AMS (Automated Met Station) Data (FIFE)

Summary:

As part of the FIFE staff science data collection effort, the FIFE Information System (FIS) processed and archived 5 minute, near-surface radiometric and meteorological information collected by the Automated Meteorological Stations (AMS) distributed over the FIFE study area. The FIFE AMS Data Set contains the two output products created. The level-1 product contains unpacked 5 minute data. The level-1a product contains 30 minute averages of these data.

All AMS stations were equipped to measure air temperature, humidity, wind speed, soil temperature, reflected solar radiation, net radiation, surface temperature, and precipitation. Two stations were augmented with extra radiation sensors to become super-AMS (SAMS). These stations measured total radiation, direct solar radiation, diffuse solar radiation, photosynthetically active radiation, and downward longwave radiation.

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1. Data Set Overview:

Data Set Identification:

AMS (Automated Met Station) Data (FIFE).
(Automated Micrometeorological Observations).

Data Set Introduction:

The FIFE AMS Data Set contains air temperature, humidity, wind speed, soil temperature, reflected solar radiation, net radiation, surface temperature, and precipitation. Two stations were augmented with extra radiation sensors to become super-AMS (SAMS). These stations measured total radiation, direct solar radiation, diffuse solar radiation, photosynthetically active radiation, and downward longwave radiation. The level-1 product contains unpacked 5 minute data. The level-1a product contains 30 minute averages of these data.

Objective/Purpose:

The micrometeorological data from the automated meteorological stations were collected to: (a) measure the microclimatic variability across the FIFE study area; (b) provide input data for numerical simulation models; and © collect broad-band reflected and emitted radiation to help with evaluating satellite imagery. The simulation models are required to help extrapolate observations made at the intensive sites to other areas within the FIFE study area, and to provide estimates of radiation, energy, and mass fluxes during non-Intensive Field Campaign (IFC) periods.

Summary of Parameters:

Surface temperature, pressure, rainfall, wind direction and speed, soil temperature at two depths, and radiation (shortwave, longwave, net, PAR, total).

Discussion:

As part of the FIFE staff science data collection effort, the FIFE Information System (FIS) processed and archived 5 minute, near-surface radiometric and meteorological information collected by the Automated Meteorological Stations (AMS) distributed over the FIFE study area. Two output products were created. The level-1 product contains unpacked 5 minute data. The level-1a product contains 30 minute averages of these data.

Ten PAMS were installed within the FIFE study area prior to Intensive Field Campaign 1 (IFC-1). All stations were equipped to measure air temperature, humidity, wind speed, soil temperature, reflected solar radiation, net radiation, surface temperature, and precipitation. Two PAMs were augmented with extra radiation sensors to become super-AMS (SAMS). These stations measured total radiation, direct solar radiation, diffuse solar radiation, photosynthetically active radiation, and downward longwave radiation. These SAMS operated during IFCs 1-4 in the northeast and northwest quadrants of the FIFE study area. During IFC-4 two more SAMS were added and placed in the southwest and southeast quadrants of the FIFE study area. Extended periods of 'down' time for PAMs were usually associated with electrical problems following heavy rainfall.

Related Data Sets:

- Eddy Correlation Surface Flux Observations (USGS).
- Eddy Correlation Surface Flux Observations (UNL).
- Eddy Correlation Surface Flux Observations (GSFC).
- Eddy Correlation Surface Flux Observations (UK).
- Eddy Correlation Surface Flux Observations (Argonne).
- Bowen Ratio Surface Flux Observations (GSFC).
- Bowen Ratio Surface Flux Observations (KSU).
- Bowen Ratio Surface Flux Observations (Smith).
- Bowen Ratio Surface Flux Observations (UNL).
- Bowen Ratio Surface Flux Observations (USGS).
- Bowen Ratio Surface Flux Observations (Fritschen).

FIS Data Base Table Name:

AMS_DATA_87, AMS_DATA_88, AMS_DATA_89.

2. Investigator(s):

Investigator(s) Name and Title:

Dr. Walter F. Dabberdt
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Title of Investigation:

Staff Science Long-term Monitoring Program.

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Requested Form of Acknowledgment.

The Automated Micrometeorological Observations were provided to FIFE under a contract between NASA and NCAR.

3. Theory of Measurements:

Standard PAM sensors fall into two categories: Integrated type and event type. The so-called integrated sensors currently include the barometer and psychrometer. These self-contained devices include the sensing element, conditioning electronics, and microprocessor, which controls parameter sampling, scaling, and communication with the master remote station computer. Because these devices are calibrated as a single unit, the environmental characteristics of the composite can be accounted for in the transfer function coefficients, which are subsequently loaded into the sensor's programmable read only memory. By calculating and communicating ASCII engineering values via an RS232 link to the host computer rather than transmitting analog signals directly, noise injection is greatly reduced. These sensors are programmed to provide serial number and sensor status parameters, enabling improved long-term performance monitoring. More information are contained in Integrated Sensors for PAMII as described by Pike et al. (1983).

Event sensors include the rain gauge and anemometers. An external dc signal allows them to produce electrical pulses that are counted inside the remote station electronics box by the wind/rain board. The pulse rate is proportional to the parameter being measured. The wind/rain board is a digital assembly that includes signal conditioning, counters, and a microprocessor similar to the integrated sensors. It accumulates raw counts from each of the sensors and communicates them to the master remote station computer. It also performs a correction on wind data due to the non-cosine response of the propeller anemometers. In a sense, the wind/ rain board mimics an integrated sensor except that it has no knowledge of sensor ID or status, and it is housed inside the electronics box rather than as a part of the sensors.

4. Equipment:

Sensor/Instrument Description:

The micrometeorological stations installed for FIFE were of three types, Portable Automated Mesonet Stations (PAMS), Super Portable Automated Mesonet Stations (SAMS) and Super Data Collection Platform (SDCP). The PAMS consist of transportable computerized weather observing stations that routinely measure wind, temperature, humidity, pressure, and rain at all

stations. The SAMS are identical to the PAMS except that they are augmented with instrumentation to measure soil temperature; surface radiative temperature; and solar, net, and infrared radiation. Data are averaged over selected intervals of 1 min or longer. Stations were powered by solar panels, thereby enabling them to be located remotely without the need for commercial power. The SDCP was instrumented with radiation equipment which was identical to that installed on the SAMS.

Standard instruments include propeller anemometers, a tipping bucket rain gauge, a psychrometer, and an aneroid pressure sensor.

Psychrometer:

The psychrometer is an integrated sensor developed by NCAR, which incorporates platinum resistance thermometers (PRTs) mounted at a height of 2 meters, in a fan-aspirated duct, which is oriented towards the ground. An eight-channel multiplexer allows sampling of both dry and wet bulb temperatures.

Barometer:

The PAM barometer, developed by NCAR, consists of an aneroid transducer connected to a pressure plate and is mounted at a height of 2 meters. The transducer consists of an expandable/contractible elastic chamber, which converts pressure to electrical capacitance. The capacitance, two stable low- and high-reference capacitors, and a resistive temperature sensor are alternately switched to a frequency generating circuit. Taking all four readings into account, a calibration is performed that is proportional to the generated frequency. This technique permits compensation for fluctuations in the sampling circuitry.

