SITE AVERAGED AMS DATA: 1988 (BETTS)
Get Data

Site Averaged AMS Data: 1988 (Betts)

Summary:

The Site Averaged AMS Data: 1988 (Betts) data set contains the site-averaged product of the Portable Automatic Meteorological Station (AMS) data acquired during the 1987-1989 FIFE experiment. Data are in 30-minute time intervals in 1988.

Table of Contents:

1. Data Set Overview:

Data Set Identification:

SITE AVERAGED AMS DATA: 1988 (BETTS).

Data Set Introduction:

This data set is a site-averaged product of the Portable Automatic Meteorological Station (AMS) data acquired during the 1987-1989 FIFE experiment. The raw data have been extensively cleaned and edited before the site average was generated. The center of the FIFE 15x15 km site is close to 39.05þN, 96.53þW.

The 3 years of data were acquired and processed separately over a period of several years; and as a result there are a few differences in the 88 product and in the underlying methodology.

The 1987 data was downloaded piecemeal (by 2400 baud modem!) from the FIFE information center, edited and merged. Subsequently the 1988 data was retrieved from the FIFE CD ROM Volume1; and the 1989 data was retrieved directly from the Oak Ridge DAAC. As our computers have improved by more than an order of magnitude in speed and disc space during the processing period, the 1989 data received a more uniform processing than the 1987. All the originating data however should correspond to that in the group 8, "Surface Meteorological Measurements (SUR_MET)" or FIFE CD-ROM Volume 1, dated May 22, 1994, FIS Data Base Table "AMS_DATA_8x".

Objective/Purpose:

Information not available.

Summary of Parameters:

Air Temperature, Atmospheric Pressure, Longwave Radiation, Precipitation Rate, Reflectance, Shortwave Radiation, Soil Temperature, Solar Radiation, Surface Temperature, and Surface Wind Speed/Direction.

Discussion:

Information not available.

Related Data Sets:

- Site Averaged AMS Data: 1987 (Betts)
- Site Averaged AMS Data: 1989 (Betts)
- Site Averaged AMS Data: 1987 - 1989 (Betts)

2. Investigator(s):

Investigator(s) Name and Title:

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Title of Investigation:

FIFE Follow-On.

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Requested Form of Acknowledgment.

You may use these files freely. Please send Alan Betts (akbetts@aol.com) an e-mail if you do, so he can notify you of any updates. Please notify both Alan Betts and the ORNL DAAC of any errors you find.

This data processing was supported by NASA under Contract NAS5-32356 to Alan Betts, and an acknowledgment of the years of work that went into the production of these files would be appreciated in publications based substantially on them.

The FIFE CD-ROM can be cited as D. E. Strebel, D. R. Landis, K. F. Huemmrich, and B. W. Meeson (1994), Collected Data of The First ISLSCP Field Experiment, Vol. 1: Surface Observations and Non-Image Data Sets.

3. Theory of Measurements:

Information not available.

4. Equipment:

Sensor/Instrument Description:

- ANEMOMETER: An instrument for measuring or indicating the force or speed of wind.
- BAROMETER: An instrument used for determining atmospheric pressure. The two most common barometers are the mercury barometer and the aneroid barometer.
- PYRANOMETER: An instrument that measures shortwave radiation over the whole hemisphere.
- RADIOMETER:
- RAIN GAUGE: An instrument used for measuring the amount of precipitation (rainfall) received. Generally expressed in inches or centimeters.
- THERMOMETER: An instrument for measuring temperature.

Collection Environment:

Ground-based.

Source/Platform:

Meteorological Station.

Source/Platform Mission Objectives:

Information not available.

Key Variables:

Information not available.

Principles of Operation:

Information not available.

Sensor/Instrument Measurement Geometry:

Information not available.

Manufacturer of Sensor/Instrument:

Information not available.

Calibration:

Information not available.

5. Data Acquisition Methods:

Information not available.

6. Observations:

Information not available.

7. Data Description:

Spatial Characteristics:

The FIFE site, with areal extent of 15 km by 15 km, is located south of the Tuttle Reservoir and Kansas River, and about 10 km from Manhattan, Kansas, U.S.A. The northwest corner of the area has UTM coordinates of 4,334,000 Northing and 705,000 Easting in UTM Zone 14.

The center of the FIFE 15 x 15 km site is close to 39.05þN, 96.53þW.

Spatial Coverage:

During 1988, 17 sitegrids were instrumented with the AMS equipment. It should be noted that not all sitegrids were instrumented for the entire year.

