

Interactive comment on “Statistical analysis of the long-range transport of the 2015 Calbuco volcanic eruption from ground-based and space-borne observations” by Nelson Bègue et al.

Anonymous Referee #2

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Statistical analysis of the long-range transport of the 2015 Calbuco volcanic eruption from ground-based and space-borne observations.

In this study the authors presented results based on statistical analysis of the influence of the 2015 Calbuco eruption (Chile) on the total columnar aerosol optical properties over the Southern Hemisphere. In order to investigate the aerosol optical properties in the middle and upper troposphere injected by the Calbuco Volcano statistical analysis were applied to AERONET sunphotometer database at six stations of South America and three at African Continent. The analysis consisted on the retrieval of the AOD anomalies calculated by the relative difference of the daily AOD background as the

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reference values, for both sunphotometer and MODIS instrument. The transport and the spatio-temporal evolution of the volcanic plume were investigated using satellite data and air-masses back-trajectory model, allowing the increasing on the quality of the analyzes. On an overall, the study is clear, well presented and discussed. The study will contribute significantly to the understanding of the volcanic plumes transportation around the globe and all over South America region. Therefore, I would like to recommend the publishing of the manuscript after some revisions.

Major comments and suggestions:

Page 7 – line 1 to 6 – Are the authors using MODIS on board of Terra or Aqua satellite?

Page 11-line 21 to page 12-line 8 The discussion based on results presented on figure 1 are a bit confusing. Please, could the authors discuss in more details about SO_2 results from OMI, and mainly, a more detailed discussion about the retrieval of the air-masses trajectories presented on Fig. 1b? The authors also could enumerate as figure 1a), figure 1b and figure 1c), since the three of them are from a distinct method of retrieval. Please consider increase the quality of the figures since it is very difficult for the readers identify all the sites presented on figure 1a).

Page 12 – line 20 – the authors could consider increase the quality and the size of the figure 2. Please, consider increase the axis font size of the Extinction coefficient from CALIPSO data, and include a more detailed map of the site. Please consider also include the CALIPSO overpass trajectories, it could increase the understating and the visualization of the volcanic plume transportation all over the South America.

Page 12 – lines 20 to 22 – “On 26 April, extinction coefficients values greater or equal than 0.15 km^{-1} in link with the Calbuco eruption are observed near to the São Paulo site between 18 and 20 km (Fig. 2c).” The reference J. S. Lopes, F.; Silva, J.J.; Antuña Marrero, J.C.; Taha, G.; Landulfo, E. Synergetic Aerosol Layer Observation After the 2015 Calbuco Volcanic Eruption Event. Remote Sens. 2019, 11, 195. Discussed in detail the aerosol optical properties of Calbuco’s plume over São Paulo using lidar and

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CALIPSO data. Please, consider using this as reference.

Page 16 – lines 3 to 4 - the authors declare, “During the first days following the eruption, the AOD values obtained by LiDAR and sunphotometer observations ranges from 0.18 to 0.24 (Fig. 4e)”. It is not clear how the AOD values using the Bariloche lidar data were retrieved. It was using the Raman signal providing independent values of backscatter and extinction profiles of Calbuco ashes plume or applying Klett-Fernald-Sasano Method (KFS), based on AOD from AERONET? If the second case was applied, what is the error considered since the AOD from AERONET are retrieved by the total aerosol column and lidar can provide the AOD from a single aerosol plume? The AOD used in the KFS Method are the plume isolated AODp? The authors considered using other approach to retrieve the AOD from plume using the lidar data?

Section 5 – page 18 and 19 – it is not so clear the relation of Angström turbidity and Angström exponent, neither the Angström turbidity and the AOD variation. Please, consider discuss this point in more detail.

Minor comments and suggestions:

Please, consider increase the quality, the resolution and also the size of all figures. Please consider performing a complete typing revision, figure enumeration and citation. In addition, a complete revision on the citations throughout the text and in the references section.

Page 7 – line 17 – please correct the reference citation Lopez et al., 2012 – to Lopes et al., 2012

Please, consider correct the following reference: F. J. S. Lopes, G. L. Mariano, E. Landulfo and E. V. C. Mariano (September 12th 2012). Impacts of Biomass Burning in the Atmosphere of the Southeastern Region of Brazil Using Remote Sensing Systems, Atmospheric Aerosols - Regional Characteristics - Chemistry and Physics, Hayder Abdul-Razzak, IntechOpen, DOI: 10.5772/50406. Available from:

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<https://www.intechopen.com/books/atmospheric-aerosols-regional-characteristics-chemistry-and-physics/impacts-of-biomass-burning-in-the-atmosphere-of-the-southeastern-region-of-brazil-using-remote-sensi>

Page 10 – line 24 – Please, correct “are homogenous” sentence.

Page 15 – line 3 – the authors should mention figures 5e and 5f instead of fig 3e and 3f.

Page 15 – line 23 – the authors should mention figures 5e and 5f instead of figure 4e and 4f

Please, consider correct the following reference: J. S. Lopes, F.; Silva, J.J.; Antuña Marrero, J.C.; Taha, G.; Landulfo, E. Synergetic Aerosol Layer Observation After the 2015 Calbuco Volcanic Eruption Event. *Remote Sens.* 2019, 11, 195.

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