EGU21-7916
https://doi.org/10.5194/egusphere-egu21-7916
EGU General Assembly 2021

Calculating the Height and the Position of Volcanic Cloud SO_2 With a Lagrangian Trajectory Tool

Nick Gorkavyi[1], Nickolay Krotkov[2], Can Li[3], Leslie Lait[1], Simon Carn[4], Peter Colarco[2], Nikita Fedkin[3], Matthew DeLand[1], Mark Schoeberl[5], Alexander Vasilkov[1], and Joanna Joiner[2]

[1]United States of America (nick.gorkavyi@ssaihq.com)
[2]NASA, Goddard Space Flight Center, Greenbelt, MD, USA
[3]University of Maryland, College Park, MD, USA
[4]Michigan Technological University, Houghton, MI, USA
[5]Science and Technology Corporation, Columbia, MD, USA

We have developed a new trajectory tool to reconstruct the altitude and the position of SO_2 in a volcanic plume. Starting with 2D map of satellite observed SO_2, known volcano location, and reanalysis wind fields from the NASA Goddard Earth Observing System (GEOS) model, the Goddard trajectory tool allows us to estimate the altitude and concentration of SO_2 in the volcanic plume at time of observation. We used this tool for the June 21, 2019 Mt. Raikoke eruption and the June 15, 1991 Mt. Pinatubo event. We used SO_2 data from the Ozone Mapping and Profiler Suite/Nadir Mapper (OMPS/NM) onboard the NASA-NOAA Suomi satellite and obtained a distribution of SO_2 altitudes between 1 and 19 kilometers in different parts of the Raikoke SO_2 clouds, with the highest SO_2 concentration between 11 and 16 km, in good agreement with data from independent SO_2 layer height retrievals from the Ozone Monitoring Instrument (OMI) aboard the NASA Aura spacecraft; the Tropospheric Monitoring Instrument (TROPOMI) onboard the European Copernicus Sentinel 5 precursor satellite and Infrared Atmospheric Sounding Interferometer (IASI) on the European Space Agency's (ESA) MetOp series of a polar orbiting satellites. We then applied this method to the Pinatubo eruption using SO_2 column measurements from the NASA Total Ozone Mapping Spectrometer (TOMS) and using wind fields from the National Centers for Environmental Prediction Reanalysis version 2. We found that the southern part of the Pinatubo plume is located in the troposphere, and the northern part is in the stratosphere.