

GOES-17 ABI L2+ Volcanic Ash (VAA) Release  
Beta Data Quality  
September 28, 2018  
Read-Me for Data Users

The GOES-17 Advanced Baseline Imager (ABI) L2+ Volcanic Ash (VAA) 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 L2+ volcanic ash product determines for each earth-navigated pixel the likelihood the pixel contains volcanic ash using confidence categories. The confidence categories, while not a requirement or official product, are used to determine which pixels to perform volcanic ash height and mass loading retrievals, which are the official volcanic ash products. The volcanic ash height retrievals have units of km and volcanic ash mass loading retrievals have units of tons / km<sup>2</sup> (numerically equivalent to g/m<sup>2</sup>). The ash height retrievals are for the highest ash cloud layer, although multiple layers may be present. The mass loading is a column-integrated quantity. The volcanic ash algorithm uses only infrared channels. The volcanic ash products are generated for every ABI Full Disk (FD) of the Earth—as dictated by the ABI requirements—volcanic ash products are NOT generated for the CONUS or Mesoscale domains.

A full description and format of the VAA product 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 VAA products from GOES-16 ABI observations is described in detail in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Volcanic Ash (Detection and Height)" ([https://www.goes-r.gov/products/ATBDs/baseline/Aviation\\_VolAsh\\_v2.0\\_no\\_color.pdf](https://www.goes-r.gov/products/ATBDs/baseline/Aviation_VolAsh_v2.0_no_color.pdf)).

Beta maturity, by definition, means that:

- 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 Volcanic Ash products for any reason, including but not limited to scientific and technical investigations, are encouraged to consult the NOAA algorithm working group (AWG) scientists for feasibility of the planned applications. This product is sensitive to upstream processing, such as calibration and navigation.

Known issues at the Beta validation stage include:

1. Missing values may be present due to upstream L1b issues.
2. Focal Plane Module (FPM) overheating significantly impacts the GOES-17 ABI infrared channels utilized by the baseline volcanic ash algorithm. Product accuracy will be significantly degraded and missing values will be common during overheating periods.
3. Co-registration errors commonly cause false detection of ash at cloud edges and in convective clouds.
4. The GOES-17 volcanic ash products are not required to accurately flag pixels that contain volcanic ash. The ash cloud height and mass loading products are generated for all pixels that have a multi-spectral infrared signal that is reasonably consistent with volcanic ash. As such, many pixels that do not contain ash will have valid ash height and loading values, especially in stratus regions and under clear sky conditions over land. It is up to users to filter out non-ash pixels with valid height and loading values. While the ash confidence flag is sometimes helpful for filtering the ash height and loading products, there is no single confidence level threshold that works consistently well.
5. The validation analysis has been significantly limited by L1b data issues combined with a lack of volcanic clouds observed by GOES-17 that are coincident with “truth” data sets such as lidars.
6. The GOES-17 volcanic ash products are not designed to detect optically thick umbrella clouds produced by explosive events (e.g. 3 June 2018 Fuego event). Thus, the ash height and mass loading products will often be missing in volcanic umbrella clouds, especially in the early stages of development.
7. The baseline GOES-R ABI volcanic ash algorithm was finalized in 2010 and does not represent the latest state of the science. The science has evolved significantly since 2010, so users are cautioned that the baseline GOES-R volcanic ash products were not designed for advanced applications such as eruption alerting and integration with dispersion models. Users interested in more advanced products are referred to the VOLcanic Cloud Analysis Toolkit (VOLCAT) (<https://volcano.ssec.wisc.edu>), which generates more advanced products using a variety of satellites, including GOES-16. However, the VOLCAT products are currently non-operational and are supported on a best effort basis.

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