Supporting Information for "Global perturbation of the stratospheric aerosol layer and climatic impact associated with the Ambae (Vanuatu) eruption of July 2018"

Corinna Kloss[1], Pasquale Sellitto[2], Bernard Legras[3], Jean-Paul Vernier[4,5], Fabrice Jégou[1], M. Venkat Ratnam[6], B. Suneel Kumar[7], B. Lakshmi Madhavan[6], Gwenaël Berthet[1]

[1]Laboratoire de Physique et Chimie de l'Environnement et de l'Espace, CNRS/Université d'Orléans, UMR 7328, Orléans, France

[2]Laboratoire Interuniversitaire des Systèmes Atmosphériques Université Paris-Est Créteil and Université Paris Diderot, CNRS, IPSL, UMR 7583, Créteil, France

[3]Laboratoire de Météorologie Dynamique, UMR 8539, CNRS – École-PSL/Sorbonne Université/École Polytechnique, Paris, France

[4]Science Systems and Applications, Inc, Hampton, Virginia, USA

[5]NASA Langley Research Center, Hampton, Virginia, USA

[6]National Atmospheric Research Laboratory, Department of Space, Gadanki-517112, India

[7]National balloon facility, TIFR, Hyderabad, India

Contents of this file Figures S1 to S3

Introduction

Below we attach three additional Figures, supporting the results shown in the main paper.

Supporting information for the injection of the volcanic plume of the April eruption at Ambae (Figure S1) : In the same manner as described in Section 2, the Himawari BT observations are used together with ERA5 temperature profiles to identify the injection altitude for the Ambae April eruption (Fig. S1). Fig. S1a shows the volcanic plume at a core BT-level of 193K, which corresponds to an injection altitude of around 17 km.

Supporting information for Figure 1-4 (Figure S2) Fig. S2 extends the area sampled by Fig. 3. It represents the geographical (Fig. S2a) and vertical distribution (Fig. S2b) of the well-developed (end of September 2018) Ambae volcanic aerosol plume in the global tropics, using CALIOP data.

Supporting information for Figure 2 (Figure S3) As seen in Fig 2, Fig S3(a) shows enhanced aerosol extinction values at 19-20 km altitude after the Ambae volcanic eruption and the subsequent injection into the UTLS of sulfur. To account for the less dense sampling of the SAGEIII/ISS instruments (compared to OMPS), wider areas and time frames were averaged (Fig S3). Fig S3(b) mirrors well the conclusions drawn from Fig. 2. The relatively higher aerosol extinction values in October 2018 (compared to the OMPS observations in Fig. 4) can be explained by the larger area over which SAGEIII/ISS profiles are averaged. Fig S3(c) represents the vertical distribution for the well distributed plume, as seen in Fig. 5.

References

Thomason, L. W., & Vernier, J.-P. (2013). Improved sage ii cloud/aerosol categorization and observations of the asian tropopause aerosol layer: 1989-2005. *Atmospheric Chemistry and Physics*, *13*(9), 4605–4616. Retrieved from `https://www.atmos-chem`

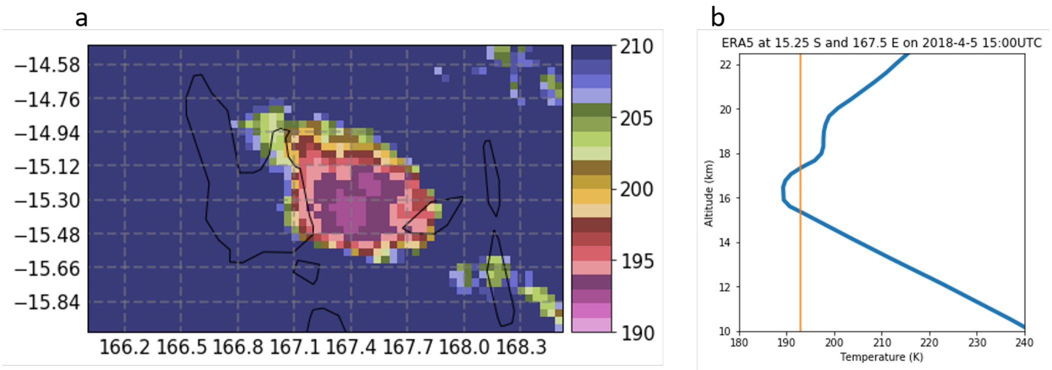

Figure S1. Same as for Fig. 1b and c for the determination of the injection altitude for the April eruption at Ambae.

