are bypassed in the modulator circuit. Reference circuits using fixed resistors are then used to modulate the carrier frequency to known values, 95, 190, or 195 Hz (47.5, 95, or 97.5 recorder divisions). Any changes that may be occurring in the modulator circuit can then be evaluated.

Sensor/Instrument Measurement Geometry:

The radiosonde consists of meteorological measuring elements coupled to a radio transmitter and assembled into a small lightweight box.

Manufacturer of Sensor/Instrument:

Not available at this revision.

Calibration:

Specifications:

Not available at this revision.

Tolerance:

Not available at this revision.

Frequency of Calibration:

Calibration is performed at the beginning of each sounding.

Other Calibration Information:

Calibration charts are provided by the manufacturer of the radiosonde. The serial numbers affixed to the baroswitch assembly are checked to make sure that they agree with those printed on the calibration chart and on the instrument. If the baroswitch numbers disagree, the radiosonde is rejected.

5. Data Acquisition Methods:

The radiosonde transmits meteorological information consisting of pressure obtained from an aneroid cell, temperature, and relative humidity. The telemetered meteorological information from the radiosonde is detected, amplified, and shaped by a receiver, and the processed information is printed in graphic form on a strip chart recorder or stored on computer disc.

Dan Tarpley, of NOAA's National Environmental Satellite Data and Information Service, acquired the NOAA radiosonde data from the reporting NOAA stations. These data were then sent to the FIFE Information System.

6. Observations:

None.

7. Data Description:

Spatial Characteristics:

Spatial Coverage:

NOAA radiosonde data for FIFE were obtained from two stations in Kansas. The names, locations, and approximate distance from the FIFE site of these stations are listed below:

UTM UTM

LOCATION	NORTHING	EASTING	LATITUDE	LONGITUDE	DISTANCE
Dodge City, KS	4180534	414568	37 46 12	99 58 12	337 km
Topeka, KS	4327629	272466	39 04 12	95 37 48	68 km

The FIFE STATION_ID and SITEGRID_ID for these locations are:

STATION_ID	SITEGRID_ID
451	XRSD-RDN
456	XRST-RDN

The horizontal coverage of an individual sonde varies depending upon the track the sonde takes as it ascends. The data were collected 400 km apart.

Spatial Coverage Map:

Not available.

Spatial Resolution:

The horizontal resolution varies with the rate and angle of the ascent. The specific values are not available at this revision.

The vertical resolution will vary as the sonde ascends.

Projection:

Not available.

Grid Description:

Not available.

Temporal Characteristics:

Temporal Coverage:

The overall time period of data acquisition was from July 2, 1985 through October 23, 1988. There are 1123 days of data, distributed as follows over this period:

```
YEAR    DAYS
----    ----------
1985    160
1986    321
1987    350
1988    292
```

Temporal Coverage Map:

Not available.

Temporal Resolution:

Observations are made at 12 hour intervals.

Data Characteristics:

The SQL definition for this table is found in the NOAA_SON.TDF File located on CD_ROM Volume 1.

```
Parameter/Variable Name
```

```
Parameter/Variable Description            Range          Units
Source
```

SITEGRID_ID
This is a FIS grid location code.   FIS
Site grid codes (SSEE-III) give
the south (SS) and east (EE) cell
number in a 100 x 100 array of
200 m square cells. The last 3
characters (III) are an instrument
identifier.

STATION_ID
The FIS site identifier used to   min = 451,   FIS
designate this site.   max = 456

OBS_DATE
The date of the observations.   min = 02-JUL-85,   NOAA
max = 23-OCT-88

OBS_TIME
The time that the observation   min = 0,   [GMT]   NOAA
was taken.   max = 1200

ATMOSPHERIC_PRESS
The atmospheric pressure, one   min = 10,   [millibars]   ANEROID
of the 15 mandatory pressure   max = 1000   SENSOR
levels used by NOAA.