Anemometers:

The PAMS propeller type anemometers, manufactured by the R.M. Young Company (Model 27106), are mounted orthogonally on the PAMS platform at a height of 10 meters above ground level (for the FIFE project, these were mounted at a height of 5.4 meters above ground level). Photodetectors in each sensor generate two separate pulses in response to +5 Vdc and ground signals provided by the wind/rain board. The wind/rain board counts these pulses, computes propeller direction, and averages these data over a 1-second period. Data are corrected for the non-cosine response of the propeller. Then wind vector data are relayed to the remote station's master processor.

Rain Gauge:

A tipping bucket device mounted 3 meters to the west of the remote station mast at a height of 1 meter above ground level is used to measure rain accumulation and rate. The gauge is provided +5 Vdc and ground signals by the wind/rain board. When an accumulation of 0.25 mm of rain causes a small bucket to tip, a magnetic reed switch is momentarily closed and an electrical pulse is generated. Pulses are counted by the

wind/rain board. The rain gauge was manufactured by Meteorological Research, Inc. (MRI) of Altadena, California.

Pyranometer:

An Eppley Precision Spectral Pyranometer (PSP) was mounted over selected sample plots, both on and near the Konza Prairie, to measure incoming (upright position) and reflected (inverted position) solar radiation in the 0.285-2.800 um region. A voltage response proportional to shortwave radiation incident on the PSP was produced and recorded using an Omnidata Polycorder (Omnidata, Inc., Logan, UT).

Net Radiometer:

Not available at this revision.

Collection Environment:

Ground-based.

Source/Platform:

The Portable Automated Mesonet Station II (PAMS) 5.4 meter tower includes a folding mast assembly and a collapsible supporting tripod. The base of the station is formed by the tripod, anchored to the ground by six steel stakes holding three plates that tie onto the tripod with three trailer hitches. All three legs of the tripod are adjustable for leveling on up to a 20 degree slope. Components mounted on the tripod include two solar panels, a battery box, the electronics box and the mast. The mast includes a crossarm at a height of 2 meters used for mounting the psychrometer and static pressure port. A lightning spike attached to the top of the wind sensor mounting uses fine wire "whiskers" to help discharge static electricity. The structure is grounded by the mast itself, as well as guy wires.

Source/Platform Mission Objectives:

Long-term monitoring of the micrometeorological parameters of the FIFE study area.

Key Variables:

PAM:

Temperature.

Wind.

Pressure.

Rain.

SAM:

In addition to the above,

Net Radiation.

Photosynthetically Active Radiation (PAR).

Infrared Radiation.

SDCP:

Net Radiation.

Shortwave Reflectance.

Diffuse and Total Incident Radiation and PAR.

Principles of Operation:

The psychrometer and barometer are self-contained devices whose sensing elements, conditioning electronics, and micro-processors control parameter sampling and scaling. The rain gauge and wind anemometers operate by counting electrical pulses produced from modulation of an external direct current signal.

Sensor/Instrument Measurement Geometry:

Psychrometer:

The psychrometer is mounted at a height of 2 meters above ground level, in a fan-aspirated duct, which is oriented towards the ground.

Barometer:

The PAM barometer is mounted at a height of 2 meters above ground level.

Anemometers:

The anemometers are mounted orthogonally on the PAMS platform at a height of 5.4 meters above ground level.

Rain Gauge:

A tipping bucket device mounted 3 meters to the west of the remote station mast at a height of 1 meter above ground level.

Manufacturer of Sensor/Instrument:

The psychrometer and barometer were built by NCAR.

The Anemometers were built by the R.M. Young Company.

Calibration:

The final calibration report from NCAR for all the instruments on the PAMS and SAMS has been scanned and is in the scanned document section on FIFE CD-ROM Volume 1. NOTE: The calibration numbers in the scanned document are in different units than those reported below.

PAM Instrument Calibration Factors Applied By FIFE.

FORMULAS:

The formulas below use generic output variables C (for calibrated) and K (for calibration coefficient). Other variables are specified in the table of coefficients which follows. The measured variables are specified by name given by NCAR (i.e., PAR_TOT is used instead of TOT_INCIDENT_PAR).

TSFC

C = (TSFC-A) + (TSFC-B)(TSFC)

TSFC-A IN DEGREES CENTIGRADE

TSFC-A UNITLESS

TSFC IN DEGREES CENTIGRADE

SOL_REFL

C = K(SOL_REFL) K IN [WATTS][METER^-2][COUNT^-1]

RNET

C = K(RNET) K IN [WATTS][METER^-2][COUNT^-1]

SOL_DN

C = K(SOL_DN) K IN [WATTS][METER^-2][COUNT^-1]

SOL_DIF

C = K(SOL_DIF) K IN [WATTS][METER^-2][COUNT^-1]

PAR_TOT

C = K(PAR_TOT) K IN [MICRO EINSTEIN][METER^-2] [SECOND^-1][COUNT^-1]

PAR_DIF

C = K(PAR_DIF) K IN [MICRO EINSTEIN][METER^-2] [SECOND^-1][COUNT^-1]

IR_DN

C = ((IR_DN)(CE)(B) + A) - (2.83516E-7)(T_DOME^4 - T_INST^4)

CE IN [WATTS][METER^-2][COUNT^-1]

B UNITLESS

A IN [WATTS][METER^-2][COUNT^-1]

Note: Refer to the table in the *Usage Guidance Section* to translate the original NCAR variable names, to the old FIFE names or the new FIFE names (as listed in the *Data Characteristics Section* of this document).

FACTORS:

Calibration factors in the formulas above are given in the left most columns in the table below. Alternate calibration factors, as explained in the end notes following the table, are given to the right. Changes in instrumentation are also noted.