-phys.net/13/4605/2013/ doi: 10.5194/acp-13-4605-2013

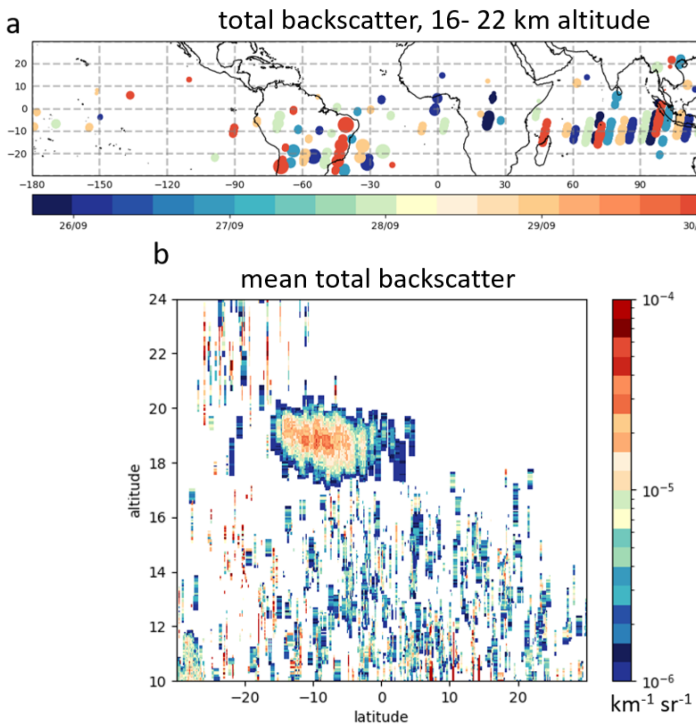

Figure S2. (a) CALIOP total backscatter individual observations in the global tropics (from 30°S to 30°N), integrated from 16 to 22 km during the end of September (25^{th} to 30^{th} 2018). Colors represent the overpass time and size represent the total backscatter value. (b) Mean total backscatter profiles as a function of the latitude integrated over all longitudes, in the same period as Fig. S2a.

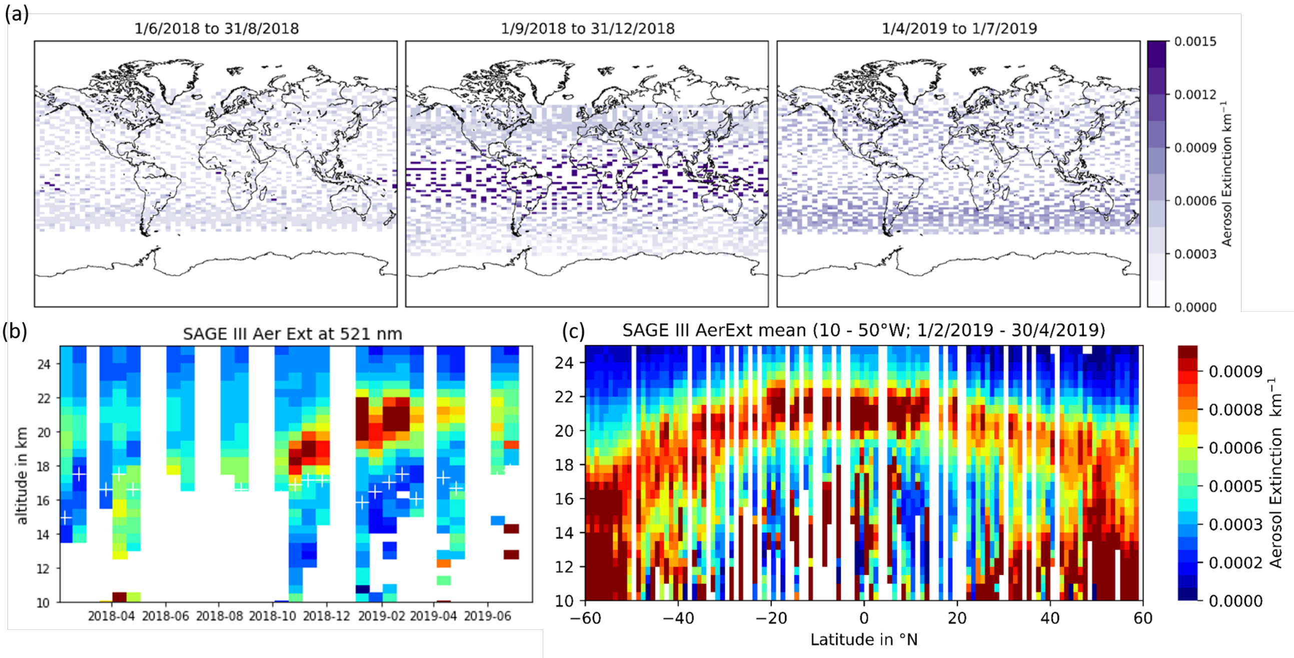

Figure S3. Same as for Fig. 2 in the manuscript with the SAGE III/ISS aerosol extinction data set (at 521 nm) averaged over 3 months each. (b) Same as for Fig 4(b) with the SAGEIII/ISS data set averaged over a larger area (11-26°N and 71-87°E). (c) Same as for Fig. 5 in February-March averaged over 10-50°E. The SAGEIII/ISS data have been cloud filtered using a simple criterion as described in Thomason and Vernier (2013): excluding values where the ratio of the aerosol extinction coefficient at 525 and 1020 nm is less than 2.