

Interactive comment on “Subseasonal variability of low cloud radiative properties over the southeast Pacific Ocean” by R. C. George and R. Wood

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This paper analyses the observed statistics of the the variability in satellite-derived properties of marine Sc in the south-east Pacific (SEP) off the Chilean coast, and its relation with a few large-scale meteorological variables, in particular the sea-level pressure (SLP), diagnosed from reanalysis products.

The covariances between a cloud-microphysical variable, i.e. the droplet number concentration, cloud macrophysical properties (cloud albedo, and liquid-water path), and the areal cloud fraction are studied, alongside with the statistical correlation of variations in such quantities with the large-scale meteorology.

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There are thus basically two parts in this paper: one in which the statistical “variance explained” of area-mean albedo in relation to the cloud properties is analysed, and one in which the association between cloud properties and cloud cover with the large-scale meteorological fields is discussed.

The conclusion from the first part is that most of the variability in the area albedo is dependent on changes in the cloud cover and the liquid-water path, to such an extent that the residual variance explained by microphysical properties in such type of analysis cannot be safely attributed, or indeed tested on, specific cloud-microphysics mechanisms such as aerosol indirect effects.

The second part of the analysis, concerning the connection between the Sc and the meteorology, is based on composites on the two leading EOFs of SLP over an area in the SEP. The main emphasis in the discussion and conclusions section of the manuscript is given to this part of the paper. Here, the authors illustrate two possible mechanisms by which the meteorology affects the cloud cover and the cloud properties. The first corresponds to a large-scale intensification of the subtropical anticyclone (EOF 1 of the SLP), which is accompanied by increased surface wind-speed, cold advection, and stability, all arguably conducive to increased PBL-top cloud formation. The second proposed mechanisms is associated with a changed zonal gradient in SLP (EOF 2) and increased subsidence near the south-American coast, presumably associated with coastal atmospheric disturbances such as coastal lows (Garreaud and Ruttlund, 2003). Based on the meteorology of such phenomena, increased offshore transport of aerosols such as e.g. anthropogenic pollutants may also be expected, thus affecting cloud-microphysical properties consistently with the relationships found.

The main conclusion of this work is thus given, that the main driver for changes in the observed cloud conditions in the SEP is represented by the meteorology, with the role of the cloud microphysics as yet not well determinable from broad statistical analyses such as that undertaken in this paper.

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General comments

The quality of the manuscript is thoroughly good, the data analysis sound, the text well-argued, and the scientific content valuable; it does not warrant significant correction to be fit for publication.

No further iteration in the review process is required, and I am left with only a few minor comments to make.

Minor comments

Appendix: Eq.(A6), which is correct, does not follow from Eq.(A4). Equations (A2), (A3), (A4) should all be corrected. It is simply a matter of writing $a' = (\langle x \rangle + x')(\langle y \rangle + y') - \langle xy \rangle = \langle x \rangle y' + x' \langle y \rangle + x' y' - \langle x' y' \rangle$, expanding a'^2 , and averaging.

p.10: “ r_e rather than α_{cld} variance dominates albedo variance”, perhaps better to write “the variance of r_e rather than that of α dominates the variance of the albedo”

p.17: “The cloud PC1’s actually...”, the incidental (“correlation coefficient of 0.3-0.4 etc”) can be polished a little and should go into a parenthesis.

p.23: “supressing” - there may be others, just run a spell-check.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 25275, 2009.