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Comment

## ***Interactive comment on “Global and regional modeling of clouds and aerosols in the marine boundary layer during VOCALS: the VOCA Intercomparison” by M. C. Wyant et al.***

**Anonymous Referee #3**

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### General Comments

This paper presents results from the VOCALS Assessment (VOCA) model intercomparison. The paper concentrates on a subset of 9 VOCA models that simulate the South East Pacific region at the time of the VOCALS-REx field campaign. Most of the models considered possess the ability to represent aerosol-cloud interactions, with varying degrees of complexity. VOCA builds on a previous intercomparison, pre-VOCA, which simulated the SEP in the same region but prior to the VOCALS-REx field campaign, and with models that did not represent aerosol-cloud feedbacks. The extensive in-situ data available from VOCALS-REx are used here as a basis for comparing model

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performance to a level that has not previously been possible. The aims of the paper are therefore sound and the analysis of the results is presented in a clear and logical manner.

However I think the conclusions section needs further work, as I didn't really come away with a clear sense of how this latest intercomparison has advanced our understanding, particularly when compared against the previous multi-model assessment, pre-VOCA. This was my main issue with the paper, and provided the authors can address this point, then I think this paper will be a useful addition to the literature on VOCALS.

On page 6542, lines 15-20, a number of questions are listed that provide the motivation for the paper, although there doesn't seem to be a clear attempt to come back to these questions towards the end of the manuscript. I suggest the conclusions section be restructured to directly tackle the questions raised at the start of the paper on page 6542, and where possible, to be more quantitative.

The authors reference the work of Yang et al 2011 on page 6542, line 1. Yang et al use WRF-CHEM to show that an explicit treatment of aerosols leads to a better simulation with respect to the observations, compared to simulations performed with a passive treatment of aerosols. However in general, the results from VOCA when compared to pre-VOCA do not necessarily seem to support this conclusion. Is this because there are too many other differences between models to allow for a fair comparison to be made? If so, I think it is important to say this. Maybe a good way to strengthen the conclusions section would be to suggest ways that future intercomparisons could be designed/improved to make it easier to glean insight. For instance, do we need a more standardised model setup to really be able to home in on the questions we want to answer? Would it be better in future to concentrate efforts around one or two common dynamical models, where the physics options, aerosol treatment, resolution etc can be varied systematically (possibly using factor separation methods) to help identify which specific aspects of a model are most important in terms of improving the agreement with the observations?

## Specific comments

Page 6541, line 10-11: “Most of these models had no representation of aerosol-cloud interactions”. Is this because the majority of models in pre-VOCA did not include an explicit treatment of aerosols? Or is it because the microphysics in the pre-VOCA models was too simplistic (i.e. single moment)?

Page 6542 line 7 – ‘reported a large aerosol lifetime effect’. I wasn’t sure what the authors meant by ‘aerosol lifetime effect’ here – do the authors mean that the emissions had a large impact on cloud lifetime?

Page 6543, lines 9-10: “Each model submitted data on its native vertical levels”. Do the authors think this could have been important in explaining some of the differences between models?

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 6537, 2014.

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