CLASIC07 PALS Brightness Temperature Data, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Yueh, S. 2015. *CLASIC07 PALS Brightness Temperature Data, Version 1.* [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/58ILBIVGP1RC. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/CL07PLTB

National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

This data set contains brightness temperature data obtained by the Passive Active L-band System (PALS) microwave aircraft radiometer instrument as part of the Cloud and Land Surface Interaction Campaign 2007 (CLASIC07).

1.1 Format

The following table provides descriptions for each column in the data files. An associated Extensible Markup Language (XML) metadata file is also provided for each data file.

Table 1. Data Column Descriptions

Column Number	Description
1	Time (hour after local midnight)
2	Latitude [°]
3	Longitude [°]
4	Incidence angle [°]
5	Horizontally polarized brightness temperature [K]
6	Vertically polarized brightness temperature [K]

1.2 File and Directory Structure

Data are available at:

`https://n5eil01u.ecs.nsidc.org/SMAP_VAL/CL07PLTB.001/`

1.3 File Naming Convention

Files are named according to the following convention, and as described in Table 2:

`CL07PLTB_MMDDADrad.txt`

Where:

Table 2. Accuracies by Land Cover Type Variable

Variable	Description
CL07PLTB	Data Set ID
MM	2-Digit Month
DD	2-Digit Day
AD	2-Character Area Designation (LW: Little Washita, FC: Fort Cobb)
rad	radiometer
.txt	Indicates this is a text file

Example: `CL07PLTB_0611LWrad.txt`

1.4 File Size

Files range in size from approximately 217 KB to 4 MB.

1.5 Volume

The total volume for this data set is approximately 40 MB.

1.6 Spatial Coverage

Southernmost Latitude: 34.91°N

Northernmost Latitude: 35.21°N

Westernmost Longitude: 98.70°W

Easternmost Longitude: 97.75°W

1.7 Spatial Resolution

The 3dB spatial resolutions of the instruments at two potential altitudes are 350 m (1000 m altitude, minimum for the radar operation) and 1100 m (3000 m, maximum).

1.8 Projection

Longitude and latitude are in World Geodetic System 1984 (WGS84) coordinates.

1.9 Temporal Coverage and Resolution

Data were collected every one to seven days from 11 June 2007 through 06 July 2007.

1.10 Parameter or Variable

Parameters include brightness temperature (K) and incidence angle (°).

1.10.1 Parameter Range

Valid parameter values are as follows:
Brightness temperature: 50 - 350 K
Incidence angle: 30° - 50°
Fill value for missing data: ****** or -inf

2 SOFTWARE AND TOOLS

Any word-processing program or Web browser is sufficient for viewing the ASCII text files.

3 DATA ACQUISITION AND PROCESSING

3.1 Theory of Measurements

Current microwave models and retrieval algorithms have significant limitations in their treatment of different vegetation types and heterogeneous scenes (mixtures of grass, crops, trees, streams, lakes) and quantitative treatment of algorithm scaling and error analysis for such heterogeneous scenes. Measurements over wide varieties of terrain are needed, with joint active and passive sensors, to develop algorithms and parameterizations that can work across all terrain types, and extract optimum information from the combined data. This will have direct impact on the design of dedicated soil moisture missions and development of methods to assimilate such data into land surface models. Microwave radiometry and radar are well-established techniques for surface remote sensing. Combining passive and active sensors provides complementary information contained in the surface emissivity and backscatter signatures, which can improve the accuracy of retrieval of geophysical parameters. Over land, it has been demonstrated that the radiometer and the radar both provide information for estimating soil moisture and vegetation water content (Bolten et al. 2003, Njoku et al. 2002, Narayan et al. 2004).

Table 3. Description of the PALS instrument

Passive	Frequency	1.413 GHz
	Polarization	V, H, +45, -45
	Calibration stability	1 K (bias); 0.2 K (stability)
Active	Frequency	1.26 GHz
	Polarization	VV, HH, VH, HV
	Calibration accuracy	<2 dB (bias); 0.2 dB (stability)
Antenna	Half Power Beamwidth	20° (passive); 23°(active)
	Beam Efficiency	94%
	Directivity	18.5 dB
	Polarization isolation	> 35 dB

PALS was flown in two major soil moisture experiments (SPG99, SMEX02) before deployment in CLASIC. Beginning with CLASIC, a new flat-panel antenna array was substituted for the large horns. The planar antenna consists of 16 stacked-patch microstrip elements arranged in four-by-four array configurations. Each stacked-patch element uses a honeycomb structure with extremely low dielectric loss at L-band to support the ground plane and radiating patches. The measured antenna pattern shows better than 35 dB polarization isolation, far exceeding the need for the polarimetric measurement capability. This compact, lightweight antenna has enabled PALS to transition to operating on small aircraft, such as the Twin Otter.

