## Aerosol characterization in the Subtropical Eastern North Atlantic region derived from long-term AERONET measurements

África Barreto et al.

Referee Report #RC2

This study from A. Barreto et al. performs a multi-annual characterization of the columnar aerosol properties (AOD, AE, SSA, etc) obtained by AERONET at four sites in the Tenerife island, two of them representative of the marine boundary layer, and the other two representative of the free troposphere.

The location of the island and the instruments is privileged and the length of the different data series is notable (9 to 16 years) so the results are of evident interest for the scientific community. Although the techniques are not novel, they are extensively used, and the data analysis, the presentation and the use of English is good. My recommendation is to publish the article after few corrections listed below. No major general corrections are placed.

<u>Authors:</u> We appreciate the positive and constructive comments of the Referee. Below we respond to his/her specific comments.

Specific comments:

Abstract.

Line 4: "This site is can be..." please correct.

Authors: Done

Line 9: Please write Angstrom the same in all appearances in the text (A^o\_ngström)

Authors: Done

Line 90: I think ground-based is more adequate.

**Authors:** We agree with this comment. We have corrected this mistake in the text.

Lines 119-120: the limited availability of data at TPO is due to bad weather conditions. But, is the instrument removed from the site? I would bet it is, but it could be stated so in the text.

<u>**Authors:**</u> The instrumentation at TPO used to be removed from the station to avoid bad weather conditions. However, since Sept. 2020, the instrument is in operation at the station without interruption. We have included the following information in the text:

"SCO, LLO and IZO are devoted to continuous long-term monitoring. **AERONET** measurements at TPO, due to adverse weather conditions, are mainly available between mid-spring and mid-autumn, **having continuous records from September 2020.**"

## Line 170: What are the AE values recorded in background conditions? (only AOD in background conditions is indicated)

**<u>Authors:</u>** We agree with this comment. AE values have been included in the manuscript.

"In contrast to these dominating background conditions, higher  $AOD_{500nm}$  and lower  $AE_{440-870nm}$  values are recorded in July ( $AOD_{500nm}$  of  $0.15\pm0.16$  and  $AE_{440-870nm}$  of  $0.54\pm0.47$  at IZO;  $0.10\pm0.14$  and  $0.60\pm0.45$  at TPO) and August ( $0.13\pm0.14$  and  $0.53\pm0.43$  at IZO;  $0.07\pm0.09$  and  $0.63\pm0.42$  at TPO)."

Line 185: the slight increase in March merits a short explanation even if it is extracted from literature.

**<u>Authors:</u>** In the intermediate seasons (spring and fall) the Canaries are in the trajectory of the polar outbreaks or the tropical thunderstorms along the discontinuities between the marine and continental air masses (Bergametti et al., 1989), illustrating the extremely variable climatology in these transition months. This is the explanation of the highly variable conditions found in March-April and September-October.

Bergametti, G., Gomes, L., Coud-Gaussen, G., Rognon, P. and Le Coustumer, M. N.: African dust observed over Canary Islands: Source-regions identification and transport pattern for some summer situations, Journal of Geophysical Research: Atmospheres (94) D12, 14855-14864, 10.1029/JD094iD12p14855, 1989.

Line 206: it is said that the coarse mode in Figure 5 is slightly increased in the summer and spring months in case of LLO, but in the figure it seems the yellow line corresponding to June has the smaller coarse mode, even if summer. Not sure about all the months due to color and symbols. Some of them are hardly visible. Please consider to group them in seasons, or use only selected months, or increase the size of symbols.

**<u>Authors:</u>** The authors agree with this comment. Figs. 5 and 7 have been changed. We have used a code of colours according to the seasonality proposed by the referee, we have changed the symbols and the size of the figures as follows:



Figure 5.- Monthly mean aerosol particle size distribution at a) SCO, b) LLO, c) IZO and d) TPO under background conditions.



Figure 6.- Monthly mean aerosol particle size distribution at a) SCO, b) LLO, c) IZO and d) TPO under dust laden conditions.

Line 266: this line has been added in this manuscript version but it needs to be rewrited (grammar)

**Authors:** The authors have changed this sentence by this new one:

"Other authors, **such as** Nakajima et al. (2020, and references therein), suggest the possible underestimation of the coarse aerosols, especially for severe dust storms, as a consequence of the a priori constraint (very low dV(r)/dlnr) introduced in the AERONET inversion procedure for **aerosols** larger than 10  $\mu$ m."

Line 317: please rewrite the sentence.

**Authors:** The authors have changed this sentence by this new one:

"As stated in Section 2.1, SCO station is located in Santa Cruz de Tenerife, the capital of Tenerife, **a city affected by** a complex mixture of anthropogenic sources of pollutants (both on-road and maritime traffic and industrial emissions from an oil refinery) (Milford et al., 2020). "

## Line 325: are the two break points from SO2 obtained with same Lanzante method?

**<u>Authors:</u>** Yes, these break points were obtained with Lanzante Method. We have added this information in the text.

**Figures:** 

Figure 1, caption: "Image" instead of "imagen"

Authors: Done

Figure 2, why 1020 nm AOD and AE is not shown?

**<u>Authors:</u>** We have added the monthly mean AOD at 1020 nm in Figure 2 for four stations as follows:



Figure 2.- Monthly mean aerosol optical depth (AOD) at 440, 500, 675, 870 and 1020 nm and Ångström Exponent (AE<sub>440-870nm</sub>) SCO from April 2005 and December 2020 ((a) and (b)), at LLO between July 2006 and December 2020 ((c) and (d)), at IZO between from October 2004 and December 2020 ((e) and (f)) and at TPO between July 2012 and December 2020 ((g) and (h)). Error bars indicate the standard deviation.

Figure 9: Y-axis is "Asymetric" parameter. Please correct. Asymmetry parameter should be correct.

Authors: Done

Figure 9, caption: error bars is a more common term, instead of error brackets

Authors: Done