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 Data and 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 Imager Radiometer Suite (VIIRS) sensor onboard the JPSS satellites. The NOAA 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

\[
LST_i = a_0(i) + a_1(i) T_1(i) + a_2(i) (T_1(i) - T_2(i)) + a_3(i) (sec \theta - 1) + a_4(i) (T_1(i) - T_2(i))^2
\]

\(i = 1, \ldots, 17\)

Note:
- \(T_1, T_2\) are the brightness temperatures of the VIIRS 11.2 and 12.3 \(\mu\)m bands respectively.
- \(\theta\) is the solar zenith angle.
- \(a_0, \ldots, a_4\) are regression coefficients for the \(\theta\)-IGBP surface type for daytime and nighttime LST retrieval respectively.

LST Product and Validation

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

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.