**Introduction**

The U.S. Joint Polar-orbiting Satellite System (JPSS) launched its first satellite, the Suomi NPP (S-NPP) satellite, in October 2011. Subsequent satellites of the JPSS mission are scheduled for launch in 2017 (J1 satellite) and in 2022 (J2 satellite). The Center for Satellite Applications and Research (STAR) at the National Environmental Satellite and Data Information Service (NESDIS) of the U.S. National Oceanic and Atmospheric Administration (NOAA) is responsible for producing operational land surface environmental data record (EDR) products for the JPSS mission, including land surface temperature (LST). The LST production is based on the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor onboard the JPSS satellites. The NOAA LST EDR team at NOAA/NESDIS/STAR has performed intensive testing and evaluation on the VIIRS LST product since the S-NPP satellite launch.

**Product Basics**

- The VIIRS LST is a moderate band pixel-by-pixel determination of effective land surface skin temperature produced as EDR.
- The split-window algorithm is performed as baseline algorithm.
- Evaluations are performed through internal and external comparisons.
- The VIIRS LST production is under the JPSS level 1 requirement.
- NOAA/NESDIS/STAR is responsible for the JPSS LST development.

**Algorithm**

\[
LST = a_i(i) + a_i(i) T_{i1} + a_i(i) (T_{i1} - T_{i2}) + a_i(i) (\sec \theta - 1) + a_i(i) (T_{i1} - T_{i2})^2
\]

- \(a_i(i)\) is the index of the IGBP surface type \(17\) International Geosphere Biosphere Program (IGBP) surface types \(T_{i1}, T_{i2}\) are the brightness temperatures of the VIIRS 10.8 \(\mu\)m and 12 \(\mu\)m bands respectively.
- \(\phi\) and \(\epsilon\) are the sensor and solar zenith angles respectively.
- \(a_i(i)\) are the regression coefficients for the IGBP surface type for daytimes and nighttimes respectively.

**LST Product and Validation**

A global daytime composite map of the S-NPP LST for the day of 20 Nov. 2013.

To account for the spatial variability of LST within a VIIRS pixel, a new scaling methodology is developed based on (a) High resolution (<250m) information about spatial variability of land type and biophysical properties; and (b) a land surface model to describe the LST spatial variability associated with the variability of surface properties.

**Correlation of the brightness temperature (BT) difference**

In principal, the BT difference of the split-window channels is applied for atmospheric correction in the algorithm, assuming that the BT difference represents well the atmospheric absorption. However, over land surface the BT difference contains the surface spectral emission difference between the channels as well as the atmospheric absorption. Considering that the VIIRS LST algorithm is an emissivity implicit absorption. Considering that the VIIRS BT difference contains the surface spectral emission difference between the channels as well as the atmospheric absorption.

**Current Status**

- Beta version of the LST has been in operations since December 2012.
- A provisional version was tested in November 2013; error of underestimation was found.
- A calibrated provisional version has been developed recently, and will be in operations soon.