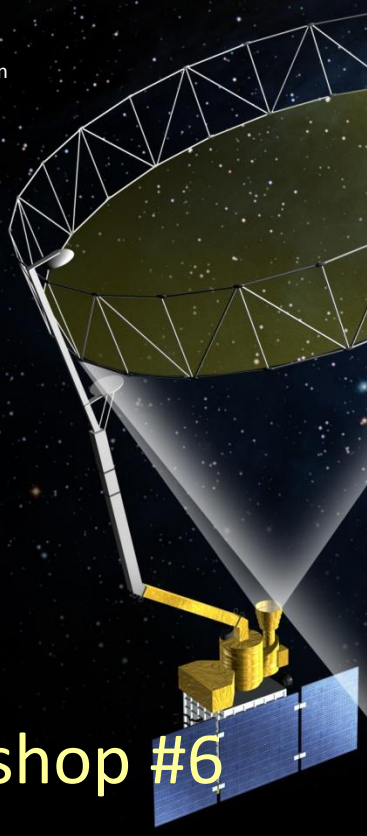
National Aeronautics and Space Administration

Soil Moisture Active Passive Mission

SMAP



L1CTB Gridded Product & Quality Flags

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Outline

1. **Product Overview**

1. **Quality Flags**

1. **Beta-Level Release**

2. **Outlook Towards Validated Release**

1. **Conclusion**

Product Overview

- **Product Attributes**
  - Gridded version of time-ordered L1BTB
  - Gridded at 36 km on
    - Global Cylindrical EASE-Grid 2.0 projection (406 rows, 964 columns)
    - North/South Polar EASE-Grid 2.0 projection (500 rows, 500 columns)
  - 6:00 am descending and 6:00 pm ascending
  - Fore-look and aft-look fields stored separately

- **Post-launch Development**
  - SW worked almost immediately upon receiving ‘first light’
  - In routine production since Mar 31, 2015
  - Beta release since July 31, 2015

