

Interactive comment on “Precipitation and cloud cellular structures in marine stratocumulus over the southeast pacific: model simulations” by H. Wang et al.

Anonymous Referee #3

Received and published: 26 May 2010

General comments:

The paper addresses the problem of POC formation and its relationship to environmental conditions by using a cloud resolving model and studying sensitivities to CCN concentrations, temperature and humidity profiles, surface sensible and latent heat fluxes, and large scale subsidence. It is a well written paper that presents interesting and valuable results about a relevant problem.

Specific comments

1) One frustrating aspect of reviewing this paper was that among its important references there are 3 papers "in preparation", which are not available for inspection.

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These papers were especially missed when trying to appreciate the basis for selection of cases or conditions used in the model setups. Therefore, the authors are requested to provide more specifics when using results from these papers, e.g. p.8344,l.9; p.8356,l.10; p.8347 l.14;

2) Thermodynamic initial profiles. Figure 1 shows vertical profiles of thermodynamic variables and winds used to initialize the model. Based on these profiles my estimates indicate a very high supersaturation at the top of the MBL (~200% in the wet case). Please indicate the initial supersaturations in wet and dry cases and comment on the initialization procedure and what impact it might have on the results. Figures 3a and 3b show that some cases have very important changes in the first hours of the model runs: is that related to the initialization shocks?

3) Missing references, un-justified statements, or missing information:

p. 8347, l.12-13: provide a reference for MBL aerosol composition

p.8347, l.16-17: why are these assumptions unlikely to have significance influence on the results?

p.8348, l.5 and 10: at what height are these vertical velocity values set? (also at p.8362,l.26).

p. 8351, l.18-27: there are several processes described but too little explanation of how these processes are appreciated based on what is shown in figure 4. Please provide a more clear connection between the figure profiles and the processes mentioned in the paragraph.

figure 4: I see very little discussion of figure 4c) and none of figure 4d). The striking contrast between $\langle w_3 \rangle$ in D30 and D500 deserves a comment in terms of what they tell about turbulence structure in both cases.

p.8353, l.9: the parenthetical values for PQV and PCCN are a mystery to me.

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p.8353,l.10: results at t=4h are described, but should say "not shown in fig. 5".

p.8356, l.20-22: provide a reference for the models that showed this.

p.8358,l.14: provide a reference for the VOCALS source strengths

p.8360,l.17: please specify to what "latter" refers to.

cloud bases: please provide information on cloud base heights (e.g. in connection with Figure 2b and/or figure 3)?

4) Basic definitions

I cannot find in the paper a clear statement of how POC, or open cells or closed cells are diagnosed based upon model results. For example p. 8349,l.7 calls experiments D30 as open cells and D500 as closed cells, but it is not immediately obvious why. It would be helpful to see somewhere an explicit declaration of how these different conditions are recognized from the results. If not, the paper will be useful only to those "initiated" in POCS.

5) Mesoscale circulations: p.8354, l.13-28: an important point of the paper is to stress the importance of mesoscale circulations to produce non-local effects and even remote POC formation. Therefore it is highly missed a better description of this circulation using the model results. I would like to see a wind vector map illustrating this circulation, in order to be able to appreciate its intensity and physical plausibility.

6) Runaway process?: p.8361,l.14: the section concludes stating that POC is a runaway process. Is that really so? Looking at POCs in satellite images I see them many times advecting and deforming but seldom as a runaway expanding/growing POC. I'd appreciate a comment on this and/or a restriction of the stated conclusion.

Technical corrections

p. 8343, l. 17: Stevens et al. appears to be 2009 and not 2005?

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p. 8346, l. 6: eliminate "the both"

p. 8346, l. 3: correct the spelling of "previous".

figures: most of the multi panel figures lack naming the panels as a), b),... (e.g. fig. 1, 4, 10,11), and others have names but are not used in the caption (e.g. 2). Make sure all are labeled and referred to in the captions.

p.8366,l.2: Hartmann with 2 n's.

figure 4: please add the location of "the cloud layer" as described in the text.(shading of the "cloud layer" would help).

figure 9: start caption with uppercase

figure 9: there are dotted lines but nowhere explained.

figure 9: should warn the reader that the time axis is different as Fig.3

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 8341, 2010.

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