

Supporting Information for "Aerosol characterization of the stratospheric plume from the volcanic eruption at Hunga Tonga January 15th 2022"

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Contents of this file

1. Text S1 to Movie S1 MSG-1: MSG-1 is one of the operational Meteosat Second Generation (MSG, designed and produced by ESA) geostationary satellites located at 45°E. It provides detailed imageries of the Earth since January 2004. In this study, we use the operational Eumetrain Ash RGB recipe to distinguish between clouds, SO₂ and ash signals. It uses the brightness temperatures (BT in K) of the three channels: 8.5, 10.4 and 12.3 256 μm. The recipe for the three color indexes ranging from 0 to 1 is $R = (BT(12.3) - BT(10.4) + 257.4)/6$, $G = (BT(10.4) - BT(8.5) + 4)/9$, $B = (BT(10.4) - 243)/60$

2. Movie S1 An animation of MSG-1 brightness temperature observations (Da, 2015) with the Eumetrain RGB recipe (Eumetrain, 2020).

3. Text S2 to Figure S2 OMPS: The Ozone Mapping Profiler Suite Limb Profiler (OMPS-LP) onboard the Suomi National Polar-orbiting Partnership satellite provides aerosol extinction and ozone observations since October 2011. Here, we use the aerosol extinction measurements version 2.0 at 745 nm and the integrated stratospheric Aerosol Optical Depth (Taha et al., 2021) together with the respectively provided tropopause altitude (from MERRA-2, e.g. (Gelaro et al., 2017)).

4. Text S3 to Figure S3 CALIOP/CALIPSO: The Cloud-Aerosol Lidar with Orthogonal Polarisation (CALIOP) instrument onboard the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellite measures attenuated backscatter profiles at 532 nm. During 20-25 January CALIOP did not provide observations because of the solar activity. Here, we use observations along one orbit in Figure S3, supporting LOAC observations from 26/01.

5. Figure S2

Figure S1-S3 below

References

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10.5194/amt-14-1015-2021

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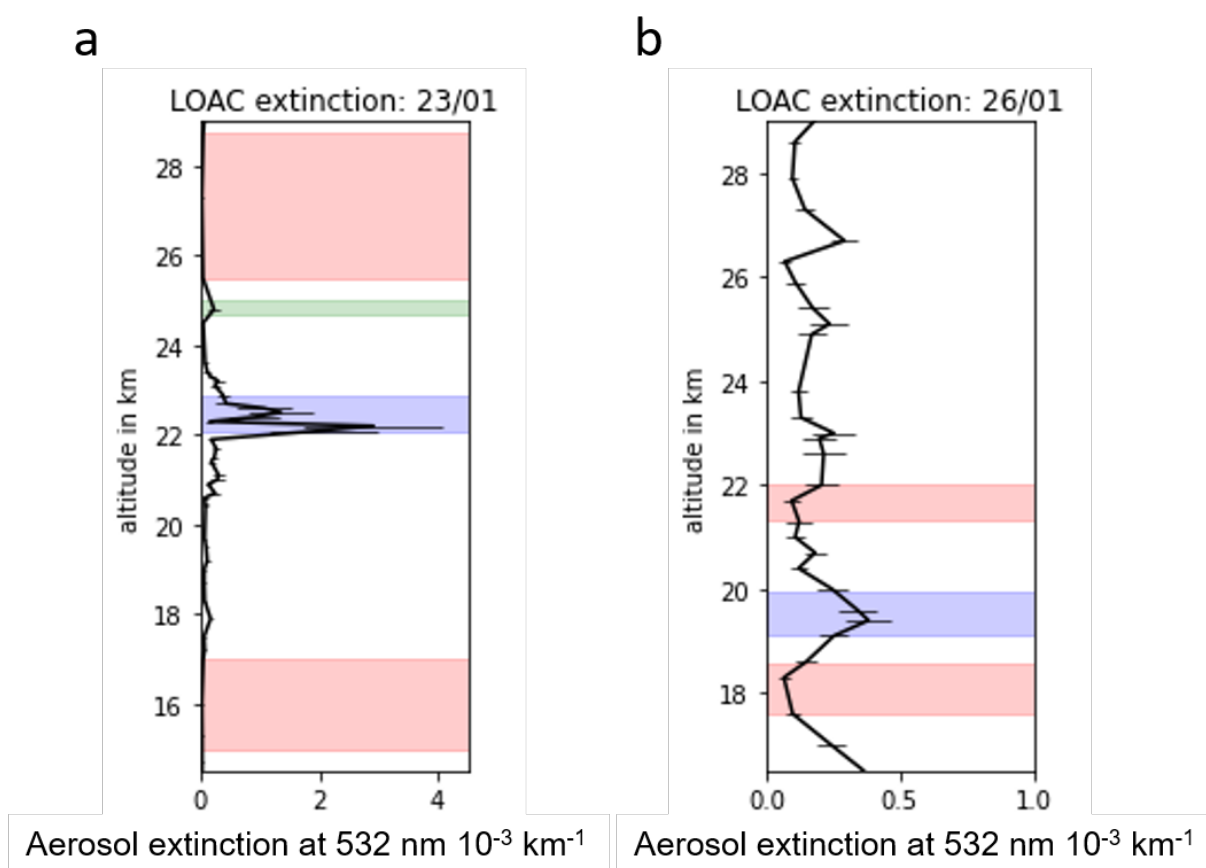


