NMC UPPER AIR DERIVED DATA (FIFE)
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Summary:

The Upper Air Derivative Data from NMC Data Set was derived from National Meteorological Center global upper air models. These models use a 6 hours intermittent assimilation method. In this method, the objective analysis is performed every 6 hours using a 6 hours forecast as an initial guess (Kanamitsu 1989). The National Meteorological Center (NMC) gridded upper air data was extracted from the NOAA operational analysis system and transmitted to the FIS. This contained spatially interpolated NMC upper air data calculated for four grid points of 381 km polar-stereograph over the FIFE area. FIS considers this a derived data set (i.e., not from original measurements).

Table of Contents:

1. Data Set Overview:

Data Set Identification:

NMC Upper Air Derived Data (FIFE)
(Upper Air Derivative Data from NMC).

Data Set Introduction:

The Upper Air Derivative Data from NMC Data Set contains pressure, geopotential height, atmospheric temperature, and relative humidity data derived from National Meteorological Center global upper air models.

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. This data may be used to provide input data for numerical models as well as be utilized as verification data for simulation studies.

Summary of Parameters:

Pressure, geopotential height, atmospheric temperature, and relative humidity.

Discussion:

The National Meteorological Center (NMC) gridded upper air data was extracted from the NOAA operational analysis system and transmitted to the FIS. This contained spatially interpolated NMC upper air data calculated for four grid points of 381 km polar-stereograph over the FIFE area. FIS considers this a derived data set (i.e., not from original measurements).

Related Data Sets:

- NOAA Radiosonde Observations.
- NOAA Radiosonde Observations - 1989 (NCDC).
- NOAA Regional Surface Data.
- NOAA Regional Surface Data - 1989 (NCDC).
- FIFE Radiosonde Data.
- Automatic Micrometeorological Observations.

FIS Data Base Table Name:

NMC_UPPER_AIR_DERV.

2. Investigator(s):

Investigator(s) Name and Title:

Dan Tarpley
National Oceanic and Atmospheric Administration

Title of Investigation:

Staff Science Meteorological Data Acquisition Program.

Contact Information:

Contact 1:
Dan Tarpley
NOAA/NESDIS

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Contact 2:
J. McDonell
NOAA/NESDIS

Requested Form of Acknowledgment.

The Upper Air Derivation Data from NMC were originally produced by NOAA's National Meteorological Center (NMC). The FIS obtained the data from Dr. Dan Tarpley of the National Oceanic and Atmospheric Administration (NOAA)/National Environmental Satellite Data and Information Service (NESDIS).

3. Theory of Measurements:

The data presented here is derived from National Meteorological Center global upper air models. The National Meteorological Center is constantly updating these models. A list of models used during the time frame of this data set is described in the *Processing Changes Section*. These models use a 6 hours intermittent assimilation method. In this method, the objective analysis is performed every 6 hours using a 6 hours forecast as an initial guess (Kanamitsu 1989). The NMC upper air data the FIS acquired from Dr. Dan Tarpley consists of these 6 hour forecast.

4. Equipment:

Sensor/Instrument Description:

Not available at this revision.

Collection Environment:

Not available at this revision.

Source/Platform:

Not available at this revision.

Source/Platform Mission Objectives:

Not available at this revision.

Key Variables:

Not available at this revision.

Principles of Operation:

Not available at this revision.

Sensor/Instrument Measurement Geometry:

Not available at this revision.

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:

Not available at this revision.

Other Calibration Information:

Not available at this revision.

5. Data Acquisition Methods:

The NMC Upper Air data was obtained by Dr. Dan Tarpley at NOAA's National Environmental Satellite Data and Information Service. This data was then sent to the FIFE Information System.

6. Observations:

None.

