**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Evaluation of stratocumulus cloud prediction in the Met Office forecast model during VOCALS-REx" *by* S. J. Abel et al.

Anonymous Referee #1

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General comments

This paper very nicely documents how the Met Office UM represents the Southeast Pacific Stratocumulus by comparing model forecasts with VOCALS observations. Overall, the paper is well written and properly structured. It contains very relevant results in the sense that it is important to document in detail what the main modeling issues are, as the evaluation of models deficiencies is a necessary benchmark for future model improvements). This paper should definitely be published after some minor revisions.

My main concern is that while the authors clearly identify some major model strengths and biases in the forecasts (for instance, the remote maritime clouds are well captured

with the MetUM- both the diurnal cycle and synoptically induced variability- but the coastal cloud is poorly represented) they don't thoroughly examine the possible causes for these biases (Is high resolution going to solve the coastal cloud problem?). This paper could substantially improve if the authors provided a more detailed interpretation of their results. Another issue is that the authors only show a few diagnostics of the boundary layer and cloud but leave out numerous others that could be relevant (for instance: TKE profile, entrainment velocity, surface fluxes...). Also, I think the paper would benefit from a more detailed description of the relevant parameterizations.

Specific comments

P16801: My feeling is that the model description could be a little more detailed. I would love to have a brief description of the parameterizations of interest (the PBL scheme in particular).

P16803: Authors claim that the model PBL height is about 200 m too low compared to observations. Is it accurate? For instance, from looking at a few points (at 80W-10S: Satellite $\sim$ 100m and Model $\sim$ 700m. At 88W-30S: Satellite > 1600m and Model $\sim$ 1100m), it might be more than 200 m.

P16805: Indeed the year 2008 was atypical in terms of PBL depth. The 2008 observed cloud-top heights were higher than in previous campaigns (except 2006 that also showed deeper PBL than usual). Do you have a sense how the MET Unified Model would perform for more typical years?

P16805: The authors suggest that the inability of the MetUM to represent the boundary layer structure may be related to a poor representation of the Andes topography. On this issue, Richter and Mechoso (2006) suggested that employing a more realistic mean orography is not likely to improve the simulation of stratocumulus.

P16807: It is not clear to me whether observations and forecasts are averaged over the same time period (in Figure 3). Do the flight time periods span a complete daily

cycle?

P16811: The authors clearly describe the problems in the diurnal cycle but don't indicate the causes of the biases. Any clues about the origins of the biases?

P16813: Main focus is on diurnal cycle of cloud fraction, LWP, and drizzle. Did the authors look at other variables (latent and sensible heat fluxes, vertical velocities, LW and SW fluxes at the surface etc...) ? It would be also interesting to look at vertical distributions of cloud liquid and cloud fraction (maybe comparing with Cloud Sat data).

P16816: The model uses a fixed Nd of 100cm-3 over the ocean. While this value is accurate for remote maritime areas, it is too small for polluted coastal areas. What is the impact on the cloud albedo and SW at the surface ?

Technical corrections

- P16800, L21: model's ability (instead of models ability)

- P16804, L25: remove one "the" from "with the the inversion"

- In the text, should you capitalize South East (instead of south east)