Calib

STN	SITEGRID	VARIABLE	FACTOR	NOTES
3	2428-PAM			<INSTALLED 4/27/87; LOWERED 5/21/87>
<REMOVED TO 13 (6735-PAM) 4/14/88>				
		TSFC-A	0.430896	
		TSFC-B	0.948076	
		SOL_RF	1.1325	
		RNET	0.222	DELTA NEB 0.0396
5	2123-SAM			<INSTALLED 4/24/87; LOWERED 5/21/87>
<ACTIVE>				
		TSFC-A	1.131684	
		TSFC-B	0.931765	
		SOL_RF	1.1325	1.1351 FROM 8/1/88 (ORIG. DEST. 6/88)
		RNET	0.251	DELTA NEB 0.0677
		SOL_DN	1.4630	DELTA 88 0.0265
		SOL_DF	1.3605	DELTA 88 0.0288
		PAR_T	3.4066	3.4492 FROM 5/12/88 DRIFTO 488 0.0125
		PAR_D	3.5914	3.6548 FROM 5/12/88 DRIFTO 488 0.0154
		IRDN-CE	2.5510	
		IRDN-B	1.003	
		IRDN-A	-9.265	
6	2133-PA	M		<MOVED FROM 27 (1563-PAM);>

```
<INSTALLED LOWERED 11/15/88 ACTIVE>
TSFC-A    -2.458126
TSFC-B     1.054297
SOL_RF     1.1455
RNET       0.218     DELTA NEB 0.0440
7     3221-PA    M                    <INSTALLED 4/25/87; LOWERED 5/21/87;>
<REMOVED 11/14/88>
TSFC-A     0.968083
TSFC-B     0.942630
SOL_RF     1.0989
RNET       0.212     DELTA NEB 0.0675
11    4439-PA    M                    <INSTALLED 4/23/87; LOWERED 5/23/87;>
<ACTIVE>
TSFC-A     0.552709
TSFC-B       0.930438
SOL_RF       1.0834
RNET         0.240     DELTA NEB 0.0595
13    6735-PAM                        <MOVED FROM 3 (2428-PAM);>
<INSTALLED LOWERED 5/11/88;>
<REMOVED 11/14/88>
TSFC-A       0.430896
TSFC-B       0.948076
SOL_RF       1.1325    <NCAR REPORTS AS "GIB5" AFTER
8/5/88;>
<FIS RESTORES TO ORIGINAL NAME &
FIELD>
RNET       0.222     DELTA NEB 0.0396
17    4609-PAM                        <INSTALLED LOWERED 5/22/87;>
<REMOVED 11/12/88>
TSFC-A     1.418656
TSFC-B     0.920957
SOL_RF     1.0650
RNET       0.238     DELTA NEB 0.0529
19    6912-PAM                        <INSTALLED 4/29/87; LOWERED 5/22/87>
<ACTIVE>
TSFC-A    -0.651969
TSFC-B     1.001195
SOL_RF     1.1429
RNET       0.231     DELTA NEB 0.0645
21    8639-SAM                        <INSTALLED 4/28/87; LOWERED 5/21/87>
<ACTIVE>
TSFC-A     0.214845
TSFC-B     0.960183
SOL_RF     1.1364
RNET       0.222     DELTA NEB 0.0581
SOL_DN     1.3578    DELTA 88 -0.0099
SOL_DF     1.2062    DELTA 88 0.0386
PAR_T      3.5529    3.5992 FROM 5/11/88 DRIFTO 488 0.0310
PAR_D      3.5914    3.5914 FROM 5/11/88 DRIFTO 488 0.0087
IRDN-CE    2.0121
IRDN-B     1.002
IRDN-A    -9.145
23    6469-PAM                        <INSTALLED 4/28/87; LOWERED 5/23/87>
<ACTIVE>
TSFC-A     0.596314
TSFC-B     0.942461
SOL_RF     1.1614    1.0650 FROM 11/23/88
```

```
RNET       0.2277    DELTA NEB 0.0562
25    4168-PAM                        <INSTALLED LOWERED 9/28/87 ACTIVE>
TSFC-A     0.478341  -0.560538 FROM 9/20/88
TSFC-B     0.936877  0.987374 FROM 9/20/88
<TSFC INSTRUMENT REPLACED>
<9/20/88>
SOL_RF     1.1587
RNET       0.246     0.238 FROM 11/30/88 DELTA NEB 0.0780
0.0529 FROM 11/30/88
SOL_DN     1.2279    DELTA 88 0.0394
SOL_RF     1.3997    DELTA 88 0.0542
PAR_T      3.9608    3.9991 FROM 5/10/88 DRIFTO 488 0.0145
PAR_D      3.3720    3.3380 FROM 5/10/88 DRIFTO 488 -0.0061
IRDN-CE    2.2522
IRDN-B     1.005
IRDN-A   -10.318
27    1563-PAM                        <INSTALLED 4/25/87; LOWERED 5/23/87>
<REMOVED TO 6 (2133-PAM) 11/12/88>
TSFC-A    -2.458126
TSFC-B     1.054297
SOL_RF     1.1455
RNET       0.218     DELTA NEB 0.0440
29    0847-SAM                        <INSTALLED 9/30/87 ACTIVE>
TSFC-A     1.198588
TSFC-B     0.929230
SOL_RF     1.2516
RNET       0.223     DELTA NEB 0.0350
SOL_DN     1.1589    1.0354 FROM 11/15/88 DELTA 88 0.0810
<INSTRUMENT REPLACED> NO DELTA 88
<11/15/88> FROM 11/15/88
SOL_DF     1.3209    DELTA 88 0.0597
PAR_T      4.3228    4.3916 FROM 5/12/88 DRIFTO 488 0.0318
PAR_D      3.3113    3.3246 FROM 5/12/88 DRIFTO 488 0.0
120
IRDN-CE    2.7027
IRDN-B     1.002
IRDN-A   -12.996
31    2139-PAM                        <INSTALLED 4/22/87; LOWERED 5/23/87;>
<REMOVED 11/12/88>
TSFC-A    -0.214398
TSFC-B     0.948997
SOL_RF     1.2755
RNET       0.240     DELTA NEB 0.0    475
```

NOTES: **TSFC:** The calibration was checked by Dr. Blaine Blad in May, 1988 and applied to all of the TSFC data in this data set (i.e., 1987, 1988 and 1989 data).

RNET: For RNET, we have used the coefficients determined by the manufacturer (actual date unknown). Calibration coefficients were independently determined by the University of Nebraska, May, 1988. These are systematically higher by 5.59 +/- 1.27 %. The exact values of these deviations ((N-M)/M) are listed as "DELTA NEB" in the table. The Nebraska results can be used by multiplying the calibrated values reported by FIS by (1 + DELTA NEB). It is not known if either of these calibrations are affected by or result from the "double dome" problem.

SOL_DN, SOL_DIF: The pyranometers show a calibration drift (indicated as DELTA 88, I.E. ((1988 VAL - MANF VAL)/(MANF VAL)). The largest drift is about 8%, for the SOL_DN instrument at station 29 (0847-SAM). This instrument was replaced 11/15/88. We have applied the coefficients determined at the time of manufacture (MANF VAL) in all cases, except for this replacement. The May 88 equivalents can be recovered by multiplying the calibrated values by (1 + DELTA 88).

An additional SOL_DN instrument was placed at station 29 (0847-SAM) on 4/8/89. The reports from this instrument ("GIB12") were not processed by FIS, but may be available from the NCAR archive in the original level 0, packed format. The calibration factor is 1.6082.

PAR_TOT, PAR_DIF: The LICOR quantum sensors show a small calibration drift, indicated as DRIFTO 488, as described for DELTA 88 above. The drift is 1-3%. The April 88 equivalents can be recovered by multiplying the calibrated values by (1 + DELTA 88). The instruments were adjusted and recalibrated by LICOR in May, 1988.

IR_DN: The IR_DN, T_DOME, and T_INST data values before 5/22/87 do not appear to be correct or usable. Normal reporting occurs after that date. The EPPLEY PIR calibration is somewhat involved. We have used values provided by Blaine Blad, which are approximate due to a possible drift in blackbody reference values. It is felt that the accuracy is within 1 to 2 percent.