Figure S1. Aerosol extinction values derived from LOAC observations with selected plume and background altitude ranges as presented on the right side of Figure 2.

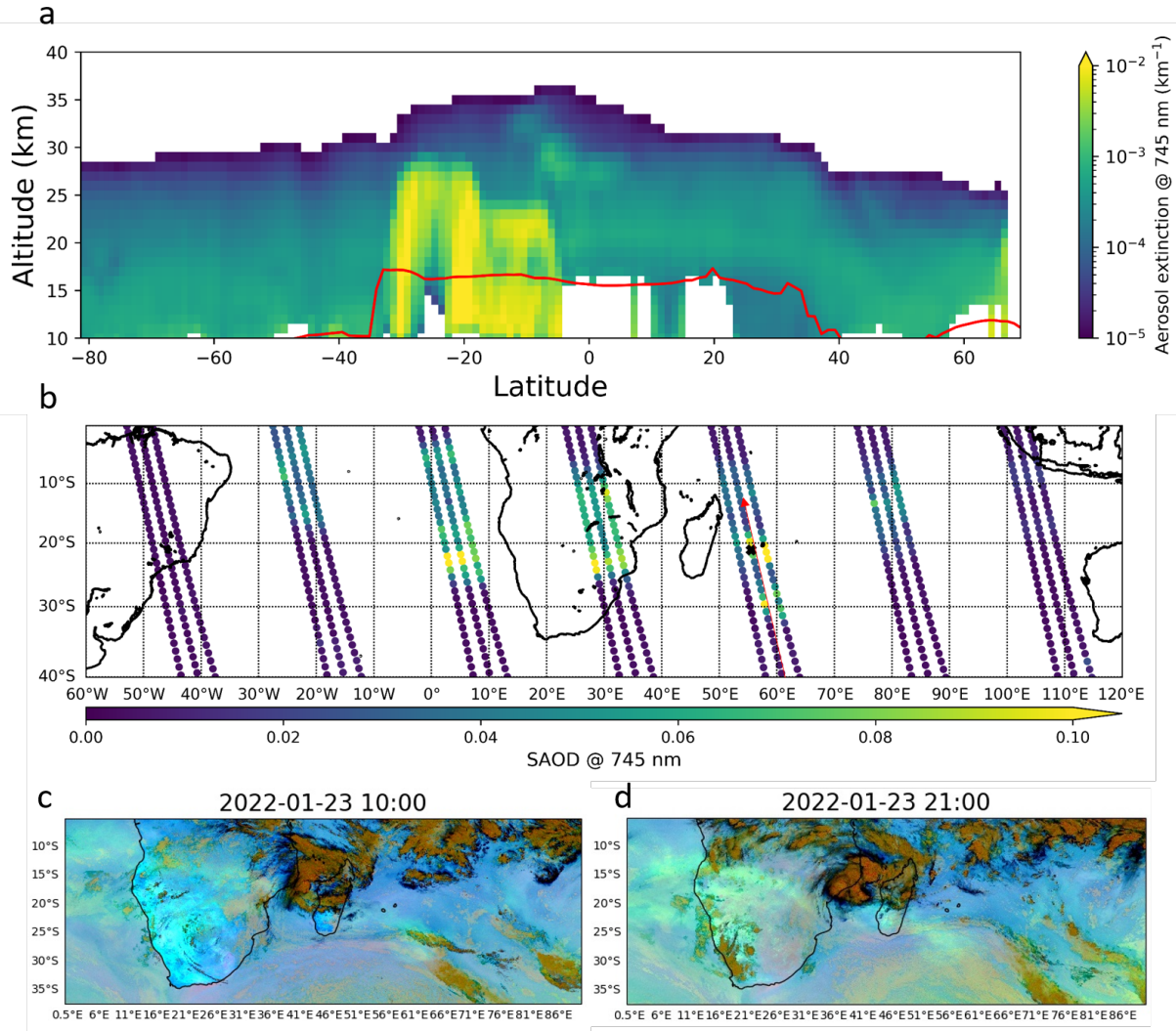


Figure S2. (a) OMPS aerosol extinction curtain plot at 745 nm (center slit) according to the observational track as indicated in (b) on 23/01 (measurements at La Réunion at around 10:00 UTC). The red line in (a) represents the tropopause altitude. (b) respective stratospheric AOD values. (c) and (d) show the horizontal plume distribution with the MSG-1 RGB recipe, at the time of the OMPS overpass in (c) and at 21:00 UTC during the time of the LOAC observations (20:04-21:35 UTC) (d).

