

Soil Moisture Gravimetric Data (FIFE)

Summary:

The gravimetric soil moisture data were collected from many stations spread over the FIFE study area. These data were collected to characterize the spatial and temporal patterns of moisture content of the soils over this area during and between the FIFE Intensive Field Campaigns. The aim of the FIFE soil moisture work was to characterize spatial and temporal patterns of soil moisture at the FIFE site, to validate and calibrate remote sensing measurements of soil water, and to evaluate alternative methods of measuring soil moisture both from the air and on the ground. A further goal was to develop techniques for comparing point and spatially continuous measurements of soil moisture. The FIFE soil moisture research was designed to advance the technology for characterizing soil moisture and contribute useful data to other FIFE investigations.

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1. Data Set Overview:

Data Set Identification:

Soil Moisture Gravimetric Data (FIFE).
(Gravimetric Soil Moisture).

Data Set Introduction:

The Gravimetric Soil Moisture data set contains water content measurements obtained using gravimetric methods. This data set consists of information on the percentage of water in the samples on a dry-mass basis.

Objective/Purpose:

The aim of the FIFE soil moisture work was: (1) to characterize spatial and temporal patterns of soil moisture at the FIFE site, (2) to validate and calibrate remote sensing measurements of soil water, and (3) to evaluate alternative methods of measuring soil moisture both from the air and on the ground. A further goal was to develop techniques for comparing point and spatially continuous measurements of soil moisture. The FIFE soil moisture research was designed to advance the technology for characterizing soil moisture and contribute useful data to other FIFE investigations.

Summary of Parameters:

Soil moisture at different depths.

Discussion:

The gravimetric soil moisture data were collected as baseline, site-monitoring information at many of the sites within the FIFE study area. These data were collected to characterize the spatial and temporal patterns of moisture content of the soils over this area during and between the FIFE Intensive Field Campaigns. Soil samples were routinely divided into 2 fractions (0-5 cm and 5-10 cm) and occasionally when soils were deep a third fraction (10-20 cm) was collected. A large number of sites were sampled during each of the three years of sample collection (1987-1989). In 1987, twenty locations (44 sites) were sampled throughout the FIFE study area. In 1988, 21 locations (22 sites), and in 1989, 13 locations (22 sites) were sampled. Multiple samples were collected from each of these locations and most samples were collected 30 meters from the center of the location. In 1987 and 1988 samples were collected only during IFC-5 (July-August). Samples were collected daily during the IFCs and about once per two weeks at other times.

Related Data Sets:

- [Soil Moisture Release.](#)
- [Soil Water Properties.](#)
- [Soil Properties Reference Information.](#)
- [Neutron Probe Soil Moisture.](#)
- [FIFE Level-3 Example Gridded Soil Moisture Data.](#)
- [Peck Airborne Gamma Ray Soil Moisture.](#)
- FIFE Level-3 Pushbroom Microwave Radiometer (PBMR) Soil Moisture Imagery. (Imagery Data)

FIS Data Base Table Name:

SOIL_MOIST_GRAV_DATA.

2. Investigator(s):**Investigator(s) Name and Title:**

Staff Science.

Title of Investigation:

Soil Moisture Measurements for FIFE.

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Requested Form of Acknowledgment.

The Gravimetric Soil Moisture data were collected for FIFE by the staff and students of the Evapotranspiration Laboratory at Kansas State University under the direction of Dr. Edward Kanemasu. The dedicated effort of A. Nelson and G. Harbers in the collection and preparation of these data is particularly appreciated.

3. Theory of Measurements:

Water content measurements by gravimetric methods involve weighing the wet sample, removing the water by drying in an oven, and reweighing the sample to determine the amount of water removed. Water content is obtained by dividing the difference between wet and dry masses by the mass of the dry sample to obtain the ratio of the mass of water to the mass of dry soil. When multiplied by 100, this becomes the percentage of water in the sample on a dry-mass (or, as often expressed, on a dry-weight) basis.

4. Equipment:

Sensor/Instrument Description:

Apparatus required for gravimetric determination of water content include an auger or sampling tube to take a soil sample, soil containers with tight-fitting lids, an oven with means for controlling the temperature to 100 to 110 degrees Centigrade, a desiccator with active desiccant, and a balance for weighing the samples.

Collection Environment:

Ground.

Source/Platform:

Person on the ground.

Source/Platform Mission Objectives:

Determination of soil moisture content.