SITEGRID	STATION_ID	SITEGRID	STATION_ID	SITEGRID	STATION_ID
0847-SAM	52	3021-PAM	807	6469-PAM	23
0847-SAM	829	3221-PAM	7	6469-PAM	823
0847-SAM	929	4139-PAM	831	6469-PAM	923
1563-PAM	27	4168-SAM	51	6735-PAM	813
1563-PAM	827	4168-SAM	825	6912-PAM	19
2123-SAM	5	4168-SAM	925	6912-PAM	819
2123-SAM	805	4439-PAM	11	6912-PAM	919
2123-SAM	905	4439-PAM	811	8639-SAM	21
2133-PAM	931	4439-PAM	911	8639-SAM	821
2139-PAM	31	4509-PAM	817	8639-SAM	921

```
2428-PAM      3      4609-PAM     17
```

Spatial Coverage Map:

Not available.

Spatial Resolution:

These are point data.

Projection:

Information not available.

Grid Description:

Information not available.

Temporal Characteristics:

Temporal Coverage:

This data set contains data from January 1, 1988 through December 31, 1988.

Temporal Coverage Map:

Information not available.

Temporal Resolution:

The time interval of the year is broken down into 30 minute intervals. There is one variable sample at each 30 minute time interval so in a LEAP (NOTE 1988) there are 366 x 48 = 17658 time intervals. This field in the database in named "YSq#" (Yearly Sequence #) and makes a convenient linear time scale; in addition to day and UTC.

Data Characteristics:

- Air temperature,
- Atmospheric pressure,
- Longwave radiation,
- Precipitation rate,
- Reflectance,
- Shortwave radiation,
- Soil temperature,
- Solar radiation,
- Surface temperature, and
- Surface wind speed/direction.

Parameter/Variable Name

- Air Temperature:
- Atmospheric Pressure: The pressure exerted by the weight of air above a given point. Usually expressed in terms of the height of a column of mercury.
- Longwave Radiation:
- Precipitation Rate:
- Reflectance:
- Shortwave Radiation: The radiant energy emitted from the sun, in the visible and near ultraviolet wavelengths.
- Soil Temperature: A measure of the thermal energy of a soil.
- Solar Radiation: A measure of the electromagnetic energy that comes from the sun only.
- Surface Temperature:
- Surface Wind Speed/Direction:

Table 1. contains a summary of the variables in this data set.

Table 1. Variable Description

Variable Name	Long Name	SAS Type	Description
1 Ysq_no		8	"Time interval of the year broken down into 30-minute intervals"
2 date	OBS_DATE	8	"Observation date (mm/dd/yyyy)"
3 Jul_Date		8	"Julian date (day of year 1-366)"
4 utc		8	"Decimal time"
5 P	ATMOSPHERIC_PRESSURE	8	"Average atmospheric pressure (mbar)"
6 P_k		8	"Number of sites included in atmospheric pressure average"
7 P_s		8	"Atmospheric pressure standard deviation (mbar)"
8 T	DRY_BULB_TEMPERATURE	8	"Average dry bulb temperature (degrees C)"
9 T_k		8	"Number of sites included in average dry bulb temperature (T)"
10 T_s		8	"Dry bulb temperature standard deviation"
11 Tw	WET_BULB_TEMPERATURE	8	"Average wet bulb temperature (degrees C)"
12 Tw_k		8	"Number of sites included in average wet bulb temperature (T)"
13 Tw_s		8	"Wet bulb temperature standard deviation"
14 Rain30	RAINFALL_RATE(*)	8	"Average rainfall rate for 30-minutes (Rain30)"
15 Rain30_k		8	"Number of sites included in average 30-minute rainfall rate (Rain30)"
16 Rain30_s		8	"Standard deviation of average 30-minute rainfall rate (Rain30)"
17 U	U_COMPNT_WIND_VELOC	8	"Average U component of wind velocity (m/s)"
18 U_k		8	"Number of sites included in average U component wind velocity (U)"
19 U_s		8	"Standard deviation of U component wind velocity (U)"