GEOPTNTL_HEIGHT
The measured geopotential height.   min = 264,   [meters]   NOAA
max = 32000,
missing = 99999

ATMOSPHERIC_TEMP
The measured atmospheric   min = -88.9,   [degrees
THERMISTOR
temperature, at a given pressure.   max = 34.2,   Celsius]
missing = 99999

DEWPNT_DEPRSSN
The measured Dewpoint Depression.

FIFE_DATA_CRTFCN_CODE   *
The FIFE Certification Code for   CPI=checked by   FIS
the data, in the following format: principal
CPI (Certified by PI), CPI-???   Investigator,
(CPI - questionable data).   CPI-MRG=merged
data

```
LAST_REVISION_DATE
data, in the format (DD-MMM-YY).      max = 11-FEB-91
```

Footnote:

* Valid levels

The primary certification codes are:

EXM Example or Test data (not for release) PRE Preliminary (unchecked, use at your own risk) CPI Checked by Principal Investigator (reviewed for quality) CGR Checked by a group and reconciled (data comparisons and cross checks)

The certification code modifiers are: PRE-NFP Preliminary - Not for publication, at the request of investigator. CPI-MRG PAMS data that is "merged" from two separate receiving stations to eliminate transmission errors. CPI-??? Investigator thinks data item may be questionable.

Sample Data Record:

```
SITEGRID   STATION_ID   OBS_DATE    OBS_TIME    ATMOSPHERIC_PRESS
--------   ----------   ---------   ----------  -----------------
XRSD-RSN    451         15-AUG-87       0              1000
XRSD-RSN    451         15-AUG-87       0               850
XRSD-RSN    451         15-AUG-87       0               700
XRSD-RSN    451         15-AUG-87       0               500
XRSD-RSN    451         15-AUG-87       0               400
XRSD-RSN    451         15-AUG-87       0               300
XRSD-RSN    451         15-AUG-87       0               250
XRSD-RSN    451         15-AUG-87       0               200
XRSD-RSN    451         15-AUG-87    1200              1000
XRSD-RSN    451         15-AUG-87       0               150
XRSD-RSN    451         15-AUG-87    1200               100
GEOPTNTL_HEIGHT     ATMOSPHERIC_TEMP     DEWPNT_DEPRSSN    FIFE_DATA_CRTFCN_CODE
---------------     -----------------    ---------------   ---------------------
----------
99999                  99999               -9999                  CPI
1456                    25.6                  8                   CPI
3131                   13                    10                   CPI
5860                   -7.1                  30                   CPI
7570                  -15.7                  30                   CPI
9690                  -28.5                  30                   CPI
10970                 -38.3                  30                   CPI
12470                 -49.1               -9999                   CPI
99999                  99999              -9999                   CPI
14300                 -62.5               -9999                   CPI
16670                 -68.9               -9999                   CPI
LAST_REVISION_DATE
------------------
10-NOV-93
10-NOV-93
```

```
10-NOV-93
10-NOV-93
10-NOV-93
10-NOV-93
10-NOV-93
10-NOV-93
10-NOV-93
10-NOV-93
10-NOV-93
```

8. Data Organization:

Data Granularity:

The overall time period of data acquisition was from July 2, 1985 through October 23, 1988. Observations were made at 12 hour intervals. The data were collected 400 km apart.

A general description of data granularity as it applies to the IMS appears in the EOSDIS Glossary.

Data Format:

The CD-ROM file format consists of numerical and character fields of varying length separated by commas. The character fields are enclosed with a single apostrophe. There are no spaces between the fields. Each file begin with five header records. Header records contain the following information: Record 1 Name of this file, its table name, number of records in this file, and principal investigator name.

Record 2 Path and filename of the previous data set, and path and filename of the next data set. (Path and filenames for files that contain another set of data taken at the same site on the same day.)

