Geophysical Research Abstracts,
Vol. 10, EGU2008-A-01701, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-01701
EGU General Assembly 2008

The NOAA/NASA OMI/AIRS system for volcanic ash, aerosol and SO2 cloud monitoring from space

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The Ozone Monitoring Instrument (OMI) on the NASA EOS/Aura research satellite allows measurement of SO2 concentrations at UV wavelengths with daily global coverage. SO2 is detected from space using its strong absorption band structure in the near UV (300-320 nm) as well as in IR bands near 7.3 and 8.6 microns. Thirty years of UV SO2 measurements with the Total Ozone Mapping Spectrometer (TOMS) and OMI sensors have shown that the highest concentrations of SO2 occur in volcanic clouds produced by explosive magmatic eruptions, which also emit ash. However, icing of ash particles in water-rich eruption clouds, and/or suppression of the IR split-window signal by ambient water vapor or cloud opacity can inhibit direct detection of ash from space. Large SO2 concentrations are therefore a reliable indicator of the presence of airborne volcanic ash. UV SO2 measurements are very robust and are insensitive to the factors that confound IR data. SO2 and ash can be detected in a very fresh eruption cloud due to sunlight backscattering and ash presence can be confirmed by UV derived aerosol index measurements. The lack of other large point sources of SO2 facilitates development and implementation of automated searches for volcanic clouds with a very low false alarm rate.

The NASA Earth Sciences Applications Office has funded a cooperative agreement between UMBC, NOAA, GSFC, and USGS to infuse research satellite SO2 data

products into volcanic hazard Decision Support Systems (DSSs) operated by the National Oceanic and Atmospheric Administration (NOAA) and the US Geological Survey (USGS). This will provide aviation alerts to the Federal Aviation Administration (FAA), that will reduce false alarms and permit more robust detection and tracking of volcanic clouds, and includes the development of an eruption alarm system, and potential recognition of pre-eruptive volcanic degassing. Near real-time (NRT) observations of SO2 and volcanic ash can therefore be incorporated into data products compatible with Decision Support Tools (DSTs) in use at Volcanic Ash Advisory Centers (VAACs) in Washington and Anchorage, and the USGS Volcano Observatories.

In this poster we show the latest NOAA Office of Satellite Data Processing and Distribution (OSDPD) development of an online NRT image and data product distribution system that generates eruption alarms, allows the extraction of volcanic cloud subsets for special processing, and provides access to analysis tools and graphical products derived from the OMI and the Atmospheric Infrared Sounder (AIRS) Instrument. Products are infused into DSTs including the Volcanic Ash Coordination Tool (VACT), under development by the NOAA Forecast Systems Laboratory and the FAA's Oceanic Weather Product Development Team (OWPDT), to monitor and track, drifting volcanic clouds.