20 V	V_COMPNT_WIND_VELOC	8	"Average V component of wind velocity (m/s)"
21 V_k		8	"Number of sites included in average V component wind velocity (V)"
22 V_s		8	"Standard deviation of V component wind velocity (V)"
23 Tsurf	SURF_TEMP	8	"Average surface temperature (degrees C)"
24 Tsurf_k		8	"Number of sites included in average surface temperature (Tsurf)"
25 Tsurf_s		8	"Standard deviation of surface temperature (Tsurf)"
26 Tsoil10	SOIL_TEMP_10CM	8	"Average soil temperature at 10 cm (degrees C)"
27 Tsoil10k		8	"Number of sites included in average soil temperature at 10 cm (Tsoil10)"
28 Tsoil10s		8	"Standard deviation of soil temperature at 10 cm (Tsoil10)"
29 Tsoil50	SOIL_TEMP_50CM	8	"Average soil temperature at 50 cm (degrees C)"
30 Tsoil50k		8	"Number of sites included in average soil temperature at 50 cm (Tsoil50)"
31 Tsoil50s		8	"Standard deviation of soil temperature at 50 cm (Tsoil50)"
32 SolDn	TOTAL_INCIDENT_RADTN	8	"Average total incident radiation (W/m2)"
33 SolDn_k		8	"Number of sites included in total incident radiation average (SolDn)"
34 SolDn_s		8	"Standard deviation of average total incident radiation (SolDn)"
35 SolRef	SHORTWAVE_SOLAR_REFL	8	"Average shortwave solar reflectance (W/m2)"
36 SolRef_k		8	"Number of sites included in average shortwave solar reflectance (SolRef)"
37 SolRef_s		8	"Standard deviation of average shortwave solar reflectance (SolRef)"
38 Rnet	NET_RADTN	8	"Average net radiation (W/m2)"
39 Rnet_k		8	"Number of sites included in average net radiation (Rnet)"
40 Rnet_s		8	"Standard deviation of average net radiation (Rnet)"
41 IRDn	INCIDENT_LONGWAVE_RADTN	8	"Average incident longwave radiation (W/m2)"
42 IRDn_k		8	"Number of sites included in average incident longwave radiation (IRDn)"
43 IRDn_s		8	"Standard deviation of average incident longwave radiation (IRDn)"
44 Q		8	"Average mixing ratio"
45 Q_k		8	"Number of sites included in average mixing ratio (Q)"

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46 Q_s	8	"Standard deviation of average mixing ratio (Q)"
47 ToCldoct	8	"Average total cloud cover (octas)"
48 HiCldoct	8	"Average high cloud cover (octas)"
49 TimePhot	8	"Time of day sky photographs were taken"
50 MF_cld10	8	"Reported cloud cover from Marshall Field (tenths)"
51 obs_time	8	"Observation time (hhmm)"

Unit of Measurement:

Refer to the *Table 1* Description.

Data Source:

Meteorological Station.

Data Range:

Information not available.

Sample Data Record:

```
Ysq_no   date      Jul_Date   utc    P     P_k    P_s    T       T_k    T_s    Tw
Tw_k  Tw_s  Rain30   Rain30_k   Rain30_s   U     U_k    U_s    V      V_k    V_s
Tsurf   Tsurf_k   Tsurf_s   Tsoil10   Tsoil10k   Tsoil10s   Tsoil50   Tsoil50k
Tsoil50s   SolDn    SolDn_k   SolDn_s   SolRef   SolRef_k  SolRef_s  Rnet   Rnet_k
Rnet_s  IRDn   IRDn_k   IRDn_s   Q    Q_k   Q_s   ToCldoct   HiCldoct   TimePhot
MF_cld10   obs_time


1     01/01/1988    1     0.25   983    0     .    -9      0     .    -1.79
0     .    .         0              .    1.01   0    .    0.46   0     .
-9.8    0          .          1.06       0          .        4.8          0
.        0        0         .        0     0     .    -28.35    0
.        .       0      .    1.8    0    .    .        .       .
.        0015
2     01/01/1988    1     0.75   982.78 0     .    -9.36   0     .    -3.59
0     .    .         0              .    1.03   0    .    -0.08  0     .
-9.81   0          .          1.12       0          .        4.2          0
.        0        0         .        0     0     .    -28.7     0
.        .       0      .    1.78   0    .    .        .       .
.        0045
3     01/01/1988    1     1.25   982.56 0     .    -9.72   0     .    -5.38
0     .    .         0              .    1.04   0    .    -0.63  0     .
-9.83   0          .          1.18       1     0    .        4.4       0
.        0        0         .        0     0     .    -29.05    0
.        .       0      .    1.76   0    .    .        .       .
.        0115
4     01/01/1988    1     1.75   982.33 0     .    -10.08  0     .    -7.17
0     .    .         0              .    1.06   0    .    -1.17  0     .
-9.85   0          .          1.25       0     0    .        4.6       0
.        0        0         .        0     0     .    -29.41    0
.        .       0      .    1.75   0    .    .        .       .
.        0145
```

8. Data Organization:

Data Granularity:

File names	size (bytes)
fofams88.dat	3585872

Data Format:

This data set is a time series of 30 minute average variables for the periods Jan 1, 1988 - Dec 31, 1988 (46 fields; 14 variables (mean , SD, and count); date (2), UTC, year sequence #.)