Record 3 Path and filename of the previous site, and path and filename of the next site. (Path and filenames for files of the same data set taken on the same day for the previous and next sites, sequentially numbered by SITEGRID.)

Record 4 Path and filename of the previous date, and path and filename of the next date. (Path and filenames for files of the same data set taken at the same site for the previous and next date.)

Record 5 Column names for the data within the file, delimited by commas.

Record 6 Data records begin.

Each field represents one of the attributes listed in the chart in the *Data Characteristics Section* and described in detail in the TDF file. These fields are in the same order as in the chart.

9. Data Manipulations:

Formulae:

Not available at this revision.

Derivation Techniques and Algorithms:

Not available at this revision.

Data Processing Sequence:

Processing Steps:

1. Unpack 9-track tape data sent to FIFE by D. Tarpley.

   A program was run that unpacked each file and created three files (e.g., FILES1_RADIO, FILE1_UPPERAIR, and FILE1_SURFACE). The 9-track tape contained the NOAA Radiosonde Observation described here, the Upper Air Derivation Data from NMC and the NOAA Regional Surface Data. All files were ASCII text files. In addition to the above files the program created a log file to flag problems (e.g., missing data or year). A message indicates any problems, which should be corrected before continuing.

2. Load data into FIS data base.

   A program was run, which uses ORACLE, that adds data to the data base in tables for each of these data sets (i.e., NOAA Radiosonde Observations described here, the Upper Air Derivation Data from NMC and the NOAA Regional Surface Data). ORACLE was then used to systematically check these data tables for data inconsistencies.

Processing Changes:

Not available at this revision.

Calculations:

Special Corrections/Adjustments:

The original NOAA radiosonde data contained pressure levels, not atmospheric pressure. The FIFE Information System staff, converted pressure levels to atmospheric pressure. The relationship between the original pressure levels and the current atmospheric pressures are listed below.

```
Pressure Level    Atmospheric Pressure
--------------    --------------------
1                        1000 mb
2                         850 mb
3                         700 mb
4                         500 mb
```

```
5                             400 mb
6                             300 mb
7                             250 mb
8                             200 mb
9                             150 mb
10                            100 mb
11                             70 mb
12                             50 mb
13                             30 mb
14                             20 mb
15                             10 mb
```

Calculated Variables:

Not available at this revision.

Graphs and Plots:

None.

10. Errors:

Sources of Error:

The sources of error are as follows:

1. Insufficient recorder sensitivity,
2. Fading or weak signals,
3. Unstable temperature traces,
4. Leaking pressure cell,
5. Sticking contact arm,
6. Electrical leakage in the baseline check box, or
7. Repeated contacts caused by faulty baroswitch assembly.

Quality Assessment:

Data Validation by Source:

Not available at this revision.

Confidence Level/Accuracy Judgment:

Not available at this revision.

Measurement Error for Parameters:

Not available at this revision.

Additional Quality Assessments:

Occasionally soundings terminate abnormally, (e.g., balloon burst, leaking or floating balloon, weak or fading signal, radiosonde failure, etc.) When possible, another release is made close to the allotted time, and a complete explanation of the problems that caused the unsuccessful flight are documented.

Data Verification by Data Center:

The data verification performed by the ORNL DAAC deals with the quality of the data format, media, and readability. The ORNL DAAC does not make an assessment of the quality of the data itself except during the course of performing other QA procedures as described below.

The FIFE data were transferred to the ORNL DAAC via CD-ROM. These CD-ROMs are distributed by the ORNL DAAC unmodified as a set or in individual volumes, as requested. In addition, the DAAC has incorporated each of the 98 FIFE tabular datasets from the CD-ROMs into its online data holdings. Incorporation of these data involved the following steps:

- Copying the entire FIFE Volume 1, maintaining the directory structure on the CD-ROM.
- Using data files, documentation, and SQL code provided on the CD-ROM to create a database in Statistical Analysis System (SAS).
- Creating transfer files to transfer the SAS metadata database to Sybase tables.