Starting May, 1988, direct thermopile voltages (vs. NCAR "corrected" voltages) were also reported. These can be used for a more direct calibration, but the same approximate constants are required. The direct voltages ("IR_RAW") were not processed by FIS, but may be available from the NCAR archive in the original Level 0, packed format.

WIND: The wind variables (U_WIND, V_WIND, W_WIND, WIND_MAX, WIND_STD) should be treated with caution prior to the "lowered" dates indicated in the table above. The original installations were at the standard PAMS configuration height of 10 m above ground level. At the request of the FIFE Science Steering Committee, the top 2 mast sections were removed in mid-May, 1987, before the start of IFC-1. The wind sensors were later reinstalled at a height of 5.4 m above ground level. Subsequently, units 6 (2133-PAM), 13 (6735-PAM), 17 (4609-PAM), 25 (4168-PAM), 29 (0847-SAM) were installed with this same configuration (wind sensor at 5.4 m).

Specifications:

Specifications for the Psychrometer:

Sampling Interval 10 sec

Resolution .025 deg Celsius

PRT accuracy .050 deg Celsius

PRT time constant in air 30 sec (approx.)

Field accuracy (dry) .250 deg Celsius

Field accuracy (wet) .500 deg Celsius

Specifications for the Barometer:

Sampling Interval 30 sec

Resolution 2 Pascals

Accuracy 40 Pascals RMS error

Anemometer specifications:

Threshold speed 0.5 m/sec

Sample interval 1 second

Propeller distance constant 3.3 m

Propeller pitch 29.4 cm

Transfer function 1 m/sec = 204.5

rpm = 3068 pulses/min

Propeller diameter 18 cm

Propeller composition polypropylene

Rain Gauge Specifications:

MRI-Gauge

Resolution 0.254 mm

Orifice size 8 in.

Orifice height 1 m

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 data collected by the sensors pass through Radio Frequency transmitter modules and then to the GOES satellite. There was a downlink for these data from this satellite to NCAR in Boulder, Colorado. NCAR checked the quality of the data (screened for glitchs), reformatted it and then sent it to FIS on 9-track magnetic tapes.

6. Observations:

Data Notes:

Not available.

Field Notes:

See comments on calibration of PAMS data (5.2). Some of the instruments were either moved from their original positions, replaced, reinstalled at a different height, or removed before the end of the project.

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, USA. The northwest corner of the area has UTM coordinates of 4,334,000 Northing and 705,000 Easting in UTM Zone 14.

Spatial Coverage:

The micrometeorological stations were placed at the following locations at some point during the period from 1987 through 1989. The micrometeorological stations were not located at all these stations during the entire 3 year period.

SITEGRID	STN_ID	NORTHING	EASTING	LATITUDE	LONGITUDE	ELEV (ft)
0847-SDC	29	4332344	714439	39 06 57	-96 31 11	418
0847-SAM	52	4332377	714419	39 06 58	-96 31 12	415
0847-SAM	929	4332344	714439	39 06 57	-96 31 11	418
0847-SAM	829	4332344	714439	39 06 57	-96 31 11	418
1563-PAM	27	4331067	717658	39 06 12	-96 28 59	350
1563-PAM	827	4331100	717610	39 06 14	-96 29 01	366
2123-SAM	5	4329866	709506	39 05 41	-96 34 39	405
2123-SAM	905	4329866	709506	39 05 41	-96 34 39	405
2123-SAM	805	4329866	709506	39 05 41	-96 34 39	405
2139-PAM	31	4329843	712789	39 05 37	-96 32 23	385
2428-PAM	3	4329265	710635	39 05 20	-96 33 53	415
3221-PAM	7	4327682	709112	39 04 30	-96 34 58	410
4168-SDC	25	4325704	718646	39 03 18	-96 28 24	438
4168-SAM	51	4325783	718675	39 03 20	-96 28 22	445
4168-SAM	925	4325704	718646	39 03 18	-96 28 24	438
4168-PAM	825	4325704	718646	39 03 18	-96 28 24	438
4439-PAM	11	4325219	712795	39 03 07	-96 32 27	445
4439-PAM	911	4325219	712795	39 03 07	-96 32 27	445
4439-PAM	811	4325219	712795	39 03 07	-96 32 27	445
4609-PAM	17	4324766	706700	39 02 58	-96 36 41	398
6469-PAM	23	4321189	718752	39 00 51	-96 28 25	440
6469-PAM	923	4321189	718752	39 00 51	-96 28 25	440
6469-PAM	823	4321189	718752	39 00 51	-96 28 25	440
6912-PAM	19	4320178	707307	39 00 29	-96 36 21	385
6912-PAM	919	4320178	707307	39 00 29	-96 36 21	385
6912-PAM	819	4320178	707307	39 00 29	-96 36 21	385
8639-SAM	21	4316771	712827	38 58 33	-96 32 36	440
8639-SAM	921	4316771	712827	38 58 33	-96 32 36	440
8639-SAM	821	4316771	712827	38 58 33	-96 32 36	440
3021-PAM	807	4328000	709250	39 04 40	-96 34 52	410
4139-PAM	831	4325850	712780	39 03 28	-96 32 27	385
4509-PAM	817	4324960	706850	39 03 04	-96 36 35	390
6735-PAM	813	4320652	712073	39 00 40	-96 33 03	385

SITEGRID	STN_ID	SLOPE	ASPECT (deg)
0847-SDC	29		
0847-SAM	52		
0847-SAM	929	1	TOP
0847-SAM	829	1	TOP
1563-PAM	27		
1563-PAM	827	18	W
2123-SAM	5		
2123-SAM	905	1	TOP
2123-SAM	805	1	TOP
2139-PAM	31		
2428-PAM	3		
3221-PAM	7		
4168-SDC	25		
4168-SAM	51		
4168-SAM	925	1	TOP
4168-PAM	825	1	TOP
4439-PAM	11		
4439-PAM	911	2	N
4439-PAM	811	2	N
4609-PAM	17		

6469-PAM	23		
6469-PAM	923	3	NE
6469-PAM	823	3	NE
6912-PAM	19		
6912-PAM	919	2	N
6912-PAM	819	2	N
8639-SAM	21		
8639-SAM	921	1	TOP
8639-SAM	821	1	TOP
3021-PAM	807	11	NW
4139-PAM	831	3	W
4509-PAM	817	3	SE
6735-PAM	813	1	BOT

The distribution of these stations during the data collection period is listed below. Only 12 sitegrids were instrumented with the AMS equipment in 1987. At two of these sitegrids additional instruments measuring radiation were also installed. During 1988, 17 sitegrids were instrumented with the AMS equipment. It should be noted that not all sitegrids were instrumented for the entire year. Finally, in 1989, 8 sitegrids were instrumented.