Key Variables:

Percent soil moisture.

Principles of Operation:

The auger is manually inserted into the soil and a core removed.

Sensor/Instrument Measurement Geometry:

Samples were usually obtained with a 4.86 cm diameter coring tube. In rocky or otherwise difficult-to-penetrate soils, a 2 cm diameter probe was used.

Manufacturer of Sensor/Instrument:

Auger:
Arts Manufacturing
105 Harrison and Oregon Trail
American Falls, ID 83211.

Calibration:

Specifications:

Auger specifications:
diameter 4.86 cm. length 5 cm
diameter 2.0 cm.

Tolerance:

+/- 0.5% water content.

Frequency of Calibration:

None.

Other Calibration Information:

None.

5. Data Acquisition Methods:

Gravimetric samples of the 0-5 cm and 5-10 cm of soil were taken using a double cylinder hammer driven core sampler. The total sample (approximately 100-150 grams) was put in a tin can and sealed with plastic electrical tape. Each sample can was identified by the sample site ID code. After collection, the samples in their cans were weighed to obtain the wet weight and then opened. Open cans were placed in ovens at 105 degrees Centigrade for a minimum of 48 hours for drying, then they were weighed again to obtain the dry weight. The weight of the can was then subtracted to determine the dry weight of the soil sample.

The sampling procedure for all stations except Station_ID=11 (sitegrid ID 4439) required the collection of 5 samples, one at the center of the site and one in each of the corners of the site (North, South, East and West) at a distance of 30 meters from the center. At Station 11, 10 samples were collected at distances of up to 100 meters from the center of the site (see the [Field Notes Section](#) for details).

6. Observations:

Data Notes:

Not available.

Field Notes:

During IFC-1:

There were 44 stations. When two or three stations are collocated, (e.g., Stations 30 and 32 are represented by a single set of soil samples) the lower station number is included in this column.

Sample number according to the following codes which identify where and at what depth the samples were taken:

Sample Location:

- 1: Central part of station location 0-5 cm depth
- 2: Central part of station location 5-10 cm depth
- 3: North of station location 0-5 cm depth
- 4: North of station location 5-10 cm depth
- 5: West of station location 0-5 cm depth
- 6: West of station location 5-10 cm depth
- 7: South of station location 0-5 cm depth
- 8: South of station location 5-10 cm depth
- 9: East of station location 0-5 cm depth
- 10: East of station location 5-10 cm depth

NOTE: Hence, surface samples (i.e. 0-5 cm depth) are odd-numbered, subsurface samples (i.e. 5-10 cm depth) are even-numbered. Samples 3 through 10 are located approximately 30 m from the station.

During IFC-4:

There were 44 stations.

Collocated stations are coded as follows:

- Stations 11, 16 and 18 together are coded as: 11
- Stations 17 and 22 together are coded as: 22
- Stations 19 and 24 together are coded as: 24
- Stations 21 and 26 together are coded as: 26
- Stations 25, 30 and 32 together are coded as: 30

Sample location in relation to the center of the site were represented according to the following codes:

- 1: Central part of station location
- 2: North of station location
- 3: West of station location
- 4: South of station location
- 5: East of station location

Locations 2 through 5 are located approximately 30 m from the station.

The samples collected at Station 11 used a different sampling scheme. There were 10 sampling locations. To emphasize the different physical lay-out of this station, those locations are coded as follows:

- 11: 150 m from center, approximately 10 degrees North of due East
- 12: 100 m from center, approximately 10 degrees North of due East
- 13: 150 m from center, approximately 10 degrees North of Southeast

- 14: 100 m from center, approximately 10 degrees North of Southeast
- 15: 150 m from center, approximately 10 degrees East of due South
- 16: 100 m from center, approximately 10 degrees East of due South
- 17: 150 m from center, approximately 10 degrees West of due South
- 18: 100 m from center, approximately 10 degrees West of due South
- 19: 100 m from center, approximately Southwest
- 20: 60 m from center, approximately Southwest

7. Data Description:

Spatial Characteristics:

The FIFE study area, 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:

In 1987, soil samples were collected from 44 stations spread over the FIFE study area. Twenty-four of these stations were collocated so that 20 unique stations are reported in this data set for 1987. At each site, 5 or 10 soil cores were taken and samples divided into 2 and sometimes 3 depth fractions.

