

Interactive comment on “Impact of natural and anthropogenic aerosols on stratocumulus and precipitation in the Southeast Pacific: a regional modelling study using WRF-Chem” by Q. Yang et al.

Anonymous Referee #1

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Yang et al. present a manuscript discussing four simulations using the WRF-Chem model where in sensitivity studies local aerosol emissions have been perturbed. No surprising results are found, and no new hypotheses are formulated. No comparison to observations is performed. Nevertheless, this study could be of some interest to a part of the community analysing the measurements from the VOCALS experiment.

In any case it would be necessary that the authors clearly discuss what is found simply due to the way it is parameterised as such in the model, and which results are found due to unexpected interactions of different parameterisations. For this purpose, it would

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also be necessary that the relevant parameterisations are reported in this manuscript (ideally in terms of the equations).

The authors present some “ACI” parameters. However, these are defined here in a way inconsistent with the published literature, and it would be useful to revise this.

The notion of “sea salt effects” is strange. Obviously, anthropogenic aerosols plus unspecified advected aerosols are taken as background, and sea salt aerosols, as an external perturbation. The relevance of this specific sensitivity study is very unclear.

Some specific remarks: p14625 l17: This concept of the “second indirect effect” is outdated. Microphysical feedbacks to a perturbation in aerosol concentrations are far more complex than the overly simplistic concept reported here.

l24: It is probably better to refer to a commonly accepted review such as the one from IPCC (2007).

l25: This is a strange notion of aerosol indirect effects. Usually the effect of the anthropogenic perturbation of the aerosol on clouds is considered as indirect effect. The background natural aerosol concentration is of course important for the magnitude of the indirect effect, but a “counteracting” is not happening.

p14626 l7: It is unclear with respect to which reference the comparisons are done.

p14627 l9: Cloud microphysical processes are not resolved but parameterised in LES.

p14629 l8: Since these parameterisations are essential to understand the results, they have to be reported here.

p14633 l6: What is the parameterisation of ΔN_{CCN} / ΔN_{acc} , or rather: can this term not be inferred from the activation parameterisation?

p14634 l27: So Δ is the difference between the regional-temporal averages of two simulations? In the studies cited, it is rather a linear regression of instantaneous values for a certain (order of 100 km) pixel-size.

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p14635 l17: It is odd to speculate about model results. Is this effect parameterised?

p14636 l2: A “mitigation” effect would usually imply a feedback. However, this is not what is discussed here.

p14641 l28: L'Ecuyer

p14644 l15: In order to judge on this, an assessment of the parameterisation of auto-conversion in the model would be necessary. What is the approximate threshold put into the model?

p14663 “Changes” with respect to what? - It would be necessary to define these formally. The red numbers need more explanation here. The definition of the standard deviation is unclear. Is it the temporal standard deviation of the regional average values?

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