PALS was mounted at a 40° incidence angle looking to the rear of the aircraft. The 3dB spatial resolutions of the instruments at two potential altitudes are 350 m (1000 m altitude, minimum for the radar operation) and 1100 m (3000 m, maximum). It is important to note that PALS provides a single beam of data along a flight track and that any mapping must rely upon multiple flight lines at a spacing of the footprint width.

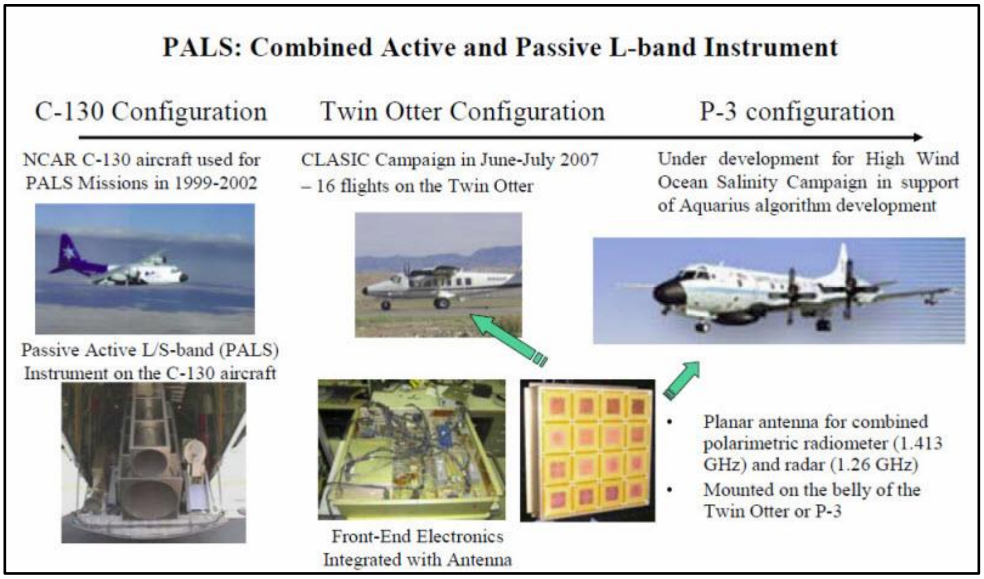

Figure 1. Images of Three Different Aircraft Installations of the PALS Combined Active and Passive L-band Instrument

3.2 Error Sources

There are no exceptional error sources for this data set.

3.3 Quality Assessment

The quality of the brightness temperature data relies on internal calibration that utilize matched loads and external calibration that exploits lake surfaces close to the experiment area. These references assure good quality of the data.

4 REFERENCES AND RELATED PUBLICATIONS

Bolten, J., V. Lakshmi, and E. Njoku. 2003. Soil Moisture Retrieval Using the Passive/Active L- and S-band Radar/Radiometer. *IEEE Trans. Geosci. Rem. Sens.*, 41:2792-2801.

Narayan, U., V. Lakshmi, and E. Njoku. 2004. Retrieval of Soil Moisture from Passive and Active L/S Band Sensor (PALS) Observations during the Soil Moisture Experiment in 2002 (SMEX02). *Rem. Sens. Environ*., 92:483-496.

Njoku, E., W. Wilson, S. Yueh, S. Dinardo, F. Li, T. Jackson, V. Lakshmi, and J. Bolten. 2002. Observations of Soil Moisture Using a Passive and Active Low Frequency Microwave Airborne Sensor during SGP99. *IEEE Trans. Geosci. Rem. Sens*., 40:2659-2673.

Wilson, W. J., S. H. Yueh, S. J. Dinardo, S. Chazanoff, F. K. Li, and Y. Rahmat-Samii. 2001. Passive Active L- and S-band (PALS) Microwave Sensor for Ocean Salinity and Soil Moisture Measurements. *IEEE Trans. Geosci. Rem. Sens.* 39, 1039-1048.

5 CONTACTS AND ACKNOWLEDGMENTS

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6 DOCUMENT INFORMATION

6.1 Publication Date

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6.2 Date Last Updated

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