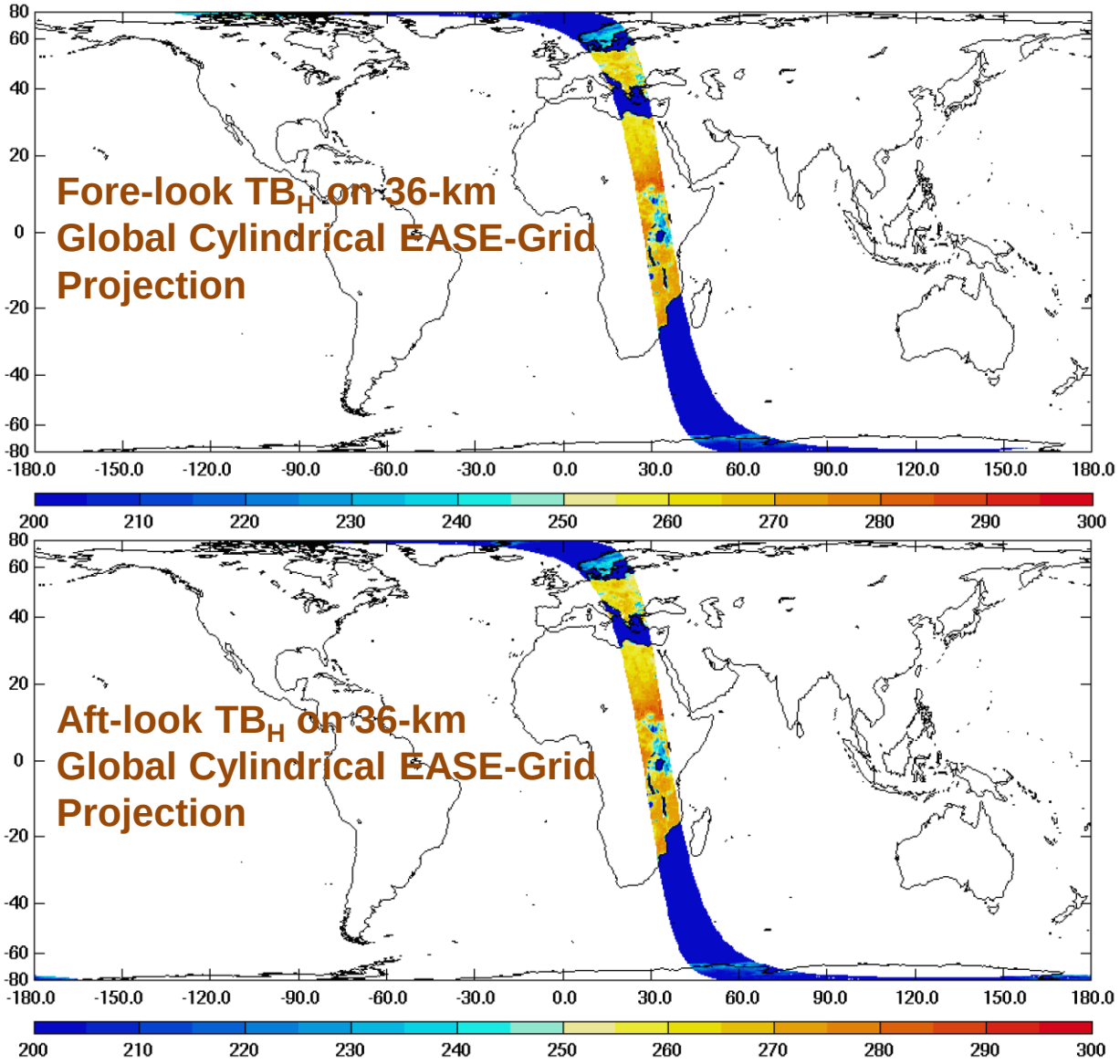
Product Overview

Sample file: SMAP_L1C_TB_01815_A_20150604T152802_T11710_001.h5

Data Fields	Minimum	Maximum	Notes
cell_tb_time_seconds_fore	2015-06-04T15:29:09.060Z	2015-06-04T16:22:27.597Z	Fore T_{min} earlier than aft T_{min}; aft T_{max} later than fore T_{max}
cell_tb_time_seconds_aft	2015-06-04T15:29:11.253Z	2015-06-04T16:22:30.410Z	
cell_row	0	405	M36 has 406 rows and 964 columns; indices start at 0.
cell_column	0	963	
cell_lat_centroid_fore / aft	-84.7507 / -84.7259	84.8859 / 84.9016	Centroid lat/lon within range
cell_lon_centroid_fore / aft	-179.8179 / -179.9323	179.8033 / 179.9612	
cell_boresight_incidence_fore / aft	39.9369 / 39.9359	40.1021 / 40.1037	Incidence should stay ~ 40°
cell_antenna_scan_angle_fore	0.088984	359.7351	Fore ⊂ [0,90] and [270,360]; aft ⊂ [90,270] by definition.
cell_antenna_scan_angle_aft	90.1843	269.8298	
cell_tb_h_fore / aft	72.3686 / 69.4475	290.3711 / 289.9701	TB shows expected dynamic range. Potential RFI may still exist as quality bit was not used to compute these statistics.
cell_tb_v_fore / aft	110.4919 / 108.9585	332.5924 / 318.0580	
cell_number_meas_h_fore / aft	0 / 0	25 / 26	Number of samples varies from zero near polar ends to high values along the swath edges.
cell_number_meas_v_fore / aft	0 / 0	25 / 26	

Product Overview

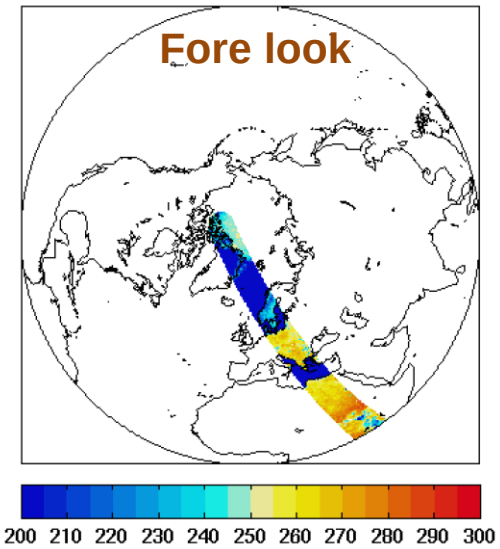
Sample file: SMAP_L1C_TB_01815_A_20150604T152802_T11710_001.h5

