

CCSM Volcanic Eruptions Use Case

Compiled Mar. 2022 by Model Data RCN team

Summary

Weighted rubric score - 61

Category - Preserve selected simulation workflow outputs

- Use Case Description
 - High-level overview of the use case
 - Using volcanic sulfur dioxide emissions in an aerosol-climate model, the researchers derived a time series of global-mean volcanic effective radiative forcing (ERF) from 1979 to 2015.
 - This project continues a previous paper and describes development for new simulation capabilities of volcanic eruptions in the WACCM model. The insertion of new emission data of SO₂ allows for deeper understanding of chemical processes which ultimately helps understand cooling and heating.
 - Published journal link:
 - <https://doi.org/10.1029/2018JD028776>
 - NCAR data repository link:
 - <https://doi.org/10.5065/D6C53JPS>
 - Science goals and basic workflow
 - The goal is to try to quantify how much volcanic eruptions impact climate. The project used new capabilities of WACCM to understand mechanisms by which volcanoes can affect climate.
 - The two files in the repository are from two different simulations, one with volcanic emissions included, and one without such emissions.
- What use-case specific additional materials were preserved and shared?
 - Data
 - Inputs to model
 - Used standard datasets already in the model. Collected emissions data and made into a model-readable file, which is also publicly available:
 - Two versions available:
 - NCAR has model readable format (4D emissions file)
 - Simple version hosted in UK database of volcanic eruptions. (Created by Ryan Neely, Anja Schmidt, named *VolcanEESM*.)

- Sources for volcanic mass of SO₂ and volcanic plume heights for eruptions came from the following (note, these are not listed in the data repository, but are listed in the paper):
- Publicly archived
 - Total Ozone Mapping Spectrometer (TOMS),
 - Ozone Monitoring Instrument (OMI),
 - Ozone Mapping Profile Suite (OMPS),
 - Infrared Atmospheric Sounding Interferometer (IASI),
 - Global Ozone Monitoring Experiment (GOME/2),
 - Atmospheric Infrared Sounder (AIRS),
 - Microwave Limb Sounder (MLS),
 - Michelson Interferometer for Passive Atmospheric Sounding (MIPAS),
 - and ground-based remote sensing or petrological methods.
- Plume height data:
 - based on published estimates of the eruption source parameters and reports from the Smithsonian Global Volcanism Program (<http://volcano.si.edu/>),
 - National Aeronautics and Space Administration (NASA)s Global Sulfur Dioxide Monitoring website (<http://so2.gsfc.nasa.gov/>),
 - Support to Aviation Control Service (<http://sacs.aeronomie.be/>)
- Raw model output
 - N/A
- Processed model output
 - Total data volume preserved in a repository by the PI
 - Model output uploaded to repository
 - Two files, around 73 MB each.
 - One simulation file includes volcanic sulfur dioxide emissions within parameterization while the other does not.
 - Each contains a large number of atmospheric variables, as well as latitude, longitude, and time.
 - Monthly averages were created, however the files in this data set contain global averages.
 - Total data volume not preserved in a repository? (might be retained on PI's local working storage)
 - The researchers generated monthly atmospheric output and reduced those files by average lat/long. The simulations included all atmospheric output, as well as

