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SMEX03 Airborne Synthetic Aperture Radar (AIRSAR) Data

The soil moisture experiments in 2003 (SMEX03) focuses on the remote sensing of soil moisture over a range of natural vegetation types. For that purpose, five different study areas were selected for the simultaneous collection ground truth and remotely-sensed data. The main study areas of the experiment were located in southern and northern part of Oklahoma around Stillwater and Chickasha, respectively. As a part of this large-scale hydrology experiment, NASA's AIRSAR instrument mapped the northern as well as the southern Oklahoma study area on six different days.

The AIRSAR instrument is mounted on a DC-8 aircraft, which is operated and managed by NASA's Jet Propulsion Laboratory (JPL). In AIRSAR's POLSAR mode, the radar instrument collects backscattering coefficients at quad polarization [HH, VV, HV and TP (Total Power)] in the C-, L- and P-band frequency ranges. AIRSAR also has an interferometric mode, where the radar collects C- and L-band data simultaneously. In the SMEX03 field campaign, POLSAR data were acquired at a bandwidth of 20 MHz. Basic characteristics of the AIRSAR data collected during SMEX03 are listed in table 1. More general information on the AIRSAR instrument can be found at <http://airsar.jpl.nasa.gov/>.

The most extensive radar data set was acquired over the Oklahoma South (OS) study area. Six different scenes were collected over this study area per flight day. Four flight lines were eastbound and covered the Little Washita (LW) watershed at incidence angles between approximately 35 and 45 degrees. The other two scenes were acquired in a northbound orientation and covered a large part of the regional study area at incidence angles between approximately 20 and 70 degrees. During the flight days over the Oklahoma North (ON) study area, two northbound lines were flown. These flight lines cover the full study area at incidence angle between 20 and 70 degrees.

Table 1. AIRSAR Antenna Parameters

Band	C (5.31 Ghz), L (1.26 Ghz), P (0.45Ghz)
Incidence Angles	0° – 75° (theoretical, in practice between 20° and 70°)
Altitude	≈ 8 km
Bandwidth	20 MHz
Slant Range Resolution	6.7 m

During SMEX03 the AIRSAR instrument flew on six days. The southern Oklahoma study area was mapped on five days. These days included the 3rd, 5th, 7th, 10th and 12th of July 2003. On each flight day, six different scenes were acquired. Four of the southern Oklahoma acquisitions are referred to as “watershed lines”, which were designed to map the Little Washita watershed between incidence angles of 30 to 50 degrees. The other two lines are referred to as “regional lines”, which cover most of the regional study area. The regional lines are northbound, while the watershed lines are eastbound.

In addition, the AIRSAR instrument mapped the northern Oklahoma study area on the 10th, 11th and 12th of July 2003. These flight lines are referred to as “northern box” lines. Similar to the regional lines, two northern box lines were collected on a flight day and they were northbound.

The AIRSAR data is processed and archived by NASA JPL. Data are available via FTP at NSIDC from the [SMEX03 AMSR-Validation Data](#) Web page. There is one directory for each POLSAR product ID (for example, “cm6679”). Data can also be downloaded from the JPL AIRSAR Web site (<http://airsar.jpl.nasa.gov/cgi-bin/search.plex>).

The "cm" directories contain files such as:

Image Files (color overlays, uncalibrated):

cm6679.jpg - three frequency color overlay, annotated
cm6679_full.jpg - three frequency color overlay, full resolution

Metadata Files:

cm6679_meta.airсар - ASCII metadata file, easy to read
cm6679_meta.podaac - ASCII metadata file, comma-separated values
cm6679_report.log - processing log
Cm6679_letter.htm - HTML file about processing

Data files:

cm6679_c.dat - C-band slant-range, compressed Stokes matrix file
cm6679_c.rad_vec - C-band ASCII radiometric correction vector applied to imagery
cm6679_l.dat - L-band slant-range, compressed Stokes matrix file
cm6679_l.rad_vec - L-band ASCII radiometric correction vector applied to imagery
cm6679_p.dat - P-band slant-range, compressed Stokes matrix file
cm6679_p.rad_vec - P-band ASCII radiometric correction vector applied to imagery
cm6679_rad_vec.README - ASCII readme file about radiometric correction vectors

The data are stored in the form of compressed stokes matrices. For convenience, the geolocation and data acquisition information of the SMEX03 flight lines are specified in Tables 2-9. To save computer memory, each northbound line (regional and northern box) was stored in two different data sets. Note that the ‘top right’ and ‘lower left’ coordinates are approximated and can only be used as an indication for the data coverage of a specific scene.