1987

SITEGRID	STATION_ID	SITEGRID	STATION_ID	SITEGRID	STATION_ID
0847-SAM	52	2428-PAM	3	4609-PAM	17
0847-SDC	29	3221-PAM	7	6469-PAM	23
1563-PAM	27	4168-SAM	51	6912-PAM	19
2123-SAM	5	4168-SDC	25	8639-SAM	21
2139-PAM	31	4439-PAM	11		

1988

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		

1989

SITEGRID	STATION_ID	SITEGRID	STATION_ID	SITEGRID	STATION_ID
0847-SAM	929	4168-SAM	925	6912-PAM	919
2123-SAM	905	4439-PAM	911	8639-SAM	921
2133-PAM	931	6469-PAM	923		

Spatial Coverage Map:

Not available.

Spatial Resolution:

These are point data.

Projection:

Not available.

Grid Description:

Not available.

Temporal Characteristics:

Temporal Coverage:

The overall time period for the data collection is from May 1, 1987 through November 10, 1989. During this period there are no extended gaps (months or more) in the measurements. However, there are stations that were moved during this period, as mentioned in the *Spatial Coverage Section* above, and there are days when particular sensors were not functioning at specific locations.

Temporal Coverage Map:

Not available.

Temporal Resolution:

The original data collected by the AMS has a sampling interval of 5 minutes. These 5 minute data have been averaged to produce 30 minute averages. Both the 5 minute and the 30 minute data are available. See the *Output Products and Availability Section* below for a listing of these two data sets.

Data Characteristics:

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

Parameter/Variable Name

Parameter/Variable Description **Range** **Units** **Source**

SITEGRID_ID This is a FIS grid location code. 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.			FIS
STATION_ID The three-digit FIFE site identification number for this site.	min = 3, max = 52		FIS
OBS_DATE The date on which the data were collected.	min = 01-MAY-87, max = 31-DEC-87		NCAR
OBS_TIME The time of day that the data were collected, given as the midpoint of 30 minute average.	min = 15, max = 2345	[GMT]	NCAR
DRY_BULB_TEMP Dry bulb temperature (ambient air temperature), at 2 meters above ground level.	min = -15.47, max = 39.44, missing = -99	[degrees Celsius]	THERMISTOR
WET_BULB_TEMP Wet bulb temperature at 2 meters above ground level. missing = -99	min = -15.38, max = 48.62,	[degrees Celsius]	THERMISTOR
ATMOSPHERIC_PRESS Atmospheric pressure. max = 1124.96, missing = -99	min = 692.52,	[millibars]	
ACCUM_RAINFALL Accumulated rainfall is the total rainfall over the 30 minute period added to the previous rainfall amount.	min = 0, max = 1040.13, missing = -99	[mm]	RAIN GAUGE
RAINFALL_RATE The rainfall rate given as mm of	min = 0,	[mm]	RAIN GAUGE

rain per 30 minutes. missing = -99	max = 12.4,	[30 minutes^-1

U_COMPNT_WIND_VELOC The U (westward) component of wind ANEMOMETER velocity at 5.4 meters above ground level.	min = -30.93, max = 35.71, missing = -99	[meters] [sec^-1]

V_COMPNT_WIND_VELOC The V (northward) component of wind ANEMOMETER velocity at 5.4 meters above ground level.	min = -35.25, max = 38.22, missing = -99	[meters] [sec^-1]

W_COMPNT_WIND_VELOC The W (vertical) component of wind ANEMOMETER velocity at 5.4 meters above ground level.	min = -32.74, max = 27.93, missing = -99	[meters] [sec^-1]

MAX_WIND_VELOC Maximum wind speed during the 30 ANEMOMETER minute period at 5.4 meters above ground level.	min = -81.84, max = 81.88, missing = -99	[meters] [sec^-1]

SDEV_W_COMPNT_WIND_VELOC The standard deviation of the W ANEMOMETER (vertical) component of the wind velocity over the 30 minute period.	min = 0, max = 16.57	[meters] [sec^-1]

SURF_TEMP The surface temperature measured THERMISTOR by an IR thermometer.	min = -178.63, max = 144.76	[degrees Celsius]

SOIL_TEMP_10CM The soil temperature at 10 cm THERMISTOR depth.	min = -251.66, max = 324.65	[degrees Celsius]

SOIL_TEMP_50CM The soil temperature at 50 cm THERMISTOR depth. For the PAMs stations at FIFE site grid locations 1563-PAM and 4609-PAM this is the soil	min = -179.56, max = 316.4	[degrees Celsius]

temperature at 10 cm depth.			
SHORTWAVE_SOLAR_REFL The shortwave reflected irradiance. PYRANOMETER	min = -301.46, max = 7838.96	[Watts] [meter^-2]	
NET_RADTN The net radiation, including both downward and upward energy. RADIOMETER	min = -147.7, max = 1396.02	[Watts] [meter^-2]	NET
INCIDENT_LONGWAVE_RADTN The incident longwave radiation. THERMISTOR	min = -382.26, max = 4778.28	[Watts] [meter^-2]	
DOME_TEMP The temperature of the dome. It is used to calculate incident longwave radiation. THERMISTOR	min = -184.95, max = 251.98	[degrees Celsius]	
INSTR_TEMP The instrument temperature. It is used to calculate incident longwave radiation. THERMISTOR	min = -179.97, max = 210.11	[degrees Celsius]	
TOT_INCIDENT_RADTN The total (direct and diffuse) incident solar radiation. PYRANOMETER	min = -144.84, max = 5363.78	[Watts] [meter^-2]	
TOT_INCIDENT_PAR The total (direct and diffuse) incoming photosynthetically active radiation.	min = -427.96, max = 5426.56	[microEinst] [meter^- 2] [sec^-1]	QUANTUM SENSOR
DIFFUSE_INCIDENT_RADTN The diffuse incident solar radiation. PYRANOMETER	min = -268.02, max = 7969.87	[Watts] [meter^-2]	
DIFFUSE_INCIDENT_PAR The diffuse incident photo-synthetically active radiation. [sec^-1]	min = -400.44, max = 6878.12	[microEinst] [meter^-2]	QUANTUM SENSOR

DATA_QUAL_CODE + The data quality information code. C=corrected+good, *=glitch, &=corrected+glitch, ?=suspect, #=suspect+glitch, $=corrected+suspect, !=corrected+glitch+suspect, R=reserved, _=missing	G=good,	NCAR
LAST_REVISION_DATE data, in the format (DD-MMM-YY).	max = 11-FEB-91	
FIFE_DATA_CRTFCN_CODE The FIFE Certification Code for data, in the following format: CPI (Certified by PI), CPI-??? (CPI - questionable data). data.	* CPI=checked by the principal investigator, CPI-MRG=merged	FIS

Footnotes:

+ Each digit in the DATA_QUAL_CODE indicates the quality for a specific parameter as listed below.