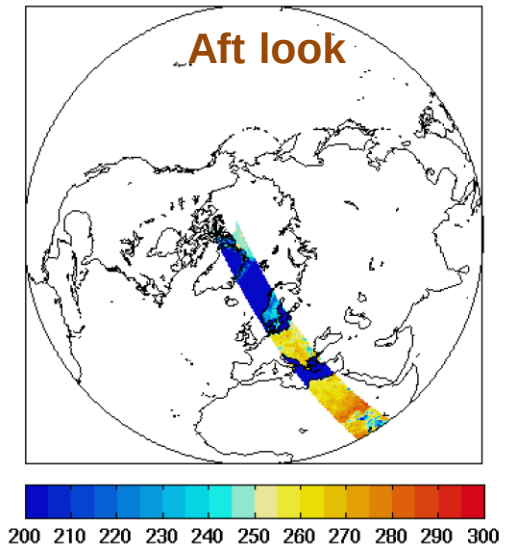


Product Overview

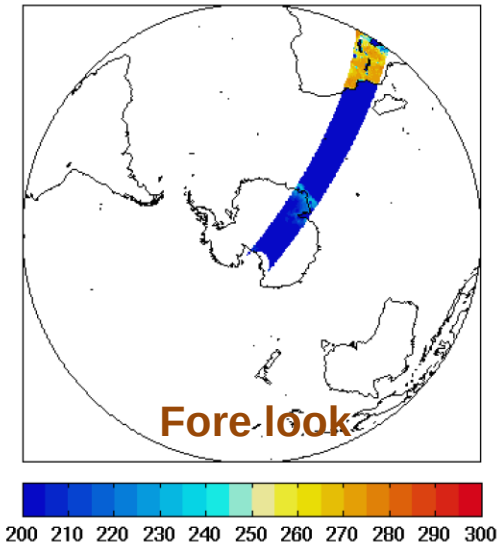
Sample file: SMAP_L1C_TB_01815_A_20150604T152802_T11710_001.h5

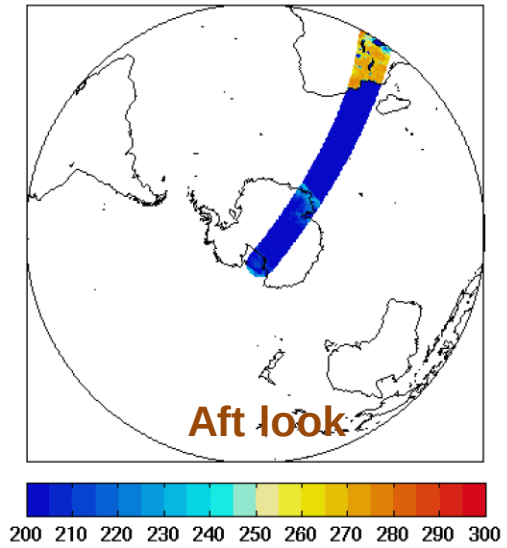
TB_H on 36-km North Polar EASE-Grid Projection





TB_H on 36-km South Polar EASE-Grid Projection





Quality Flags

- L1CTB and L1BTB have the same definition in T_B quality flags
- L1CTB applies bitwise logical OR to T_B quality flags from *all* T_B footprints in a grid cell

L1BTB footprint 1

Bits	Interpretation
0	Vertical polarization **quality**
1	Vertical polarization **range**
2	Vertical polarization **RFI detection**
3	Vertical polarization **RFI correction**
4	Vertical polarization **NEDT**
5	Vertical polarization **direct sun correction**
6	Vertical polarization **reflected sun correction**
7	Vertical polarization **reflected moon correction**
8	Vertical polarization **direct galaxy correction**
9	Vertical polarization **reflected galaxy correction**
10	Vertical polarization **atmosphere correction**
11	Vertical polarization **Faraday rotation correction**
12	Vertical polarization **null value**
13	Vertical polarization **half orbit location**
14	Vertical polarization **RFI check**
15	Vertical polarization **RFI clean**

.OR.

