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Utilization of Multiple Satellites for Automated Volcanic Cloud Identification, Tracking, and Characterization

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Volcanic clouds, which are an aviation hazard, are complex and the background environment in which they reside can be as well. Thus, sophisticated, automated, remote sensing algorithms are needed to transform large volumes of satellite data into actionable information for increasing the timeliness and value of volcanic ash advisories and forecasts. The need for automated algorithms has never been greater as data volumes are significantly increasing with the advent of the next generation of operational meteorological satellites. In addition, no single satellite sensor provides optimal spatial, temporal, and spectral capabilities for accurately detecting and characterizing all types of volcanic clouds. In an effort to fully utilize geostationary and low earth orbit satellite measurements for real-time volcanic cloud applications, National Oceanic and Atmospheric Administration (NOAA), in collaboration with the University of Wisconsin, has developed the Volcanic Cloud Analysis Toolkit (VOLCAT). VOLCAT utilizes many different satellite sensors and non-satellite data sources to generate alerts when volcanic unrest or an eruption is detected. VOLCAT also automatically tracks and characterizes volcanic clouds and provides information needed to constrain and validate dispersion model forecasts. Through advanced use of spectral, spatial, and temporal information, the VOLCAT algorithms are capable of automatically detecting a broad range of volcanic clouds, including opaque multi-component (ash, ice, and SO2) clouds. Several Volcanic Ash Advisory Centers and volcano observatories utilize VOLCAT products. An overview of the unique VOLCAT algorithm suite, along with examples that illustrate the benefits of a multi-sensor approach, will be presented.