**Why are the OMPS and VIIRS SO₂ Products Important?**

Volcanic sulfur dioxide gas (SO₂) is often co-located with ash emitted from volcanic eruptions. Although ash poses significant threat to aviation safety, high concentrations of SO₂ can also adversely affect in-cabin air quality and the health of crew and passengers. Direct broadcast OMPS and VIIRS SO₂ products have low-latency and high selectivity to volcanic plumes, thus providing valuable information for mitigating volcanic aviation hazards. The VIIRS SO₂ product also provides the ability to monitor volcanic hazards at night.

**How are the OMPS and VIIRS SO₂ Products Created?**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pixel Size [km]</th>
<th>Spectral Bands (µm)</th>
<th>Physically Relates to…</th>
<th>Small contribution to pixel indicates…</th>
<th>Large Contribution to pixel indicates…</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMPS SO₂</td>
<td>50 (SNPP)</td>
<td>0.31µm 0.34µm</td>
<td>Column SO₂ amounts in Dobson Units [DU]</td>
<td>Low SO₂ amount Min = 0.0 DU</td>
<td>High SO₂ amount Max = 2.0 DU</td>
</tr>
<tr>
<td></td>
<td>17 (NOAA-20)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>10 (NOAA-21)</td>
<td></td>
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</tr>
<tr>
<td>VIIRS SO₂</td>
<td>.75</td>
<td>m14 (8.5µm) minus MAX[m14 (8.5µm), m15 (11µm), m16 (12µm)]</td>
<td>SO₂ content, Temp. contrast (ΔT) between cloud and surface</td>
<td>Minor SO₂ amount and/or small ΔT Min = 0</td>
<td>Major SO₂ amount and/or large ΔT Max = 100</td>
</tr>
</tbody>
</table>

**Impact on Operations**

**Aviation health hazard:** high concentrations may affect health of crew and passengers.

**Aid to ash plume location:** initially co-located with volcanic ash plume.

**Specific for SO₂:** tuned for only SO₂ plumes simplifying interpretation.

**Frequent coverage at high latitudes.**

**VIIRS**

**24 hour detection:** uses mid-longwave thermal radiation bands available day or night.

**High spatial resolution:** 750 m

**OMPS**

**Quantitative:** concentrations in Dobson units (DU).

**Limitations**

**OMPS**

**Daytime only:** uses solar UV reflectances.

**Noise artifacts:** speckles from noise may occur at times (also stripes with SNPP).

**Resolution varies:** dependent on satellite.

**VIIRS**

**WV artifacts:** water vapor absorption can mimic SO₂, especially near the swath edge.

**Surface Minerals:** Emissivity of surface minerals (esp. quartz and gypsum) can mimic SO₂.

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OMPS SO$_2$ at 0005 UTC (upper) and VIIRS SO$_2$ Index at 1209 UTC (lower) on 13 April 2023 after eruption of Sheveluch Volcano on Kamchatka Peninsula. SO$_2$ plumes are observed in the Aleutians and portions of the Gulf of Alaska.

ABI SO$_2$ RGB (GEO) vs VIIRS SO$_2$ INDEX (LEO):
Nadir view from VIIRS results in less geometric distortion and parallax. VIIRS offers more detail with superior resolution (750 m) of the SO$_2$ plume. ABI SO$_2$ RGB has much higher frequency but requires subjective interpretation of colors.

Resources
Day-Night Monitoring of Volcanic SO$_2$ and Ash Clouds for Aviation Avoidance at Northern Latitudes


Real-time Data
https://www.star.nesdis.noaa.gov/map
https://proto.gina.alaska.edu/distro/aerosols/

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