9. Data Manipulations:

Information not available.

10. Errors:

Sources of Error:

Information not available.

Quality Assessment:

Data Validation by Source:

Information not available.

Confidence Level/Accuracy Judgment:

Most variables are continuous for all but a few short periods. There is no radiation data for an extended period of one month from April 11 through May 10, 1988 because the instruments were being calibrated. However, other than this period, Rnet is available about 99% of the time. IRDn is missing for three extended time intervals and may be of questionable value for much of the time that it is available.

Data Filters and Cleaning:

A set of filters was applied to reject bad data points and help to identify lines of bad data (such as produced by electrical noise). Table 2 summarizes these filters. Scanning the data and nulling out obvious erroneous data manually effected further data editing. Some bad values will, however, have slipped through, these can often be identified by a large value of the standard deviation.

Table 2. Data filters

Variable	Max/Min (1988)	Filter Range
P	999.94/938.29	930 to 1000
T	37.94/−23.17	−30 to 45
Tw	36.01/−22.43	−30 to 40 & (Tw−T)0.05
Rain30	7.75/0	

```
U               31.20/-27.56
V               22.29/-17.86
Tsurf           54.76/-39.34              -50 to 60
Tsoil10         39/-2.85                  -10 to 50
Tsoil50         26/1.38                   -5 to 40
SolDn           1034.71/-4.88             -5 to 1200
SolRef          543,45/-4.93              -5 ot 600
Rnet            8.39.52/-87.36            -98 to 1000
IRDn            498.52/143.60             100 to 600
Q               N/A (calculated)
```

Each variable (for all sites), together with the site-average and standard deviation were then examined graphically and manually (and iteratively) edited to eliminate bad data; and generate a cleaned-up site average for each variable. Some such as temperature and wet-bulb temperature were examined in pairs. Some bad data has escaped this process; often this is indicated by a solitary extreme standard deviation.

Interpolation

We did not interpolate variables at a site before averaging; but we have interpolated most site-average variables to fill gaps (where these are small <6 hours) to reduce the burden on modelers. Gaps of more than a day have generally not been interpolated; although we have filled a few missing days temperature profiles with a simple and obvious sawtooth patterns (in 1988 and 1989). Some missing Net radiation values at night have been set to -30 Wm-2. In 1988 and 1989 SolDn and SolRef have been set to 0 (zero) between sun set and sun rise.

INTERPOLATED DATA IS EASILY IDENTIFIED. If the count on a variable is zero the data has been interpolated.

Measurement Error for Parameters:

Information not available.

Additional Quality Assessments:

Information not available.

Data Verification by Data Center:

Information not available.

11. Notes:

Limitations of the Data:

Not available.

Known Problems with the Data:

Information not available.

Usage Guidance:

Information not available.

Any Other Relevant Information about the Study:

Original 1987 AMSDOC.txt

This is the documentation from the original May 26 - Oct 16 1987 site average data set from the FIFE CD-ROM. We include it for its remarks on the cloud data fields; and formula used for mixing ratio q, as we have not reprocessed this period, except for rain and IRDN.

FIFE-87 compacted surface data set. (Betts and Ball, 1992)
Rev. Date: December 11, 1992

This data set contains FIFE-site averages derived from (ten) AMS stations (data every 30 minutes), together with cloud data from two sources, from May 26 - Oct 16, 1987.

The raw data for these files came from the FIS Data Base tables AMS_DATA_87 and CLOUD_CAMERA_DATA. The MF_Cld field was obtained independently from the hourly cloud observations of Marshall AAF, KS, approximately 12 km west of the FIFE site.

Data Processing

Surface Portable Automated Meteorological Stations.

These were PAM-II stations supplied by the National Center for Atmospheric Research (NCAR), with pressure (PS), temperature (T)and wet-bulb (TW) temperature sensors mounted at 2 m and an anemometer at 5.4 m, as well as ground temperature sensors at 10 cm (T1soil) and 50 cm (T2soil) below the surface.

Each station measured surface skin temperature (TSfc) with a downward looking radiometer, net radiation (RNet) with a net radiometer, measured reflected solar radiation (SolRef) and recorded rainrate and accumulation from a tipping bucket raingauge. A subset of stations (2 before August, 10 1987 and then 4) measured incoming solar radiation (SolDn), and longwave radiation (LWDN) (2 before October, 1987, and then 4). The archive data uses NCAR's calibrations of the instruments.

