

GOES-R Volcanic Ash Risk Reduction: Operational decision support within NOAA's Rapid Refresh (RAP)

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Abstract

A volcanic ash detection and height baseline product will be available with the 2016 launch of the new Advanced Baseline Imager (ABI) instrument aboard NOAA's Geostationary Operational Environmental Satellite R-Series (GOES-R) satellite. The developed volcanic ash cloud algorithm retrieves parameters such as heights and mass loadings of volcanic ash clouds, cloud emissivity, information on cloud optical depth and effective particle radius of ash particles. We aim to evaluate the algorithm to provide pathways to support quality control of GOES-R ash retrievals.

A volcanic emission model was previously included within the numerical Weather Research Forecast (WRF) model with online Chemistry (WRF-Chem), and model evaluation was performed within the current GOES-R initiative. As a first goal we propose to conduct further case studies with WRF-Chem to confirm and validate the GOES-R volcanic ash algorithm for a wide range of types and magnitudes of volcanic eruptions worldwide and build upon the current GOES-R research. Modeled ash clouds will be compared with the GOES-R volcanic ash algorithm using MODIS and VIIRS data. As a second goal we will prepare a pathway to operations, implement volcanic ash parameters within NOAA's Rapid Refresh (RAP) modeling system, further prepare the modeling framework to initialize operational ash prediction models with GOES-R data. As a first step, the volcanic emission model used for the WRF-Chem model will be implemented into the RAP system. Since for operational applications computational efficiency is of extreme importance we will limit the additional complexity to only the most important parameters. We then perform RAP volcanic ash predictions of historic cases in a model setting very similar to the used hourly updated operational RAP setup. Computational costs and ash dispersion will be validated. Based upon RAP performance, volcanic ash will be included in the operational runs of NOAA National Centers for Environmental Prediction RAP. The aim is to build an improved volcanic ash decision support system that NOAA can use within the Volcanic Ash Advisory Center (VAAC) system. While this system may also be used with other operational systems, the RAP – because of its hourly update cycle – is ideally suited for this application over the North American domain.