Each distinct type of data (i.e. "data set" on the CD-ROM), is accompanied by a documentation file (i.e., .doc file) and a data format/structure definition file (i.e., .tdf file). The data format files on the CD-ROM are Oracle SQL commands (e.g., "create table") that can be used to set up a relational database table structure. This file provides column/variable names, character/numeric type, length, and format, and labels/comments. These SQL commands were converted to SAS code and were used to create SAS data sets and subsequently to input data files directly from the CD-ROM into a SAS dataset. During this process, file names and directory paths were captured and metadata was extracted to the extent possible electronically. No files were found to be corrupted or unreadable during the conversion process.

Additional Quality Assurance procedures were performed as follows:

- Statistical operations were performed to calculate minimum and maximum values for all numeric fields and to create a listing of all values of the character fields. During this process, it was determined that various conventions were used to represent missing values. (Note: no modifications were made to any data by the DAAC). In most cases, missing value identification conventions were discussed in the accompanying .doc file. Based on a visual check of the minimum and maximum values, no glaring errors or holes were identified that might indicate errors introduced during CD-ROM mastering by the FIFE project or data ingest by the DAAC.
- Some minor inconsistencies and typographical errors were identified in some of the character fields and column labels, however, no modifications were made to the data by the DAAC.

- Some conversions of ASCII data were necessary to move the data from a DOS platform to a UNIX platform. Standard operating system conversion utilities were used (e.g., dos2unix).
- Much of the metadata required for archival is imbedded in the narrative documentation accompanying the data sets and extracted manually by DAAC staff who have read the .doc files provided on the CD-ROM and have hand entered this information into the metadata database maintained by the DAAC. QA procedures have been performed on these metadata to identify and eliminate typographical errors and inconsistencies in naming conventions, to ensure that all required metadata is present, and to ensure the accuracy of file names and paths for retrieval.
- Data requested for distribution to users are checked to verify that files copied from disk to other media remain uncorrupted.

As errors are discovered in the online tabular data by investigators, users, or DAAC staff, corrections are made in cooperation with the principal investigators. These corrections are then distributed to users. CD-ROM data are corrected when re-mastering occurs for replenishment of CD-ROM stock.

11. Notes:

Limitations of the Data:

Not available.

Known Problems with the Data:

Not available at this revision.

Usage Guidance:

When the types of ground and flight equipment used to collect these data malfunction they exhibit little or no obvious abnormalities in the record. These cases, however, do show certain patterns in the record, a knowledge of these is very helpful in the classification of the data.

Any Other Relevant Information about the Study:

Not available at this revision.

12. Application of the Data Set:

These data can be used as input to numerical models, as well as, verification data for simulation studies.

13. Future Modifications and Plans:

The FIFE field campaigns were held in 1987 and 1989 and there are no plans for new data collection. Field work continues near the FIFE site at the Long-Term Ecological Research (LTER) Network Konza research site (i.e., LTER continues to monitor the site). The FIFE investigators are continuing to analyze and model the data from the field campaigns to produce new data products.

14. Software:

Software to access the data set is available on the all volumes of the FIFE CD-ROM set. For a detailed description of the available software see the *Software Description Document*.

15. Data Access:

Contact Information:

ORNL DAAC User Services
Oak Ridge National Laboratory

Telephone: (865) 241-3952
FAX: (865) 574-4665

Email: ornldaac@ornl.gov

Data Center Identification:

ORNL Distributed Active Archive Center
Oak Ridge National Laboratory
USA

Telephone: (865) 241-3952
FAX: (865) 574-4665

Email: ornldaac@ornl.gov

Procedures for Obtaining Data:

Users may place requests by telephone, electronic mail, or FAX. Data is also available via the World Wide Web at http://daac.ornl.gov.

Data Center Status/Plans:

FIFE data are available from the ORNL DAAC. Please contact the ORNL DAAC User Services Office for the most current information about these data.

