

Interactive comment on “Wintertime Aerosol Measurements during the Chilean Coastal Orographic Precipitation Experiment” by Sara Lynn Fults et al.

Anonymous Referee #1

Received and published: 28 June 2019

General Comments:

The paper describes aerosol data obtained in a 3-month observational study at a coastal site in Chile. Aerosol observations in this part of the world are rare so the data should be of interest to the community. Hence, I support publication of this work.

I offer some comments below that the authors can consider in revision. In general, I think some of the discussion of standard instruments and approaches could be streamlined or moved to the Appendix. The analyses and findings are fairly straightforward. Implications could be strengthened by additional comparison to observations that are clearly “clean marine”.

C1

Specific Comments:

Line 52: it's not clear how these aerosol indirect effects differ, as described here; please clarify. The Albrecht reference may refer to hypothesized increasing cloud lifetime and cloud cover due to increased aerosol?

Line 61: perhaps the VOCALS study should be cited as a contribution to Southern Hemisphere field work exploring aerosol-cloud interactions.

Line 70: I think you mean that the presence of SSA is associated with the presence of giant CCN that promote drizzle production.

Line 132: the particle size overestimate due to not being fully dried is discussed and a ballpark % given. However, it seems the data were not corrected for this. The CCN estimate will therefore be affected since critical supersaturation is very sensitive to size. Why wasn't this factored in? (Since a κ is assumed, the data could be corrected for water content if RH is known.) Could this overestimate be used to add uncertainties into the parameterization?

Line 136: what height was the inlet? (this is specified only later on line 175, as 2 m) It seems to me that the aerosol inlet was much lower than is typically done for aerosol sampling campaigns (e.g., THD has an aerosol inlet at 10m). What is the impact on the data?

Line 141: there is a lot of detail about the CPC principle of operation, yet this is a very commonly applied and simple instrument. In general I think the descriptions of instrumentation could be much briefer.

Line 161: the presence of the paper mill immediately render this as a non-pristine site. Later, on lines 476, the prevalence of wood burning is mentioned. Even with onshore winds, complex coastal flows will likely result in influences from these aerosol sources. Probably it needs to be stated upfront that this site is not representative of a “clean marine” location even when data are segregated by sector.

C2

Line 182: there is no mention of topography in the description of the site and surrounding area. This seems critical to understanding how the site is affected by transport.

Line 191: Just a comment: in the end there are only a few days (five days?) of data with onshore flow + UHSAS data that can be used to characterize the “marine” sector.

Line 231-233: I don't think these equations are needed in the text – perhaps in the supplement if you think they are necessary, but they are pretty standard.

Line 265: the T-test is a fairly standard statistical test and doesn't need a lot of description.

Line 434: internal mixing is probably not a good assumption as claimed, since many observations have shown that organics content of marine aerosol increases with decreasing size. However, it is hard to justify another assumption here, and perhaps the best way to address is to discuss some prior observations and add estimates of uncertainty?

CCN parameterization: why aren't the size distributions used more directly, and why fit with the exponential relationship? The latter is clearly not physical despite its long history of use on the community, although for marine stratus that do not reach high supersaturations, it is reasonable within the expected supersaturation bounds. What about comparing with other published spectra for coastal aerosol?

Figure 6: perhaps add local wind speed and direction to this figure?

Technical Corrections:

Line 482: “was” should be “were”

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-185>, 2019.