Why is the OMPS Ash-Smoke Index Important?
The OMPS UV Ash-Smoke Index (ASI) identifies UV-absorbing aerosols such as smoke, dust, and ash above or mixed with clouds. High concentrations of volcanic ash can severely damage aircraft engines and cause them to shutdown. High concentrations of smoke can cause health and visibility problems both in the air and on the ground. The ASI can detect smoke, dust, and ash that are above or mixed in clouds since cloud droplets scatter UV radiation and do not absorb it. The magnitude of the ASI is sensitive to altitude so similar concentrations at higher altitudes will have higher values.

OMPS Ash-Smoke Index Attributes

<table>
<thead>
<tr>
<th>Satellites</th>
<th>Res.</th>
<th>OMPS Bands (µm)</th>
<th>Physically Relates to…</th>
<th>Small index values indicate…</th>
<th>Large Index values indicate…</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNPP</td>
<td>50 km</td>
<td>0.342 µm, 0.367 µm</td>
<td>Aerosol UV light absorption related to the difference (or residual) between actual radiances and an idealized Rayleigh model of radiances that do not include aerosols.</td>
<td>Low aerosol concentrations or lower plume altitudes. Low residuals. Min = 1.0</td>
<td>High aerosol concentrations at higher altitudes (volcanic ash, smoke or dust). Large residuals. Max = 3.0</td>
</tr>
<tr>
<td>NOAA-20</td>
<td>17 km</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOAA-21</td>
<td>10 km</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Impact on Operations

Aviation advisories: Provides the location and spatial extent of potentially hazardous ash concentrations.
Multipurpose: Useful for tracking volcanic ash, smoke and dust.
All sky conditions: Identifies aerosols above or mixed in clouds.
Frequent coverage at high latitudes: LEO satellites pass near the poles with every orbit.
Better sensitivity: OMPS UV bands are more sensitive to UV-absorbing aerosols.
Low latency with Direct Broadcast: 15-30 min.

Limitations

Daytime only: Senses ultraviolet (UV) solar reflectances
Unable to identify aerosol type: Several aerosols are UV-absorbing (volcanic ash, smoke and dust). Additional information is needed to determine aerosol type.
Qualitative: Index does not provide concentrations.
Full column: Index does not provide information about the vertical distribution of aerosols; for similar concentrations, aerosols at higher altitudes will have higher Index values.
Course spatial resolution: The OMPS sensor on SNPP has resolution at 50 km, however, NOAA-20 and NOAA-21 OMPS resolution is 17 by 13 km.
Coverage: OMPS on LEO satellites has less frequent, but more global coverage than GEO.

Contributors: ¹Vince Realmuto, Nick Krotkov, Can Li, ²Carl Dierking

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OMPS Ash-Smoke Index

Quick Guide

OMPS AI Interpretation

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>Very high aerosol concentration</td>
</tr>
<tr>
<td>2.5</td>
<td>High aerosol concentrations</td>
</tr>
<tr>
<td>2.0</td>
<td>Low aerosol concentrations</td>
</tr>
<tr>
<td>1.5</td>
<td>Trace aerosols or noise</td>
</tr>
</tbody>
</table>

OMPS Products for AWIPS:
- Ash-Smoke Index
- SO2-TRM
- Ozone
- UV Reflectance (331 µm)

OMPS Ash-Smoke Index vs VIIRS Aerosol Optical Depth

The OMPS Ash-Smoke Index (ASI) is qualitative whereas the VIIRS Aerosol Optical Depth (AOD) is quantitative. The VIIRS AOD is less reliable in clouds and uses a cloud mask, however the OMPS ASI can detect smoke above and mixed with clouds. The VIIRS AOD may misinterpret thick smoke as clouds and be removed by the cloud mask. OMPS ASI resolution ranges from 10 km on NOAA-21 to 50 km on SNPP. The VIIRS AOD resolution is much higher at 750m.

Resources

NOAA NESDIS OMPS Page

NASA OMPS Page
https://ozoneaq.gsfc.nasa.gov/omps/

Near Real-time OMPS Data
https://worldview.earthdata.nasa.gov/
Real-time OMPS
https://proto.gina.alaska.edu/dis/tro/aerosols/
https://sampo.fmi.fi/

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