EGU21-10523
https://doi.org/10.5194/egusphere-egu21-10523
EGU General Assembly 2021

Uncertainty in limb aerosol measurements following the Raikoke eruption

Landon Rieger[1], Adam Bourassa[1], Daniel Zawada[1], Doug Degenstein[1], Sergey Khaykin[2], and Ghassan Taha[3]

[1]Institute of Space and Atmospheric Science, University of Saskatchewan, Saskatoon, Canada
[2]Laboratoire atmosphères, milieux, observations spatiales, IPSL, Guyancourt, France
[3]Universities Space Research Association, Greenbelt, USA

The eruption of Raikoke on June 22nd, 2019 was one of the largest in recent decades, spewing approximately 1.5 Tg of sulfur up to 17 km altitude. This eruption has been widely studied using a combination of climate models and measurement systems, including ground based lidars, in situ particle counters, and a variety of satellite platforms. The early plume has been well categorized by high-resolution measurements from CALIPSO, MODIS, VIIRS, IASI and other nadir viewing instruments, but as the plume ages investigation often shifts to limb sounding instruments that provide greater sensitivity to lower aerosol levels. These instruments have proven critical in understanding the long-term radiative and climatic impacts of stratospheric aerosol burdens after these explosive events, but the complexity of the measurements, sampling, and retrievals has made error characterization in high-loading conditions difficult.

This work explores systematic biases in limb measurements after the Raikoke eruption due to a variety of factors often implicit in the retrievals and analysis. Near-coincident CALIPSO, SAGE III and OMPS-LP measurements are used to investigate saturation of limb-sounding measurement in the early plume. The recent OMPS-LP v2 stratospheric aerosol product is compared with the University of Saskatchewan product to investigate benefits and drawbacks of the tomographic approach. SAGE III measurements are used as a validation when available although coverage limitations preclude comparisons in the thickest parts of the plume. This work highlights the subtleties in comparing limb observations, with implications for model comparisons after large events such as volcanic eruptions and forest fires. Not only in the early plume, where sampling can be sparse, but also in the weeks and months following the eruption.