	GRID_ID	STN_ID	NORTHING	EASTING	LATITUDE	LONGITUDE	COLLOCATED
1246-SMK	40	4331666	714212	39 06 35	-96 31 21		
1445-SMK	42	4331160	714090	39 06 19	-96 31 27		
1478-SMK	38	4331216	720603	39 06 15	-96 26 56	79	
1916-SMK	2	4330296	708270	39 05 56	-96 35 30	70,150,902	
2043-SMK	44	4330003	713536	39 05 42	-96 31 51	35	
2132-SMK	6	4329774	711336	39 05 36	-96 33 23	37,60	
2516-SMK	14	4328956	708102	39 05 12	-96 35 38		
2655-SMK	36	4328787	716070	39 05 00	-96 30 07	33,78,836,	
936							
2731-SMK	4	4328678	711110	39 05 01	-96 33 34	1,50,71,114,	
402,403							
2915-SMK	12	4328167	708028	39 04 47	-96 35 42		
3129-SMK	8	4327702	710711	39 04 30	-96 33 51	-8	
3414-SMK	10	4327286	707854	39 04 19	-96 35 51		
3479-SMK	34	4327134	720890	39 04 02	-96 26 49	77	
4268-SMK	30	4325626	718574	39 03 15	-96 28 27	25,32,51,76,	
825,834,925,							
932							
4439-SMK	11	4325219	712795	39 03 07	-96 32 27	16,18,45,53,	
73,106,811,							
844,911,916,							
945							
4609-SMK	22	4324890	706705	39 03 02	-96 36 41	17,74	
6340-SMK	20	4321484	713000	39 01 06	-96 32 23		
6912-SMK	24	4320111	707336	39 00 26	-96 36 20	19,75,819,	
919,924							
6943-SMK	28	4320147	713500	39 00 22	-96 32 04	43,72	
8739-SMK	26	4316699	712845	38 58 31	-96 32 35	21,821,921,	

926,947,954

In 1988, soil samples were collected from 22 stations spread over the FIFE study area. Only one of these stations were located with other stations in 1988 so that 21 unique stations are reported in this data set for 1988. At each site, 5 or 10 soil cores were taken and samples divided into 2 and sometimes 3 depth fractions.

	GRID_ID	STN_ID	NORTHING	EASTING	LATITUDE	LONGITUDE	COLLOCATED
0847-SMK 929	829	4332344	714439	39 06 57	-96 31 11	29,52,151,	
1246-SMK	840	4331625	714200	39 06 34	-96 31 22		
1563-SMK	827	4331100	717610	39 06 14	-96 29 01		
1816-SMK	802	4330410	708225	39 05 59	-96 35 32		
1935-SMK	812	4330195	711927	39 05 49	-96 32 58		
2123-SMK	805	4329866	709506	39 05 41	-96 34 39	5,905	
2133-SMK	806	4329726	711604	39 05 34	-96 33 12	124,904,906,	
931,937							
2655-SMK	836	4328787	716070	39 05 00	-96 30 07	33,36,78,936	
3021-SMK	807	4328000	709250	39 04 40	-96 34 52		
3128-SMK	808	4327780	710683	39 04 32	-96 33 52		
3317-SMK	810	4327463	708463	39 04 24	-96 35 25	910	
3409-SMK	814	4327244	706850	39 04 18	-96 36 32		
4139-SMK	831	4325850	712780	39 03 28	-96 32 27		
4168-SMK	825	4325704	718646	39 03 18	-96 28 24	25,30,32,51,	
76,834, 925,932							
4439-SMK	811	4325219	712795	39 03 07	-96 32 27	11,16,18,45,	
53,73,106, 844,911,916, 945							
4509-SMK	817	4324960	706850	39 03 04	-96 36 35		
6340-SMK	820	4321500	713000	39 01 07	-96 32 23		
6469-SMK	823	4321189	718752	39 00 51	-96 28 25	23,923	
6735-SMK	813	4320652	712073	39 00 40	-96 33 03	13,842,913	
6912-SMK	819	4320178	707307	39 00 29	-96 36 21	19,24,75,	
919,924							
8639-SMK	821	4316771	712827	38 58 33	-96 32 36	21,26,921,	
926,947,954							

In 1989, soil samples were collected from 22 stations spread over the FIFE study area. Nine of these stations were located with other stations in 1989 so that 13 unique stations are reported in this data set for 1989. At each site, 5 or 10 soil cores were taken and samples divided into 2 and sometimes 3 depth fractions.