RANGE	PARAMETER
1	OBS_DATE
2	OBS_TIME
3	DRY_BULB_TEMP
4	WET_BULB_TEMP
5	ATMOSPHERIC_PRESS
6	ACCUM_RAINFALL
7	RAINFALL_RATE
8	U_COMPNT_WIND_VELOC
9	V_COMPNT_WIND_VELOC
10	W_COMPNT_WIND_VELOC
11	MAX_WIND_VELOC
12	SDEV_W_COMPNT_WIND_VELOC
13	SURF_TEMP
14	SOIL_TEMP_10CM
15	SOIL_TEMP_50CM
16	SHORTWAVE_SOLAR_REFL
17	NET_RADTN
18	INCIDENT_LONGWAVE_RADTN
19	DOME_TEMP
20	INSTR_TEMP
21	TOT_INCIDENT_RADTN
22	TOT_INCIDENT_PAR

```
23        DIFFUSE_INCIDENT_RADTN
24        DIFFUSE_INCIDENT_PAR
```

The valid values for each digit are given in the range column in the chart above.

* 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 are "merged" from two separate receiving stations to eliminate transmission errors. CPI-??? Investigator thinks data item may be questionable.

Sample Data Record:

SITEGRID_ID	STATION_ID	OBS_DATE	OBS_TIME	DRY_BULB_TEMP	WET_BULB_TEMP
2123-SAM	5	1987-05-01	15	24.35	16.26
2139-PAM	31	1987-05-01	15	-99.00	-99.00
2428-PAM	3	1987-05-01	15	24.45	16.46
3221-PAM	7	1987-05-01	15	24.43	16.52

A Digit Parameter

ATMOSIC_PRESS	ACCUM_RAINFALL	RAINFALL_RATE	U_COMPNT_WIND_VELOC
962.25	.00	.00	-6.01
962.01	.00	.00	-4.71
961.47	.00	.00	-5.67
963.30	.00	.00	-1.51

V_COMPNT_WIND_VELOC	W_COMPNT_WIND_VELOC	MAX_WIND_SPEED
3.01	.20	10.16
2.71	-.27	8.72
2.21	.03	9.76
.74	-.43	6.20

W_COMPNT_WIND_VELOC_SDEV	SURF_TEMP	SOIL_TEMP_10CM	SOIL_TEMP_50CM
.41	21.67	18.72	13.08
.62	22.23	19.18	18.83
.43	21.73	-99.00	12.89
1.04	22.09	21.01	18.48

SHORTWAVE_SOLAR_REFL	NET_RADTN	INCIDENT_LONGWAVE_RADTN	DOME_TEMP
36.99	24.89	-5.43	210.08
37.41	15.64		

```
32.84              29.08
37.00              10.18
INSTR_TEMP    TOTAL_INCIDENT_RADTN    TOTAL_INCIDENT_PAR
----------    --------------------    ------------------
210.08            146.30                  287.29
DIFFUSE_INCIDENT_RADTN    DIFFUSE_INCIDENT_PAR         DATA_QUAL_CODE
----------------------    --------------------    -------------------------
136.28                    274.74            GGGGGGGGGGGGGGGG*GGGC***
__GGGGGGGG__GGGG*________
GGGGGGGGGGGGG_GG*________
GGGGGGGGGGGGGGG**________
LAST_REVISION_DATE    FIFE_DATA_CRTFCN_CODE
------------------    ---------------------
1989-05-23             CPI-MRG
1989-05-23             CPI-MRG
1989-05-23             CPI-MRG
1989-05-23             CPI-MRG
```

8. Data Organization:

Data Granularity:

These are point data. The original data collected by the AMS has a sampling interval of 5 minutes. These 5 minute data have been averaged to produce 30 minute averages.

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:

Formulas Used for Deriving 30 minute Values:

See the *Calibration Section* for calibration constants applied.

All calibration is done on the 5 min values, before averaging.

OBS_TIME Midpoint of interval

DRY_BULB_TEMP SUM(x) / N

WET_BULB_TEMP SUM(x) / N

ATMOSPHERIC_PRESS SUM(x) / N

ACCUM_RAINFALL Last value (MAX) in interval

RAINFALL_RATE SUM(x) / N

U_COMPNT_WIND_VELOC SUM(x) / N

V_COMPNT_WIND_VELOC SUM(x) / N

W_COMPNT_WIND_VELOC SUM(x) / N

MAX_WIND_VELOC Maximum wind over the last interval

SDEV_W_COMPNT_WIND_VELOC SQRT(SUM(wind_std**2 + w_wind**2) / N - (AVG(w_wind)**2))

SURF_TEMP SUM(x) / N

SOIL_TEMP_10CM SUM(x) / N

SOIL_TEMP_50CM SUM(x) / N

SHORTWAVE_SOLAR_REFL SUM(x) / N

NET_RADTN SUM(x) / N

DATA-QUAL_CODE The lowest quality level in the interval

INCIDENT_LONGWAVE_RADTN SUM(x) / N

DOME_TEMP SUM(x) / N

INSTR_TEMP SUM(x) / N

TOT_INCIDENT_RADTN SUM(x) / N

TOTAL_INCIDENT_PAR SUM(x) / N

DIFFUSE_INCIDENT_RADTN SUM(x) / N

DIFFUSE_INCIDENT_PAR SUM(x) / N

NOTE : If any value in the interval is missing, an average is not computed. The "missing" flag value (-99.00) is entered instead.

Derivation Techniques and Algorithms:

Voltage readings of the Precision Spectral Pyranometer were converted to energy units ([Watts][m^-2]) by a simple linear transformation:

SW = Vt . CC

where:

SW is the incoming (ISW) or reflected (RSW) shortwave in [Watts][m^-2],

Vt is the voltage response of the PSP in millivolts and

CC is the calibration constant (instrument specific)

Albedo was calculated as the ratio of RSW and ISW. Voltage readings of the Net radiometer were converted to energy units using the following formula:

Q* = Vt . CF

where:

Q* is net radiation ([Watts][m^-2]),

Vt is voltage response, and

CF is the calibration factor ([Watts][m^-2][mV])

The calibration factor is sensor specific.

Data Processing Sequence:

Processing Steps:

FIS created the level-1 AMS data product by:

1. Unpacking the original level 0 data into individual dates, and converting SOL_REFL, RNET, SOL_DN, SOL_DIF, PAR_DN, PAR_DIF, and IR_DN to physical units. (See the *Formulae Section* for full conversion/calibration information and the *Usage Guidance Section* for the translation of these variable names to the ones given in the chart above.)
2. Writing the data values as ASCII characters to daily output files,
3. Summarizing the data collection for the day in a header file,
4. Writing the data and header summary files to tape, and
5. Inventorying the new data product in the online data base

FIS creates the level-1a AMS data product by :

1. Combining the 5 minute data values into a 30 minute average (see the *Formulae Section* for full details),
2. Writing the average values as ASCII characters to an output file,
3. Storing the 30 minute values in the online data base,
4. Summarizing the data collection for the period (usually about 2 weeks) in a header file,
5. Writing the data and header summary files to tape, and
6. Inventorying the new data product in the online data base.

Processing Changes:

Not available at this revision.

Calculations:

Not available at this revision.

Special Corrections/Adjustments:

Not available at this revision.

Calculated Variables:

Albedo.