7. Data Description:

Spatial Characteristics:

Spatial Coverage:

NMC gridded upper air data is calculated for four grid points around Manhattan, Kansas. The center latitude and longitude of these grids are:

```
  LATITUDE         LONGITUDE
------------    --------------
36 15 35.99     -98 25 48.00
37 5 60.00      -94 55 48.00
39 2 60.00      -99 39 0.00
39 58 12.00     -95 56 60.00
```

Spatial Coverage Map:

Not available.

Spatial Resolution:

The four grid points are 381 km apart.

Parameters are calculated at 10 pressure levels, therefore, the vertical resolution of the data will vary with atmospheric conditions.

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.

Temporal Coverage Map:

Not available.

Temporal Resolution:

Forecasts are made at 12 hour intervals, using data collected 6 hours before.

Data Characteristics:

The SQL definition for this table is found in the NMC_UPR.TDF file located on CD-ROM Volume 1.

Parameter/Variable Name

Parameter/Variable Description Range Units Source

OBS_DATE The date on which the min = 02-JUL-85, [GMT] NOAA information for this data max = 23-OCT-88 set was derived.

OBS_TIME The time at which the min = 600, [GMT] NOAA information for this data max = 1800 set was derived.

LATITUDE The latitude at which the min = 36 15 35.99, [Degrees, NOAA information for this data max =

39 58 12.00 Minutes, set was recorded. Seconds]

LONGITUDE The longitude at which the min = -94 55 48.00, [Degrees, NOAA information for this data max = -99 39 0.00 Minutes, set was recorded. Seconds]

GEOPTNTL_HEIGHT The interpolated geopotential min = -94.48, [meters] NOAA height. max = 16788.63, missing = 99999

ATMOSPHERIC_PRESS The atmospheric pressure. min = 100, [millibars] NOAA max = 1000

ATMOSPHERIC_TEMP The measured atmospheric min = 197.08, [degrees NOAA temperature, at a given max = 339.29, Kelvin] pressure. missing = 99999

REL_HUMID The interpolated relative min = -2.09, [percent] NOAA humidity. max = 102.09, missing = 99999

Sample Data Record:

```
OBS_DATE    OBS_TIME   LATITUDE        LONGITUDE        GEOPTNTL_HEIGHT
----------  --------  -------------  ---------------  ----------------
07-JAN-87   1800       39 58 12.00   -95 56 60.00     233.530
07-JAN-87   1800       39 58 12.00   -95 56 60.00    1519.650
07-JAN-87   1800       39 58 12.00   -95 56 60.00    3038.560
07-JAN-87   1800       39 58 12.00   -95 56 60.00    5586.480
ATMOSPHERIC_PRESS    ATMOSPHERIC_TEMP     REL_HUMID
-----------------    ----------------     ----------
1000                 270.910                73.140
850                  269.520                44.560
700                  264.630                35.490
500                  250.610                27.210
```

8. Data Organization:

Data Granularity:

NMC gridded upper air data is calculated for four grid points around Manhattan, Kansas. The four points are 381 km apart. Parameters are calculated at 10 pressure levels.

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 begins 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, path and name of the document that describes the data in this file, and name of principal investigator for these data.

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_ID)).

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:

The data was originally processed by the National Meteorological Center. The processing steps, described below, are what occurred to the data after the FIS acquired it.

1. Unpack 9-track tape data sent 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 sent by D. Tarpley contained three sets of data; the NOAA Radiosonde Observations, Upper Air Derivative Data from NMC, and NOAA Regional Surface Data. The 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 indicated any problem, correct and continue.

2. Load data into FIS data base.

   A program was run, which uses ORACLE, that adds data to the data base in appropriately labeled tables (e.g., NOAA Radiosonde Observations, Upper Air Derivative Data from NMC, or NOAA Regional Surface Data). ORACLE was then used to systematically check data tables for inconsistencies in entries.

3. Extract data files for CD-ROM.

   A program was run that extracted the data into files for the CD-ROM.