16. Output Products and Availability:

NOAA Radiosonde Observation data is available on FIFE CD-ROM Volume 1. The CD_ROM filename is as follows:

\DATA\ATMOS\NOAA_SON\GRIDxxx\YyyMmm\ydddgrid.NOR

Where *xxxx* is the four digit code for the location within the FIFE site grid, *yy* is the last two digits of the year (e.g. Y87=1987), mm is the month of the year (e.g. M12=December), and *ddd* is the day of the year, (e.g. 061=sixty-first day in the year). Note: capital letters indicate fixed values that appear on the CD-ROM exactly as shown here, lower case indicates characters (values) that change for each path and file.

The format used for the filenames is: *ydddgrid.sfx*, where *grid* is the four-number code for the location within the FIFE site grid, *y* is the last digit of the year (e.g. 7=1987, and 9=1989), and *ddd* is the day of the year. The filename extension (*.sfx*), identifies the data set content for the file (see the *Data Characteristics Section*) and is equal to .NOR for this data set.

17. References:

Satellite/Instrument/Data Processing Documentation.

Federal Meteorological Handbook No. 3. Radiosonde Observations. U.S. Department of Commerce, National Oceanic and Atmospheric Administration Washington, D. C.

Federal Meteorological Handbook No. 4. Radiosonde Code, Second Edition-1976. U.S. Department of Commerce, National Oceanic and Atmospheric Administration Washington, D. C.

Journal Articles and Study Reports.

Brutsaert, W., M. Sugita, and L.J. Fritschen. 1990. Inner region humidity characteristics of the neutral boundary layer over prairie terrain. Water Resour. Res. 26:2931-2936.

Sugita, M., and W. Brutsaert. 1990. Wind velocity measurements in the neutral boundary layer above hilly prairie. J. Geophys. Res. 95:7617-7624.

Sugita, M. and W. Brutsaert. 1991. Daily evaporation over a region from lower boundary layer profiles measured with radiosondes. Water Resour. Res. 27:747-752.

Sellers, P.J., F.G. Hall, G. Asrar, D.E. Strebel, and R.E. Murphy. 1988. The First ISLSCP Field Experiment (FIFE). Bull. Am. Meteorol. Soc. 69:22-27.

Archive/DBMS Usage Documentation.

Contact the EOS Distributed Active Archive Center (DAAC) at Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee (see the *Data Center Identification Section*). Documentation about using the archive and/or online access to the data at the ORNL DAAC is not available at this revision.

18. Glossary of Terms:

A general glossary for the DAAC is located at Glossary.

19. List of Acronyms:

BPI Byte per inch CD-ROM Compact Disk (optical), Read-Only Memory CCT Computer Compatible Tape DAAC Distributed Active Archive Center EOSDIS Earth Observing System Data and Information System FIS FIFE Information System IFOV Instantaneous Field of View ISLSCP International Satellite Cloud Climatology Project Mbps Megabyte per second NESDIS National Environmental Satellite Data and Information Service NOAA National Oceanic and Atmospheric Administration ORNL Oak Ridge National Laboratory URL Uniform Resource Locator UTM Universal Transverse Mercator

A general list of acronyms for the DAAC is available at Acronyms.

20. Document Information:

April 28, 1994 (citation revised on October 10, 2002).

This document has been reviewed by the FIFE Information Scientist to eliminate technical and editorial inaccuracies. Previous versions of this document have been reviewed by the Principal Investigator, the person who transmitted the data to FIS, a FIS staff member, or a FIFE scientist generally familiar with the data. It is believed that the document accurately describes the data as collected and as archived on the FIFE CD-ROM series.

Document Review Date:

September 4, 1996.

Document ID:

ORNL-FIFE_NOAA_SON.

Citation:

Cite this data set as follows:

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Document Curator:

DAAC Staff

Document URL:

http://daac.ornl.gov