Graphs and Plots:

See scanned figure of PAM Supplemented Instrument Stand.

10. Errors:

Sources of Error:

Most remote station problems are detected at the base by direct observation of data being received and displayed. Determining the nature of most problems is generally straightforward. Typical problems experienced in the field, which introduce errors in the data, include a variety of modes. Psychrometer water bottles dry out or fail to wick properly, or their fans may freeze-up. Rain gauges can become clogged. Batteries can lose one or more cells. Water may invade components or cabling, causing failure or sporadic operation. Wind sensors may become choked with dust. Electronic boxes may experience component failures. Communication quality or timing may degrade.

Quality Assessment:

In the glitch screening process, no alteration of these data was performed. Any variable values, which require rectification, were indicated in the flag field for the respective variable. In the data set, a glitch value is indicated by an '*' in the QUALITY field. Good and missing values are indicated by the characters 'G' and '', respectively. Other NCAR flag values which were a combination of the glitch flag and other conditions were not used for FIFE. The glitch screening process was performed by NCAR on every variable during generation of the data in the Common Mesonet Format (CMF) for FIFE.

Data Validation by Source:

The AMS data are forwarded to FIS at three processing stages: preliminary, merged (two or more receivers), and final (includes glitch screening). The data distributed by the FIS are the latest received and processed.

The glitch screening process uses an algorithm based upon median filtering with adaptive selection criteria (see. F.V. Brock 1986 for details). The adaptive selection process means that the algorithm is capable of treating each variable differently based upon the time-local noisiness of the data itself. The median filter is fifth-order for all sensors except accumulated precipitation, which is subject to only a first-order filter. The glitch screening process flags data values that are beyond 4 standard deviations of the median value of a population of 11 values (3 values for precipitation) centered in time around the data value of concern.

Confidence Level/Accuracy Judgment:

Not available at this revision.

Measurement Error for Parameters:

Not available at this revision.

Additional Quality Assessments:

FIS staff applied a general Quality Assessment (QA) procedure to these data to identify inconsistencies and problems for potential users. As a general procedure, the FIS QA consisted of examining the maximum, minimum, average, and standard deviation for each numerical field

in the data table. An attempt was made to find an explanation for unexpected high or low values, values outside of the normal physical range for a variable, or standard deviations that appeared inconsistent with the mean. In some cases, histograms were examined to determine whether outliers were consistent with the shape of the data distribution.

The discrepancies, which were identified, are reported as problems in the *Known Problems with the Data Section*.

In addition, FIS generated yearly station reports for each of the PAMS and SAMS. These reports list, by month, the number of readings in the month, and by parameter the number of unserviceable or missing, and questionable data for the month. These reports are available for 1987 and 1989. There is an abbreviated form of this report available for the 1988 data. They are found in the GRABBAG directory in the AMS_QUAL subdirectory on FIFE CD-ROM Volume 1.

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); and
- 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:

or errors in these data have been reported:

The PRELIMINARY data reported all variables for the 2355 time as missing. Thus, the last 30 minute average period (2345) was always missing. This problem was corrected with the merged data sent from NCAR, and does not occur in distribution product created by FIS after May 22, 1989.

Some of the FIFE installed instruments (i.e., on the 'SUPER'-PAMS) did not have the calibration factors applied when the PRELIMINARY data was sent. The values reported were raw counts instead of physical units. A complete conversion was applied to the merged data (see the *Formulae Section*), and is present in distribution products created by FIS after May 22, 1989.

The values reported for the IR_DN, T_DOME, and T_INST variables are not correct prior to May 22, 1987.

The parameter PAR_DIF does not appear on the documentation file list. However, it is present in the data files as the last variable before the quality flags, and the noted formats are correct.

The preliminary data reported the parameter PAR_DIR. This in fact is the total PAR, and was renamed to PAR_TOT in all NCAR merged data. FIS uses the name PAR_DN, to be consistent with the other radiation instruments, in distribution products created after May 22, 1989. These names are for reference only - there is no difference in collecting or processing these data.

See the *Formulae Section* for documentation of all instrumentation changes and calibration efforts for the FIFE installed instruments.

Usage Guidance:

These standard meteorological data for sites within the FIFE area could be used to compare with imagery-derived meteorological data of the area, and perhaps ground meteorological data from other prairie regions.

The variables contained in this data set have at various times had different names. The table below provides a lexicon to these names.

Original Previous Current

NCAR Name	FIFE Name	FIFE Name
Temp_Dry	Dry_Bulb_Temp	
Temp_Wet	Wet_Bulb_Temp	
Pressure	Atmospheric_Press	
Rain_Amt	Accum_Rainfall	
Rain_Rate	Rainfall_Rate	
U_Wind	U_Compnt_Wind_Veloc	
V_Wind	V_Compnt_Wind_Veloc	
W_Wind	W_Compnt_vind_Veloc	
Wind_Max	Max_Wind_Veloc	
Wind_Std	Sdev_W_Compnt_Wind_Veloc	
TSFC	TSFC	Surf_Temp
TSOL	Tsoil_1	Soil_Temp_10cm
Tsoil_2	Soil_Temp_50cm	
SOL_REFL/SOL_RF	Sol_Refl	Shortwave_Solar_Refl
RNET Rnet	Net_Radtn	
IRDN IR_DN	Incident_Longwave_Radtn	
T_Dome	Dome_Temp	
T_Inst	Instr_Temp	
SOL_DN	Sol_Dn	Tot_Incident_Radtn
PAR_DIR/PAR_T/PAR_TOT	PAR_Dn	Tot_Incident_PAR
Sol_Dif	Diffuse_Incident_Radtn	
PAR_D	PAR_FIN	Diffuse_Incident_PAR

Any Other Relevant Information about the Study:

Materials inside enclosures in grazed areas, including wires between sensing and recording units of the AMS, were occasionally considered culinary treats by grazing cattle. Some data gaps and glitches may have resulted.