	GRID_ID	STN_ID	NORTHING	EASTING	LATITUDE	LONGITUDE	COLLOCATED
1478-SMK	938	4331223	720664	39 06 15	-96 26 53		
1916-SMK	902	4330282	708259	39 05 55	-96 35 30	2,70,150	
1942-SMK	944	4330133	713414	39 05 46	-96 31 56	946	
2133-SMK	906	4329726	711604	39 05 34	-96 33 12	124,806,904,	
931,937							
2330-SMK	908	4329314	711066	39 05 22	-96 33 35		
2655-SMK	936	4328787	716070	39 05 00	-96 30 07	33,36,78,836	
3129-SMK	912	4327822	710820	39 04 33	-96 33 47		
3317-SMK	910	4327395	708485	39 04 22	-96 35 24	810	
4168-SMK	925	4325704	718646	39 03 18	-96 28 24	25,30,32,51,	
76,825,834, 932							

4439-SMK	916	4325193	712773	39 03 06	-96 32 28	11,16,18,45, 53,73,106, 811,844,911, 945
6735-SMK	913	4320652	712073	39 00 40	-96 33 03	13,813,842
6912-SMK	919	4320178	707307	39 00 29	-96 36 21	19,24,75, 819,924
8739-SMK	926	4316699	712845	38 58 31	-96 32 35	21,26,821, 921,947,954

In all years, the vertical coverage ranged from 0-20 cm below the surface of the prairie.

Spatial Coverage Map:

Not available.

Spatial Resolution:

These are point data.

Vertical resolution varied with depth. It was 5 cm from 0-10 of depth and 10 cm from 10-20 of depth.

Horizontal resolution was 30 meters for all sites except Station 11. For this site the horizontal resolution ranged from 60-150 m from the center of the site. The [Field Notes Section](#) gives a detailed listing of the sampling resolution at Station 11 (sitegrid ID = 4439).

Projection:

Not available.

Grid Description:

Not available.

Temporal Characteristics:

Temporal Coverage:

Soil samples were collected in 1987, 1988 and 1989. The overall period of collection for 1987 was May 20 to November 4. In 1988, samples were collected between April 11 and September 28, and in 1989 samples were collected during IFC-5 (July 19 to August 12).

Temporal Coverage Map:

Not available.

Temporal Resolution:

- In 1987, samples were collected daily during the four Intensive Field Campaigns and weekly between the campaigns.
- In 1988, samples were collected about once every two weeks.
- In 1989 samples were collected daily.
- Generally, 210 samples were collected per day.

Data Characteristics:

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

Parameter/Variable Name		
Parameter/Variable Source	Range	Units
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 Site number for AMS or Flux station or transect point where sample was taken.	min = 2, max = 944	FIS
OBS_DATE The date on which the sample was taken. STATE UNIVERSITY	min = 20-MAY-87, max = 12-AUG-89	KANSAS
SAMPLE_LOCN Location of sample with respect to site center (for IFC data). STATE UNIVERSITY 1 = center, 2 = north, 3 = west, 4 = south, 5 = east (approx 30 m in all cases).	min = 1, max = 20	KANSAS

Station 11 is different - see
documentation.

WET_WEIGHT_25MM			
The wet weight of the soil sample	min = 6.49,	[grams]	WEIGHING
taken at 25 mm.	max = 190.9,		BALANCE
missing = -99.9			

DRY_WEIGHT_25MM			
The dry weight of the soil sample	min = 5.37,	[grams]	WEIGHING
taken at 25 mm.	max = 164,		BALANCE
missing = -99.9			

SOIL_MOISTURE_25MM			
The soil moisture of the sample	min = 3.3,	[percent]	KANSAS
STATE			
taken at 25 mm.	max = 81.8,		
UNIVERSITY			
missing = -99.9			

WET_WEIGHT_75MM			
The wet weight of the soil sample	min = 2.29,	[grams]	WEIGHING
taken at 75 mm.	max = 213.06,		BALANCE
missing = -99.9			

DRY_WEIGHT_75MM			
The dry weight of the soil sample	min = 1.77,	[grams]	WEIGHING
taken at 75 mm.	max = 167.01,		BALANCE
missing = -99.9			

SOIL_MOISTURE_75MM			
The soil moisture of the sample	min = 4.9,	[percent]	KANSAS
STATE			
taken at 75 mm.	max = 53.6,		
UNIVERSITY			
missing = -99.9			