Processing Changes:

Operational medium-range forecast (MRF) models at NMC

```
        Date                 Model Type/Characteristics
------------------------ ----------------------------------
19 Oct 1985-16 Apr 1985   Spectral
Rhomboidal-40 horizontal resolution
12 layers in the vertical
Limited physics
17 Apr 1985-28 May 1986   MRF 85
Rhomboidal-40 horizontal resolution
18 equally spaced layers
(moisture in lowest 12 only)
GFDL physics, including sophisticated
radiation
Silhouette mountains
First guess analysis cycle comes
from R-30 spectral model
29 May 1986-12 Aug 1987   MRF 86
Rhomboidal-40 horizontal resolution
Improved boundary layer via
increased vertical resolution near
surface and shallow convection
Deep convection extended to tropopause
Horizontal diffusion adjusted for
orography
First guess from MRF 86
13 Aug 1987-30 Nov 1987   MRF 87
Triangular-80 horizontal resolution
Simple diurnal cycle
Improved surface fluxes
Minor changes to radiation and deep
convection
Gravity wave drag (3 Sept 1987)
18 layers of moisture (20 Jan 1988)
Montieth-penman moisture over
land (18 May 1988)
1 Dec 1988 to present     MRF 88
Interactive clouds
Changes to horizontal diffusion and
advection
New observational and forecast error
statistics in data assimilation system.
```

Calculations:

Not available at this revision.

Special Corrections/Adjustments:

Not available at this revision.

Calculated Variables:

Not available at this revision.

Graphs and Plots:

None.

10. Errors:

Sources of Error:

Not available at this revision.

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:

Not available at this revision.

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:

Not available at this revision.

Any Other Relevant Information about the Study:

Not available at this revision.

12. Application of the Data Set:

This data may be used to provide input data for numerical models as well as be utilized 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:

Upper Air Derivative Data from NMC is available on FIFE CD-ROM Volume 1. The CD-ROM filename is as follows:

\DATA\ATMOS\NMC_UPR\YyyMmm\ydddFIFE.NMC

Where *yy* is the last two digits of the year (e.g., Y87 = 1987) and *mm* is the month of the year (e.g., M12 = December). 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 : *ydddFIFE.sfx*, where *y* is the last digit of the year (e.g., 7 = 1987, and 9 = 1989), and *ddd* is the day of the year (e.g., 061 = sixty-first 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 .NMC for this data set.

17. References:

Satellite/Instrument/Data Processing Documentation.

Anonymous. 1982. Federal Meteorological Handbook No. 1 Surface Observations. Third Edition - 1982. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Washington, D. C.

Anonymous. 1988. Federal Meteorological Handbook No. 2. Surface Synoptic Codes FCM-H2-1988. U.S. Department of Commerce, National Oceanic and Atmospheric Administration. Washington, D. C.

Journal Articles and Study Reports.

Caplan, M.P. and G.H. White. 1989. Performance of NMC's Medium-Range-Model. Weather and Forecasting. 4:391-400

Kanamitsu, M. 1989. Description of the NMC global data assimilation and forecast system. Weather and Forecasting. 4:335-342.

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:

CD ROM Compact Disk-Read Only Memory DAAC Distributed Active Archive Center EOSDIS Earth Observing System Data and Information System FIFE First ISLSCP Field Experiment FIS FIFE Information System ISLSCP International Satellite Land Surface Climatology Project MRF Medium Range Forecast NESDIS National Environmental Satellite Data and Information Service NMC National Meteorological Center 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 24, 1994 (citation revised on October 7, 2002).

Warning: This document has not been checked for technical or editorial accuracy by the FIFE Information Scientist. There may be inconsistencies with other documents, technical or editorial errors that were inadvertently introduced when the document was compiled or references to preliminary data that were not included on the final CD-ROM.

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.

Document Review Date:

September 3, 1996.

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ORNL-FIFE_NMC_UPR.

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Document Curator:

DAAC Staff

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