The following FORTRAN program should serve as a guide to read the original level-1 and level-1A data that are stored on magnetic tape.

```
PROGRAM AMS_LOOK

      IMPLICIT NONE
C**********************************************************************
*
C* *
C* *
C* *
C**********************************************************************
*
C
REAL INPUT_DATA(24), OUTPUT_DATA(24)
INTEGER I, IUNIT, J, K, L, OUTUNIT, STATION_ID
INTEGER NUM_PARMS, NUM_STATIONS, N, SIZE, TIME
C
CHARACTER*80 INFILE,OUTFILE
CHARACTER*50 STATION_FLAG
CHARACTER*11 DATA_NAMES(25), USE_NAMES(25)
CHARACTER*9 DATE, STATION_NAME
CHARACTER*1 ANSWER
LOGICAL ERROR, EOF, USE_DATA(25)
DATA DATA_NAMES /'TEMP_DRY ','TEMP_WET ',
& 'PRESSURE ','RAIN_AMT ','RAIN_RATE ','U_WIND ',
& 'V_WIND ','W_WIND ','WIND_MAX ','WIND_STD ',
& 'HUM_1 ','HUM_T ','TSFC ','T_SOIL1 ',
& 'T_SOIL2 ','SOIL_REF ','R_NET ','IR_DN ',
& 'T_DOME ','T_INST ','SOL_DN ','PAR_DIR ',
& 'SOL_DIF ','PAR_DIF ','DATA_FLAGS '/
C
10 IUNIT = 50
OUTUNIT = 20
NUM_STATIONS=12
EOF = .FALSE.
DO I=1,25
USE_DATA(I)=.FALSE.
END DO
WRITE (6,20)
```

```
20 FORMAT (/,' AMS Data File Formatter.')
WRITE (6,30)
30 FORMAT (/,' Enter name of file to be formatted : ', $)
READ (5,40) INFILE
40 FORMAT (A80)
OPEN (ACCESS='SEQUENTIAL', ERR=2000, FILE=INFILE,
& FORM='FORMATTED', STATUS='OLD', UNIT=IUNIT)
C
WRITE (6,50)
50 FORMAT (/,' Enter name of file to be produced : ', $)
READ (5,60) OUTFILE
60 FORMAT (A80)
C
CALL CHOOSE_DATA (USE_DATA, DATA_NAMES, NUM_PARMS) C
IF (NUM_PARMS.EQ.0) GO TO 9999
N=0
DO I=1,25
IF (USE_DATA(I).EQ..TRUE.) THEN
N=N+1
USE_NAMES(N)=DATA_NAMES(I)
END IF
END DO
C
OPEN (UNIT=OUTUNIT, STATUS='NEW', FORM='FORMATTED',
FILE=OUTFILE,
& RECL=300, RECORDTYPE='VARIABLE')
WRITE (20,70) (USE_NAMES(I), I=1, NUM_PARMS)
70 FORMAT (' OBS_DATE TIME ST_NAME ',<NUM_PARMS>(A11))
READ (IUNIT, * ,END=9999)
READ (IUNIT, * ,END=9999)
PRINT*, ' Processing data now.'
C
500 READ(IUNIT,600,END=9999) DATE, TIME, STATION_NAME,
& (INPUT_DATA(I), I=1, 24), STATION_FLAG 600 FORMAT(1X, A9,
1X, I4, 1X, A12, 1X, 24(F10.4,1X), A50)
C
N=0
DO I=1,24
IF (USE_DATA(I).EQ..TRUE.) THEN
N=N+1
OUTPUT_DATA(N)=INPUT_DATA(I)
END IF
END DO
C
IF (NUM_PARMS.EQ.1 .AND. USE_DATA(25).EQ..TRUE.) THEN
WRITE(20,610) DATE, TIME, STATION_NAME, STATION_FLAG
```

```
GO TO 500
END IF
IF (NUM_PARMS.GT.1 .AND. USE_DATA(25).EQ..TRUE.) THEN WRITE (20,620)
DATE, TIME, STATION_NAME, & (OUTPUT_DATA(I), I=1, N), STATION_FLAG
GO TO 500 END IF WRITE (20,630) DATE, TIME, STATION_NAME,
(OUTPUT_DATA(I),
I=1, N)
GO TO 500
C
610 FORMAT (1X, A9, 1X, I4.4, 1X, A12, 1X, A50)
620 FORMAT (1X, A9, 1X, I4.4, 1X, A12, 1X, <N>(F10.4,1X),
A50)
630 FORMAT (1X, A9,1 X, I4.4, 1X, A12, 1X, <N>(F10.4, 1X))
C
C-------------------------------------------------------------------------
C
2000 WRITE (6,2010)
2010 FORMAT ('0', '*** ERROR OPENING SPECIFIED FILE ***')
2020 WRITE (6,2030)
2030 FORMAT (//, ' ', 'Respecify file ® OR End (E) ? -->',
$)
READ (5,2040) ANSWER
2040 FORMAT (A1)
IF (ANSWER.EQ.'R' .OR. ANSWER.EQ.'r') THEN
GO TO 10
ELSE IF (ANSWER.NE.'E' .AND. ANSWER.NE.'e') THEN
GO TO 2020
ELSE
GO TO 9999
END IF
C
9999 END
C
C-------------------------------------------------------------------------
C

SUBROUTINE CHOOSE_DATA (USE_DATA, DATA_NAMES, NUM_PARMS)
C
CHARACTER*11 DATA_NAMES(25)
CHARACTER*1 WANT_IT
INTEGER I, SIZE, NUM_PARMS
LOGICAL USE_DATA(25)
C
SIZE=32
NUM_PARMS=0
WRITE (6,10)
```

```
10 FORMAT (' Chose the data fields you want included (Y/N)',//)
DO I=1,25
WRITE (6,20) DATA_NAMES(I)
20 FORMAT ('+ ',A11,': ',$)
WANT_IT='N'
READ (5,30) WANT_IT
30 FORMAT (A1)
IF (WANT_IT.EQ.'Y' .OR. WANT_IT.EQ.'y') THEN
USE_DATA(I)=.TRUE.
NUM_PARMS=NUM_PARMS+1
SIZE=SIZE+11
IF (I.EQ.25) SIZE=SIZE+39
END IF
WRITE (6,40) SIZE
40 FORMAT ('Size = ',I3)
END DO
RETURN

END
```

12. Application of the Data Set:

This data set can be used to provide input data for numerical simulation models. The simulation models are required to help extrapolate observations made at the intensive sites to other areas within the FIFE study area, and to provide estimates of radiation, energy, and mass fluxes during non-Intensive Field Campaign (IFC) periods.

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:

14.1 Tape Products.

The Level-1, 5 minute calibrated and unpacked data and the Level-1A, 30 minute averages are available on 4 mm, 8 mm, 6250, or 1600 BPI computer compatible tapes (CCTs).

Film Products.

None.

Other Products.

The 30 minute, Level-1A Automated Micrometeorological Observations are available on FIFE CD-ROM Volume 1. The CD-ROM filename is as follows:

\DATA\SUR_MET\AMS\GRIDxxxx\YyyMmm\ydddgrid.AMS

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 .AMS for this data set.

17. References:

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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 Gov/glossary.

19. List of Acronyms:

AMS Automatic Meteorological Station BPI Byte per inch CCT Computer Compatible Tape CD-ROM Compact Disk-Read Only Memory CMF Common Mesonet Format DAAC Distributed Active Archive Center DCP Data Collection Platform EOS-DIS Earth Observing System-Data and Information System FIFE First ISLSCP Field Experiment FIS FIFE Information System GOES Geostationary Operational Environmental Satellite ISLSCP International Satellite Land Surface Climatology Project MRI Meteorological Research Incorporated NCAR National Center for Atmospheric Research ORNL Oak Ridge National Laboratory PAMS Portable Automatic Mesonet PAR Photosynthetically Available Radiation PRT Platinum Resistance Thermometers PSP Precision Spectral Pyranometer SAMS Super

AMS SDCP Super Data Control Platform URL Uniform Resource Locator UTM Universal Transverse Mercator

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

20. Document Information:

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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.

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