GOES-17 ABI Level 2 Land Surface Temperature
Beta Data Quality
September 21, 2018
Read-Me for Data Users

The GOES-17 Advanced Baseline Imager (ABI) L2+ Land Surface Temperature (LST) product was declared Beta maturity on August 27, 2018. No formal review was conducted because the algorithms are identical to the ones running with GOES-16, so the Beta declaration of the ABI L1b and CMI flows down to the ABI L2+ products.

The ABI Level 2 LST product provides coverage over the Full Disk (FD) of the Earth, the Continental United States (CONUS) region, and two Mesoscale (MESO) regions. The file includes the LST scaled to unsigned integer, the corresponding data quality flags (DQF), and a series of product metadata. They also include the product quality indicator (PQI) in the intermediate product (IP) files.

Output data contains two data arrays: the LST values and the associated DQF. The PQI is included in the intermediate product (IP) files. For more details about the product and its corresponding coordinate navigation, please use Product Definition and User's Guide (PUG) Volume 5: Level 2+ Products.

LST is scaled to 16-bit unsigned integer using add_offset and scale_factor to reduce the storage size. The actual format of LST in the file is 16-bit signed integer. When reading it, the LST values and its attributes of _FillValue and valid_range shall be converted to 16-bit unsigned integer before they can be unscaled to real LST values. After _FillValue and valid_range is applied, the LST can be unscaled with the equation:

$$LST = LST\_unsigned\_integer * scale\_factor + add\_offset$$

The DQF and PQI provide information on algorithm results for each satellite pixel. The information indicates if the algorithm results are abnormal, degraded, or unavailable at the pixel level. Similarly, DQF and PQI shall be converted to 16-bit unsigned integer before each bit can be extracted. Their bit-wise flag definition can be found in Table 2 and 3. Note that bit 0 is counted from the least significant bit (leftmost). A full description and format of the LST products can be found in the Product Definition and User's Guide (PUG) document (http://www.goes-r.gov/products/docs/PUG-L2+-vol5.pdf).

The algorithm used to derive the LST product from GOES-R series ABI observations is described in detail in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Land Surface Temperature," (https://www.goes-r.gov/products/ATBDs/land_surface_temp2.pdf).

Beta maturity, by definition, means that:

- Initial calibration applied (L1b);
- Rapid changes in product input tables / algorithms can be expected;
- Product quick looks and initial comparisons with ground truth data were not adequate to determine product quality;

- Anomalies may be found in the product and the resolution strategy may not exist;
- Product is made available to users to gain familiarity with data formats and parameters;
- Product has been minimally validated and may still contain significant errors; and
- Product is not optimized for operational use.

Beta users bear all responsibility for inspecting the data prior to use and for the manner in which the data are utilized. Persons desiring to use the GOES-17 ABI Beta-maturity LST for any reason, including but not limited to scientific and technical investigations, are encouraged to consult the NOAA AWG for feasibility of the planned applications. The product is sensitive to upstream processing, such as the quality of the L1b product calibration, sensor navigation/registration, cloud mask, total precipitable water and emissivity at the two split-window bands.

Known issues being investigated include the following:

1. Due to the sensor Focal Plane Module (FPM) overheating issue, degradation of L1b data and the upstreaming EDR data as LST algorithm input was expected. This leads to the degradation of LST product especially during the nighttime. The impact is more significant between hours 06 and 15 UTC.
2. Due to the above mentioned reason, missing files, blank data, and striping happen frequently, especially during hour 08 to 14 UTC.
3. A navigation issue in L1b data introduced a 6km shift of the observations. This leads to potential degradation of the LST product. The issue was fixed on Sept. 13rd, 2018, and a longer time series is needed for verification.

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