WET_WEIGHT_150MM			
The wet weight of the soil sample	min = 31.2,	[grams]	WEIGHING
taken at 150 mm.	max = 92.6,		BALANCE
missing = -99.9			

DRY_WEIGHT_150MM			
The dry weight of the soil sample	min = 27.2,	[grams]	WEIGHING
taken at 150 mm.	max = 75.7,		BALANCE
missing = -99.9			

SOIL_MOISTURE_150MM			
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The soil moisture of the sample min = 12, [percent] KANSAS
 STATE
 taken at 150 mm. max = 32.9,
 UNIVERSITY
 missing = -99.9

FIFE_DATA_CRTFCN_CODE *

The FIFE Certification Code for min = D, FIS
 the data, in the following format: max = D
 CPI (Certified by PI), CPI-???
 (CPI - questionable data).

LAST_REVISION_DATE
 data, in the format (DD-MMM-YY). max = 18-OCT-89

Footnote:

* Valid levels

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

The certification code modifiers are: PRE-NFP Preliminary - Not for publication, at the request of investigator. CPI-MRG PAMS data which is "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	SAMPLE_LOCN	WET_WEIGHT_25MM
1916-SMK	2	20-MAY-87	1	13.63
1916-SMK	2	20-MAY-87	2	15.02
1916-SMK	2	20-MAY-87	3	12.14
1916-SMK	2	20-MAY-87	4	8.81
1916-SMK	2	20-MAY-87	5	14.16
2731-SMK	4	20-MAY-87	1	16.39
2731-SMK	4	20-MAY-87	2	16.89
2731-SMK	4	20-MAY-87	3	14.15
2731-SMK	4	20-MAY-87	4	16.81
2731-SMK	4	20-MAY-87	5	-99.9
2132-SMK	6	20-MAY-87	1	16.84
2132-SMK	6	20-MAY-87	2	18.73
DRY_WEIGHT_25MM	SOIL_MOISTURE_25MM		WET_WEIGHT_75MM	DRY_WEIGHT_75MM
11.43	19.2	17.64	15.22	
12.29	22.2	18.88	16.18	
10.06	20.7	17.6	15.71	
7.09	24.3	19.44	16.83	
11.6	22.1	18.35	15.34	
14	17.1	17.81	15.51	

14.44	17	17.03	14.82
12.29	15.1	16.05	14.04
14.07	19.5	16.77	14.02
-99.9	-99.9	-99.9	-99.9
12.29	37	26.96	20.86
14.52	29	22.12	17.03
SOIL_MOISTURE_75MM	WET_WEIGHT_150MM	DRY_WEIGHT_150MM	SOIL_MOISTURE_150MM

15.9			
16.7			
12			
15.5			
19.6			
14.8			
14.9			
14.3			
19.6			
-99.9			
29.2			
29.9			
FILE_DATA_CRTFCN_CODE	LAST_REVISION_DATE		

CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		
CPI	31-AUG-87		

8. Data Organization:

Data Granularity:

A general description of data granularity as it applies to the IMS appears in the [EOSDIS Glossary](#).

Data Format:

The CD-ROM file format consists of numerical and character fields of varying length separated by commas. The character fields are enclosed with a single apostrophe. There are no spaces between the fields. Each file begin with five header records. Header records contain the following information: Record 1 Name of this file, its table name, number of records in this file, and principal investigator name. Record 2 Path and filename of the previous data set, and path and filename of the next data set. (Path and filenames for files that contain another set of data taken at the same site on the same day.) Record 3 Path and filename of the previous site, and path and filename of the next site. (Path and filenames for files of the same data set taken on the same day for the previous and next sites, sequentially numbered by SITEGRID.) Record 4 Path and filename of the previous date, and path and filename of the next date. (Path and filenames

for files of the same data set taken at the same site for the previous and next date.) Record 5 Column names for the data within the file, delimited by commas. Record 6 Data records begin.

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

9. Data Manipulations:

Formulae:

Derivation Techniques and Algorithms:

Percent soil moisture on a weight basis.

Calculated according to the following formula:

$$\text{Percent Water content} = \left[\frac{\text{weight of wet soil}}{\text{weight of dry soil}} - 1 \right] \times 100.$$

Data Processing Sequence:

Processing Steps:

Not Applicable.

Processing Changes:

None.

Calculations:

Special Corrections/Adjustments:

None.

