

***Interactive comment on* “Transport of Pollution to a Remote Coastal Site during Gap Flow from California’s Interior: Impacts on Aerosol Composition, Clouds and Radiative Balance” by A. C. Martin et al.**

Anonymous Referee #1

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Review of “Transport of Pollution to a Remote Coastal Site during Gap Flow from California’s Interior: Impacts on Aerosol Composition, Clouds and Radiative Balance” by Martin et al.

This study examines ground based in-situ aerosol properties at a remote location in California and shows that the atmospheric aerosol, and with it also cloud properties, at this location depend on the atmospheric flow patterns. Anthropogenically polluted air mass can be advected under certain circumstances, but can also originate from areas closer by. The study distinguishes between different phases with different aerosol

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properties, based on different air mass origins. Further, some modelling efforts are done to estimate the influence of the differences in the aerosol on clouds. Overall, the study gives a good overview concerning the conditions at this location and shows that there are possible influences of the aerosol on clouds on a regional scale. It is up to date and well written. I only have minor issues which I mention below.

As a correlation of air masses to their origin seems to be of particular importance in this work, I wonder why trajectories were not used at all. Also, I wonder if the authors could comment on the fact if their observation are particularly important to only the location of the study, or to sea side sites in general, or even to more locations worldwide. This could be discussed in a few sentences in the summary. It would also be nice if they related their results to the points they raise in the introduction (bulleted point list) in the summary, to see how their results match with the here cited literature.

The issues I raise here are, however, only thought as additional ideas the authors may pick up. Below a number of minor changes are suggested, and after they will have been addressed, together with considering what I wrote above, the manuscript is fit for publication in ACP.

Requested minor changes:

page 3, line 12: Maybe include a map of the area showing the mountain range (at least some of it), the gap and the sampling location.

page 3, line 24: Say explicitly that some more information on the instrumentation follows below. And mention explicitly when the measurements took place (which month, and for how long).

page 4, line 19: "PSL" was already introduced above (line 10 on this page), but as PSLs - homogenize and use acronyms once you have defined them.

page 4, line 19: Add values for the RH that were generally observed, and the maximum values.

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page 4, line 25: This section, short as it is, is not only “Aerosol Mass”. More correct would be “Aerosol and BC mass concentration”.

page 5, line 2: Check the symbol in here - I guess it should have been a “kappa”, but in my version, it was a very strange symbol instead.

page 5, line 27: A sentence or two describing the methodology of N06 would be good, as this is the basis for a crucial part of your work.

page 5, line 34-35: I was puzzled about the use of mPFG and PFG. Maybe explain the difference between the two explicitly in a sentence where mPFG first appears. And make sure you use both consistently in the text.

page 7, line 2: Refer to section 3.1 (otherwise it is a self-reference).

page 8, line 28: What do you mean by a “dry free atmosphere”?

page 9, line 25: Some formatting error - too large spaces between words at the end of the line.

page 9, line 28: What do you mean by “the difference in likely concentration”? Reformulate.

page 10, line 31: The size distributions shown in Fig. 4: Are they averages for all times of CTL and PGF, or just single distributions you used as examples? Explain in the text or caption.

page 13, top: In the text (related to Fig. 9b), it needs to be explained how CDNC were obtained. (It is not enough to mention an adiabatic parcel model in the summary.)

page 13, line 6 ff: Mention explicitly that the “Twomey effect albedo change” is what is shown in Fig. 10 as “fractional albedo change”. I understand that in the text you try to relate the albedo measured by MODIS to the derived fractional albedo change, but I find this part of the text rather confusing. Consider rewriting this part.

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page 13, line 12: “entrain” is not the best choice of word (a cloud is not a thing that is moved from an air mass with CTL properties into an air mass with PGF properties), it is rather that the clouds form in the air mass, which has a certain aerosol in it. Reformulate.

page 14, line 13: When you first mention aged SSA, “aged” is not capitalized, but it is capitalized here and in other locations. Be coherent.

page 14, line 27: Remove the extra “.”.

Fig. 2 and 3: The change in color code is confusing (blue is “all” in Fig. 2, but CTL in Fig. 3, red is PGF in both, and black is CTL in Fig. 2 but local in Fig. 3). Please change this, and keep the colors for CTL and PGF for all figures where possible and applicable (e.g., Fig 4 and Fig. 9).

Fig. 5: Explain that the explanation of the abbreviations can be found in Tab. 2.

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