

**VIIRS Aerosol Optical Thickness (AOT) and Aerosol Particle Size Parameter (APSP)
EDR Release, Beta Data Quality
November 27, 2012
Read-me for Data Users**

The JPSS Algorithm Engineering Review Board (AERB) released the VIIRS Aerosol Optical Thickness and Aerosol Particle Size Parameter Environmental Data Record (EDR) to the public with a Beta level maturity as of May 2, 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 Aerosol Optical Thickness (AOT) and Aerosol Particle Size Parameter (APSP) EDR.

1. **The AOT & APSP data is not useable between October 15, 2012 and November 27, 2012.** An inadvertent error was introduced in the operational IDPS Aerosol code on October 15 at 15:19 GMT, invalidating the Aerosol beta maturity results. The error was fixed on November 27, 2012 at 16:00 GMT. Users should be aware that within this timeframe, AOT values were retrieved for confidently cloudy areas (as determined by the VIIRS Cloud Mask) where there should not have been retrievals, leading to increased AOT values and significantly degraded products.
2. AOT is a unitless value; however, the APSP is reported as Angstrom Wavelength Exponent.
3. The VIIRS Aerosol EDR contains the AOT for eleven wavelengths ranging from 0.412 to 2.250 microns as well as the Angstrom Exponent. These values are stored as 96 x 400 arrays of 16-bit integers with the corresponding scale and offset stored separately in the granule.
4. The VIIRS Aerosol EDR is derived from Intermediate Products (IPs) of like quantities retrieved for 8 x 8 moderate resolution (750 m) pixels. Note that pixel resolution can be slightly larger at the edge of scan.
5. There is a significant difference in quality between APSP over ocean and that over land. The APSP over land data has no quantitative value; however the overall VIIRS Aerosol EDR product is still declared Beta because:
 - a. AOT and APSP are contained within the same product; the quality of APSP over land should not prevent users from obtaining AOT.
 - b. APSP is derived from spectral AOT, and users may calculate it even if the APSP product is not provided.
 - c. Users have dealt with this shortcoming for MODIS as the MODIS Aerosol Team has stated that Angstrom Exponent over land from MODIS has no quantitative value, even though it is available in the same product file with AOT.

6. The following are known issues with the VIIRS Aerosol EDR:
 - a. There is an overall significant high bias in AOT over land, away from deserts.
 - b. There is an artificially high AOT in the snow melt region.
 - c. There is a low bias in AOT over ocean in dust outflow regions.
 - d. The proportion of AOT attributed to small particles is unexpectedly too high over ocean.
 - e. There are missing data in the bowtie deletion region.
 - f. The internal fire test fails to find any fires, even when large fires are known to be active. Several other internal tests (e.g., bright pixel flag) need further evaluation to determine performance.
 - g. The Angstrom Exponent out of range flag occurs only at extreme high latitudes, which seems unlikely.
 - h. Snow and ice are present in unexpected areas.
 - i. The “Bad SDR Data” quality flag is set incorrectly, with too many pixels being flagged..
 - j. In heavy dust/smoke plume regions, AOT could be flagged as out of range.
7. The next steps in the VIIRS Aerosol EDR validation process, to move the product to Provisional maturity, include the following:
 - a. Perform collocations against AERosol RObotic NETwork (AERONET) / Maritime Aerosol Network (MAN) data over ocean.
 - b. Determine reasons for high AOT bias over land and for high APSP bias over ocean.
 - c. Determine whether there is possibility for skill in Angstrom Exponent over land.
 - d. Tune thresholds to improve detection of dust over water.
 - e. Implement revisions to sub-pixel snow/ice mask tests to avoid issues with spring thaw.
 - f. Evaluate and improve internal tests to flag bright pixels, ephemeral water, fires, etc.
 - g. Continue investigations beyond the initial one month of analysis.

More information about VIIRS and VIIRS aerosol products can be found at the following websites, where users can find the Algorithm Theoretical Basis Document (ATBD), Operational Algorithm Description (OAD) document, Common Data Format Control Book (CDFCB), and product examples:

<http://www.star.nesdis.noaa.gov/smcd/emb/aerosols/index.php>

<http://npp.gsfc.nasa.gov/science/documents.html>

Additionally, the VIIRS Sensor Data Record (SDR) Beta quality Read-me document is available at:

http://www.class.ncdc.noaa.gov/notification/pdfs/120615_VIIRS_SDR_Release_v2.pdf

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