

*VIIRS LST EDR Release, Beta Data Quality*  
*Last Updated: 02/15/2013*  
*Read-me for Data Users*

The Joint Polar Satellite System (JPSS) Algorithm Engineering Review Board approved the release of the Visible Infrared Imager Radiometer Suite (VIIRS) Land Surface Temperature (LST) Environmental Data Record (EDR) to the public with a Beta level quality as of Aug 10, 2012. Beta quality is defined as:

- Early release product
- Initial calibration applied
- Minimally validated and may still contain significant errors (additional changes are expected)
- Available to allow users to gain familiarity with data formats and parameters
- Product is not appropriate as the basis for quantitative scientific publications, studies and applications

The Board recommends that users be informed of the following product information and characteristics when evaluating the VIIRS LST EDR.

1. Product status:

- a. The beta version VIIRS LST EDR is based upon two regression algorithms: a split window (SW) algorithm that applies data of VIIRS thermal infrared bands M15 and M16 centered at wavelength 10.8 mm and 12.0 mm, respectively, and a dual-split window (DSW) algorithm that applies additional two shortwave infrared bands M12 and M13 centered at wavelength 3.75 mm and 4.0 mm, respectively. Before August 10, 2012<sup>1</sup>, the DSW is performed as baseline algorithm for the LST production. After August 10, 2012, since the operational implementation of IDPS Mx6.0/1/2, the SW is executed as the baseline algorithm for the LST production.
- b. The algorithm coefficients are determined for 17 surface types defined by the International Geosphere-Biosphere Programme (IGBP), as well as day ( $0^\circ \leq \text{Solar Zenith Angle} \leq 85^\circ$ ) and night conditions for each surface type.
- c. The LST values are available for those pixels with cloud confidence indicators of “confident clear”, “probably clear”, and “probably cloudy”, as identified in the VIIRS Cloud Mask documentation.
- d. A 3-byte set of quality flags (QFs) is provided for each LST retrieval. The QF information includes:
  - byte 1: LST quality, algorithm, day/night, input SDR quality
  - byte 2: within LST measurement range (or not), cloud indicator, AOT condition, sun glint
  - byte 3: land/water background, surface typeUsers may refer to the QF information for their applications.
- e. The measurable LST value range is from 183.2 K to 350 K.

<sup>1</sup>This information is necessary for those users who may be accessing pre-beta data from sources other than CLASS.

## 2. Product evaluation:

Overall performance of the Suomi NPP VIIRS LST product is fairly good. The internal evaluation on the quality flag, maps, geolocation etc. reveals no significant problems with upstream SDR, EDRs and IPs. The preliminary results from external evaluations including inter-comparison with MODIS Aqua, validation against ground truth data and near real time monitoring of LST product indicate that the LST production is working fine. However, significant seasonal inconsistency is observed which may be caused by the algorithm surface type dependency feature, which increases the concern of the considerable spectral variation in emissivity for different land surface types and emissivity variation within a surface type. More work is needed to further improve the LST product.

## 3. Known errors:

- a. Snow/ice indicator needed in the LST production is a combination acquired from the quarterly surface type EDR (for “permanent snow”) and daily snow EDR (for “temporal snow”). Since the snow EDR is only available for daytime, the nighttime temporal snow cannot be flagged. Snow/ice team is working on changes to provide nighttime snow cover information as well.
- b. Before August 10, 2012<sup>1</sup>, there is a mis-order issue in the LST coefficient Look-up table (LUT), for the DSW algorithm: the 17 IGBP surface types listed in the LUT are not in the order listed in the surface type EDR, resulting in a coefficient set for certain surface types that may be applied to other surface type pixels. The problem does not occur in those pixels where the LST is derived using SW algorithm. This information is necessary for those users who may be accessing pre-beta data from sources other than CLASS. The problem has been corrected as of August 10, 2012.

Additional information on VIIRS and Land Surface Temperature algorithm theoretical basis document (ATBD) are available at

<http://www.star.nesdis.noaa.gov/jpss/ATBD.php>

The VIIRS SDR Read-me for Beta Data Quality is also available at the CLASS Homepage.

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