Data Filters

A set of filters was applied to reject bad data points and identify lines of bad data (such as produced by electrical noise). These are shown in Table 87-1.

```
                        Table 87-1


Variable         May 26-Jun 24  Jun 25-Aug21   Aug 22-Oct 16


SolDn            -5 to 1200     -5 to 1200     -5 to 1200
SolRef           -5 to 250      -5 to 250      -5 to 250
RNet             -98 to 1000    -98 to 1000    -98 to 800
TSfc              0 to 55       10 to 55      -10 to 35
TSoil10           9 to 30       19 to 30       9 to 21
TSoil150         11 to 30       19 to 30      11 to 19
```

T

and **TW** were filtered to eliminate any data where **T** was less than **TW**. The data was scanned for low values of surface pressure.

For both the radiation and thermodynamic data, further data editing was done by scanning the data and nulling out obvious erroneous data manually. Some bad values will however have slipped through.

The mixing ratio (**Q**) was calculated from **TW** and **PS** (surface pressure) as follows:

QW = 622 / (0.1631 * PS * exp(-17.67 * TW / (TW + 243.5)) - 1) Q = QW - (1006 / 2501) * (T - TW)

Data Averaging

All the station data that passed this editing were averaged for each date and time to give a site average, a standard deviation, and a count of stations in the average. The center of the FIFE area is close to 39.05þN, 96.53þW.

The standard deviation is between sites, which are located at different altitudes, on different types and slopes of terrain, different soils etc. Isolated high standard deviations probably indicate an erroneous value that has not been filtered, although in some variables such as SolDn or RNet, they may be caused by more extensive cloud over a few sites. We have not included a standard deviation for LWDN, since there are only 2 sites with this measurement for much of the time.

Cloud data

Two fields relating to daytime cloud cover for total cloud and high cloud (in octas) are from the archive of digitized photographic data (from Ann Henderson-Sellers). They are not 30 min. averages. The instantaneous digitized mean cloud cover from each single frame was simply assigned to the 30 min. time block in which it was taken. Since photos were typically every 40 min., every fourth time had no photo. A further field indicates the exact time of a photo. The MF_Cld field was obtained independently from the hourly cloud observations of Marshall AAF, KS, approximately 12 km west of the FIFE site. This data set is in tenths cloud cover, estimated by observer.

12. Application of the Data Set:

Information not available.

13. Future Modifications and Plans:

There are no plans to revisit this data; but let us know of errors.

14. Software:

Information not available.

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
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:

This data set is available online via the World Wide Web at *http://daac.ornl.gov/*, or telnet ornlims.ornl.gov 6493 (128.219.24.108 6493), or eosims.ornl.gov 12345 (128.219.24.108 12345)

17. References:

Betts and Ball, 1996: FIFE surface climate and site-average data set 1987-1989, Submitted to J. Atmos. Sci. (3rd FIFE special issue)

Betts, A.K., J.H. Ball, and A.C.M. Beljaars, 1993: Comparison between the land surface response of the European Centre model and the FIFE-1987 data. Q.J.R.M.S., 119, 975-1001.

Betts, A.K. and J.H. Ball, 1994: Budget analysis of FIFE-1987 sonde data. J.G.R., 99, 3655-3666.

Betts, A.K. and J.H. Ball, 1995: The FIFE surface diurnal cycle climate. J.G.R. 100, 25679-25693.

Betts A. K. And J. H. Ball, 1997: FIFE surface climate and site-average dataset: 1987-1989. (FIFE special issue 3 J.Atmos. Sci. in press)

Strebel, D. E., D. R. Landis, K. F. Huemmrich, and B. W. Meeson, 1994: Collected data of the First ISLSCP Field Experiment, in Surface Observations and Non-Image Data Sets., Vol 1, CD-ROM, NASA GSFC, Greenbelt, MD 20771

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 *http://cdiac.esd.ornl.gov/cdiac/glossary.html*.

19. List of Acronyms:

ESD Environmental Sciences Division (Oak Ridge National Laboratory) FTP File Transfer Protocol NASA National Aeronautics and Space Administration ORNL Oak Ridge National Laboratories, Oak Ridge, Tennessee, U.S.A. URL Uniform Resource Locator

A general list of acronyms for the DAAC is available at *http://daac.ornl.gov/acronyms.html.*

20. Document Information:

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April 4, 1997

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FIFE_FFOAMS88

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