AIRSAR Acquisitions of the Oklahoma South (OS) Study Area

Table 2. OS AIRSAR Acquisitions and Corresponding JPL Labels for 3 July 2003

	Upper left*		Lower right*		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
cm6667	34.9661	-97.7124	34.8135	-98.3784	E-W
cm6669	34.9846	-97.7246	34.8319	-98.3784	E-W
cm6666	35.0232	-98.3895	34.8686	-97.7143	W-E
cm6668	35.0437	-97.7124	34.8135	-98.3784	W-E
cm6697, cm6698	35.4061	-97.9934	34.4102	-97.8082	N-S
cm6699, cm6700	35.4572	-97.5739	34.4265	-97.7594	S-N

*Coordinates are approximations and should not be used to process the data.

Table 3. OS AIRSAR Acquisitions and Corresponding JPL Labels for 5 July 2003

	Top right*		Lower left*		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
cm6671	34.966	-97.7246	34.8705	-97.7219	E-W
cm6673	34.9839	-97.7097	34.8312	-98.3759	E-W
cm6670	35.0251	-98.3872	34.8133	-97.7219	W-E
cm6672	35.0442	-98.3885	34.8897	-97.7231	W-E
cm6701, cm6702	35.4089	-97.9915	34.3798	-97.8064	N-S
cm6703, cm6704	35.4625	-97.5756	34.427	-97.761	S-N

*Coordinates are approximations and should not be used to process the data.

Table 4. OS AIRSAR Acquisitions and Corresponding JPL Labels for 7 July 2003

	Top right*		Lower left*		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
cm6676	34.967	-97.7167	34.8141	-98.2757	E-W
cm6678	34.9851	-97.7133	34.8324	-98.3794	E-W
cm6675	35.0243	-98.4137	34.8697	-97.7484	W-E
cm6677	35.0441	-98.3883	34.8895	-97.7229	W-E
cm6738, cm6739	35.4138	-97.5735	34.3795	-97.8073	N-S
cm6740, cm6741	35.4616	-97.5735	34.4303	-97.7595	S-N

*Coordinates are approximations and should not be used to process the data.

Table 5. OS AIRSAR Acquisitions and Corresponding JPL Labels for 10 July 2003

	Top right*		Lower left*		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
cm6691	34.9674	-97.7116	34.8145	-98.2706	E-W
cm6693	34.9848	-97.7143	34.8321	-98.3805	E-W
cm6690	35.0239	-98.385	34.8693	-97.7197	W-E
cm6692	35.0429	-98.39	34.8883	-97.7246	W-E
cm6725, cm6726	35.4118	-97.9939	34.3814	-97.8079	N-S
cm6727, cm6728	35.461	-97.5741	34.4409	-97.7594	S-N

*Coordinates are approximations and should not be used to process the data.

Table 6. OS AIRSAR Acquisitions and Corresponding JPL Labels for the 12 July 2003

	Top right *		Lower left *		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
cm6680	34.9658	-97.7134	34.8131	-98.3794	E-W
cm6682	34.9837	-97.7075	34.831	-98.3736	E-W
cm6679	35.0249	-98.3864	34.8705	-97.7212	W-E
cm6681	35.0446	-98.3869	34.8901	-97.7215	W-E
cm6709, cm6710	35.409	-97.9922	34.378	-97.8065	N-S
cm6711, cm6712	35.46	-97.5742	34.4274	-97.76	S-N

*Coordinates are approximations and should not be used to process the data.

AIRSAR Acquisitions of the Oklahoma North (ON) Study Area

Table 7. ON AIRSAR Acquisitions and Corresponding JPL Labels for 10 July 2003

	Top right *		Lower left *		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
Cm6696	36.4918	-97.8832	35.9436	-97.6938	N-S
Cm6695	36.9745	-97.8829	36.4264	-97.6925	N-S
Cm6694	37.0048	-97.4335	36.6375	-97.6245	S-N

*Coordinates are approximations and should not be used to process the data

Table 8. ON AIRSAR Acquisitions and Corresponding JPL Labels for 11 July 2003

	Top right *		Lower left *		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
Cm6707	36.9829	-97.8803	36.4348	-97.6901	N-S
Cm6708	36.4916	-97.8808	35.9434	-97.6916	N-S
Cm6705	36.536	-97.4336	35.9878	-97.6232	S-N
Cm6706	37.0211	-97.4341	36.473	-97.6249	S-N

*Coordinates are approximations and should not be used to process the data.

Table 9. ON AIRSAR Acquisitions and Corresponding JPL Labels for 12 July 2003

	Top right *		Lower left *		
JPL_label	Latitude	Longitude	Latitude	Longitude	Heading
Cm6713	36.5393	-97.4339	35.9911	-97.6235	N-S
Cm6714	37.0205	-97.4345	36.4724	-97.6252	N-S
Cm6715	36.9755	-97.8804	36.4274	-97.6894	S-N
Cm6716	36.4878	-97.8802	35.9396	-97.691	S-N

*Coordinates are approximations and should not be used to process the data.

Data Documentation

For in-depth documentation regarding these AIRSAR data, refer to the AIRSAR Web site at the Jet Propulsion Laboratory (JPL): <http://airsar.jpl.nasa.gov/>

Contact

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