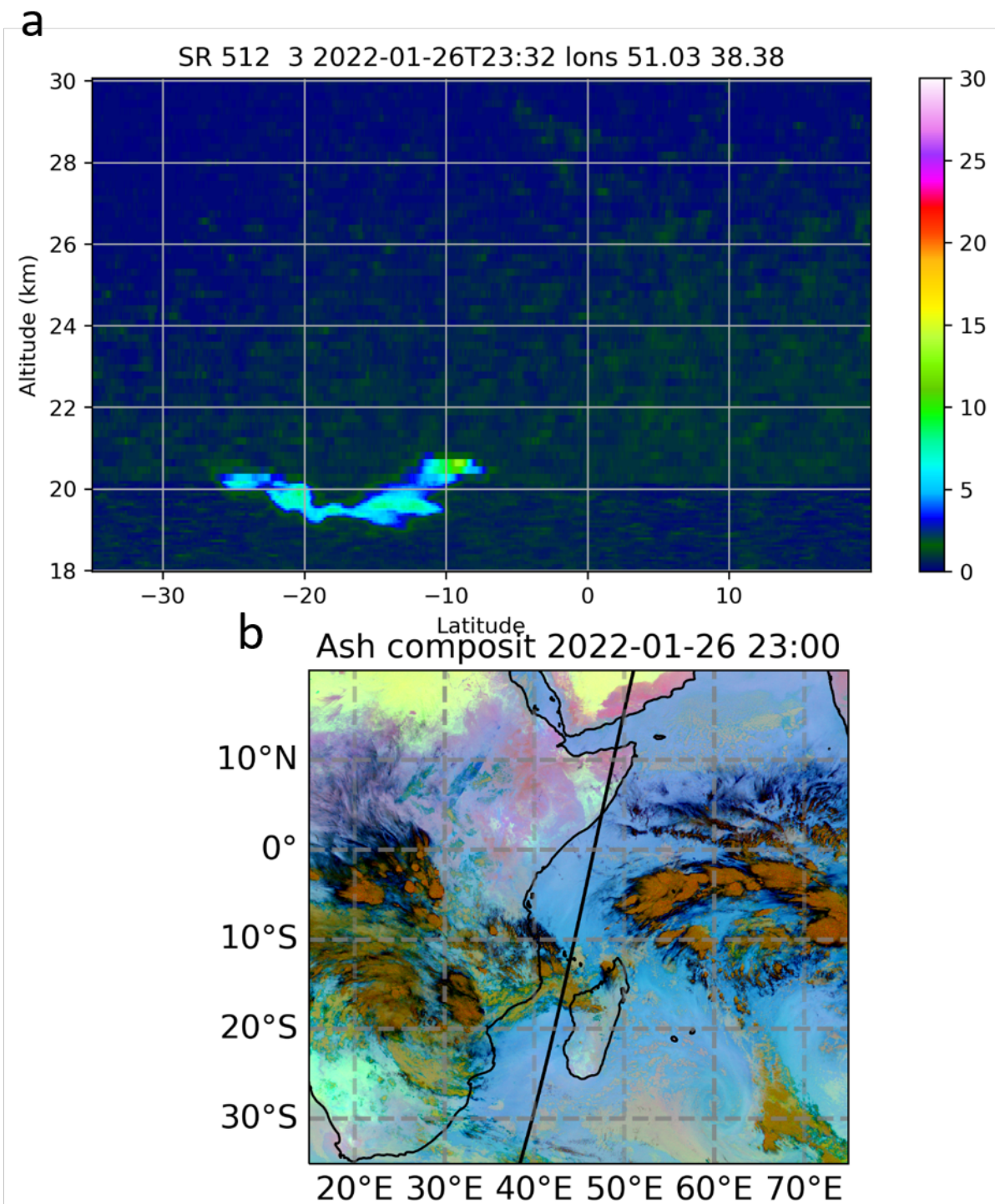


Figure S3. (a) CALIOP aerosol 532 nm backscatter ratio observations along the orbit track (orbit: 2022-01-26T23_03_33ZN) as indicated in (b). (b) The respective MSG-1 (with RGB recipe) observations during the CALIOP overpass.