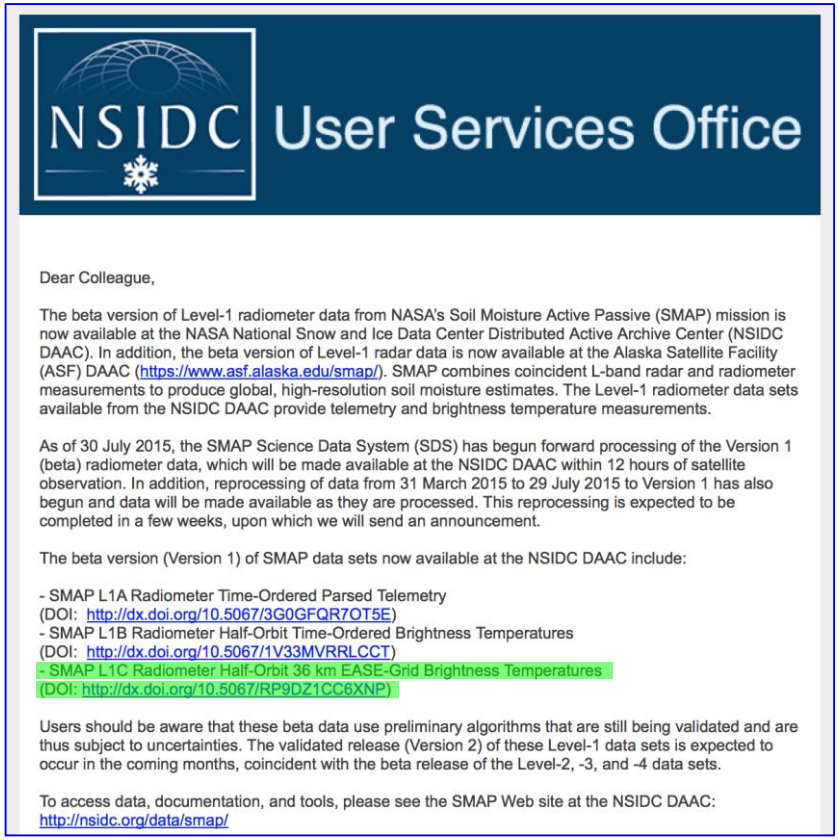
L1BTB footprint 2

Bits	Interpretation
0	Vertical polarization **quality**
1	Vertical polarization **range**
2	Vertical polarization **RFI detection**
3	Vertical polarization **RFI correction**
4	Vertical polarization **NEDT**
5	Vertical polarization **direct sun correction**
6	Vertical polarization **reflected sun correction**
7	Vertical polarization **reflected moon correction**
8	Vertical polarization **direct galaxy correction**
9	Vertical polarization **reflected galaxy correction**
10	Vertical polarization **atmosphere correction**
11	Vertical polarization **Faraday rotation correction**
12	Vertical polarization **null value**
13	Vertical polarization **half orbit location**
14	Vertical polarization **RFI check**
15	Vertical polarization **RFI clean**

Beta-Level Release

- **L1CTB available along with L1A and L1B Radiometer products from NSIDC since Jul 31, 2015**

SMAP L1C Radiometer Half-Orbit 36 km EASE-Grid Brightness Temperatures (DOI: http://dx.doi.org/10.5067/RP9DZ1CC6XNP)



NSIDC User Services Office

Dear Colleague,

The beta version of Level-1 radiometer data from NASA's Soil Moisture Active Passive (SMAP) mission is now available at the NASA National Snow and Ice Data Center Distributed Active Archive Center (NSIDC DAAC). In addition, the beta version of Level-1 radar data is now available at the Alaska Satellite Facility (ASF) DAAC (https://www.asf.alaska.edu/smap/). SMAP combines coincident L-band radar and radiometer measurements to produce global, high-resolution soil moisture estimates. The Level-1 radiometer data sets available from the NSIDC DAAC provide telemetry and brightness temperature measurements.

As of 30 July 2015, the SMAP Science Data System (SDS) has begun forward processing of the Version 1 (beta) radiometer data, which will be made available at the NSIDC DAAC within 12 hours of satellite observation. In addition, reprocessing of data from 31 March 2015 to 29 July 2015 to Version 1 has also begun and data will be made available as they are processed. This reprocessing is expected to be completed in a few weeks, upon which we will send an announcement.

The beta version (Version 1) of SMAP data sets now available at the NSIDC DAAC include:

- SMAP L1A Radiometer Time-Ordered Parsed Telemetry
(DOI: http://dx.doi.org/10.5067/3G0GFQR7OT5E)
- SMAP L1B Radiometer Half-Orbit Time-Ordered Brightness Temperatures
(DOI: http://dx.doi.org/10.5067/1V33MVRRLCCT)
- SMAP L1C Radiometer Half-Orbit 36 km EASE-Grid Brightness Temperatures
(DOI: http://dx.doi.org/10.5067/RP9DZ1CC6XNP)

Users should be aware that these beta data use preliminary algorithms that are still being validated and are thus subject to uncertainties. The validated release (Version 2) of these Level-1 data sets is expected to occur in the coming months, coincident with the beta release of the Level-2, -3, and -4 data sets.

To access data, documentation, and tools, please see the SMAP Web site at the NSIDC DAAC:
http://nsidc.org/data/smap/

- **Documentation**
  - L1 Radiometer Assessment Report (JPL D-93978)
  - L1CTB Product Specification Document (JPL D-72545)
  - L1CTB User Guide

Outlook Towards Validated Release

- **More refined QC prior to gridding**
  - Current: Flagged T_B footprints included in gridding, but indicated collectively with other (nominal) unflagged T_B footprints in T_B quality flags
  - Future: Flagged T_B footprints filtered out prior to main processing (gridding and bitwise OR)?

- **Gridding domain extended to match more closely with FOV**
  - Current: Gridding domain the same as rectangular boundary of a grid cell
  - Future: Gridding domain matched more closely with main beam coverage (2.5 x HPBW) but posted on a finer grid

Conclusion

- **L1CTB's prompt reach to beta-level quality credited to**
  - Extensive pre-launch testing with GloSim
  - Strict adherence to product specifications by L1 radiometer team

- **Beta-level L1CTB available from NSIDC since July 31, 2015**
  - Data documentation (PSD, User Guide, Assessment Report, etc) ✓
  - Data production (Mar 31 – present) ✓

- **Room for improvement towards validated release**
  - More refined QC prior to gridding
  - Gridding domain matched more closely with main beam coverage

Backup

Product Overview

Daily Composite

Daily composite of fore-look TB_H on 36-km EASE-Grid Projections