Calculated Variables:

Percent water content.

Graphs and Plots:

None.

10. Errors:

Sources of Error:

Errors could arise in water content measurements depending on the technique used to avoid absorption of water from the air during cooling and prior to weighing. Also, the time necessary to reach 'constant' weight will depend upon the type of oven used (forced-draft or convection type), the size or depth of the sample, the nature of the soil, and if the oven is loaded heavily or not. Water content values for stony or gravelly soils, both on a mass and volume basis, can be grossly misleading. The problem arises from the fact that a large rock can occupy appreciable volume in a soil sample and contribute appreciably to the mass without making a commensurate contribution to the porosity or water capacity of the soil.

Quality Assessment:

Data Validation by Source:

Not available.

Confidence Level/Accuracy Judgment:

The crews collecting these data were generally conscientious. Adequate drying-oven space was available, therefore, dry weight should be representative of a "constant" dry weight. These data should be as accurate as gravimetric sampling would allow.

In 1989, the variation of gravimetric soil moisture values from day-to-day during the field campaign were plotted to check for anomalous data points.

Measurement Error for Parameters:

No quantitative assessment was made, see the [Confidence Level/Accuracy Judgment Section](#).

Other errors mentioned in the [Sources of Error Section](#) above were not quantified.

Additional Quality Assessments:

Not available.

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.

Usage Guidance:

This data set can be used in conjunction with other soil moisture data to validate the soil moisture values predicted by the airborne remote sensing instruments during FIFE. It can be used with caution in similar prairie landscapes to compare remote sensing derived soil moisture and field measured soil moisture.

Any Other Relevant Information about the Study:

Not available.

12. Application of the Data Set:

These data were collected to characterize the spatial and temporal patterns of moisture content of the soils over this area during and between the FIFE Intensive Field Campaigns.

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 Office
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:

Gravimetric Soil Moisture data are available on FIFE CD-ROM Volume 1. The CD-ROM file names are as follows: \DATA\SOILMSTR\SM_GRAV\GRIDxxxx\YyyMmm\yddgrid.SMG or \DATA\SOILMSTR\SM_GRAV\GRIDxxxx\Yyy\yddgrid.SMG.

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: *yddgrid.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 .SMG for this data set.

17. References:

17.1 Satellite/Instrument/Data Processing Documentation.

Gardner, W.H. 1986. Water content. p.635-662. In: A. Klute (ed.) Methods of Soil Analysis. Part 1. Physical and mineralogical methods, 2nd ed. Agronomy Monogr. 9. ASA and SSSA. Madison, WI.

17.2 Journal Articles and Study Reports.

Engman, E.T., W. Kustas, T.J. Schmugge, and J.R. Wang. 1987. Relationship among the remotely sensed soil moisture, streamflow, and evapotranspiration. AGU Fall Meeting. San Francisco.

Engman, E.T., G. Angus, and W. Kustas. 1989. Relationships between the hydrologic balance of a small watershed and remotely sensed soil moisture. Remote Sensing and Large Scale Processes. IAHS Publ. No. 186. Proc. IAHS. 3rd Int. Asso. Baltimore, MD.

Schmugge, T.J. 1978. Remote sensing of surface soil moisture. J. Appl. Meteorol. 17:1547-1557.

Schmugge, T.J., T.J. Jackson, and H.L. McKim. 1980. Survey of methods of soil moisture determination. Water Resources Res. 16(16):961-979.

Wetzel, P.J., and J.T. Chang. 1987. Concerning the relationship between evapotranspiration and soil moisture. J. Clim. Appl. Meteor.

17.3 Archive/DBMS Usage Documentation.

The Collected Data of the First ISLSCP Field Experiment is archived at the EOS Distributed Active Archive Center (DAAC) at Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee (see [Data Center Identification](#)). Documentation about using the archive and/or online access to the data at the ORNL DAAC is not available at this revision.

18. Glossary of Terms:

A general glossary for the DAAC is located at [Glossary](#).

19. List of Acronyms:

BPI Byte per inch CCT Computer Compatible Tape 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 ISLSCP International Satellite Land Surface Climatology Project ORNL Oak Ridge National Laboratory URSA Universities Space Research Association URL Uniform Resource Locator UTM Universal Transverse Mercator

A general list of acronyms for the DAAC is available at [Acronyms](#).

20. Document Information:

April 28, 1994 (citation revised on October 15, 2002).

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

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