Atmos. Chem. Phys. Discuss., 10, C12414–C12416, 2011
www.atmos-chem-phys-discuss.net/10/C12414/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "An aircraft case study of the spatial transition from closed to open mesoscale cellular convection over the Southeast Pacific" *by* R. Wood et al.

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Received and published: 17 January 2011

The paper provides a detailed analysis of stratocumulus (Sc) in the SE Pacific, and the spatial variation of Sc in a quasi-Lagrangian framework, obtained from a criss-crossing flight track designed to keep step (approximately but not exactly) with the horizontally translating cloud deck, sampling orthogonal to the boundary between open and closed cells. Emphasis is therefore given to the spatial, not temporal, evolution of the cells. The two regions afford a sharp contrast between relatively homogeneous properties in the closed-cell region, and strong heterogeneity in the pocket of open cells. The

boundary between the two regions also has some noteworthy properties.

Two general recommendations for this type of study can be given:

1. Consideration should be given to the intrinsic time evolution of the open- and closed-cell regions. It is clear from animations of the imagery that temporal variation occurs in the translating frame, as might be expected of clouds in general. One particular question I have is whether a closed cell evolves temporally (and intrinsically, following horizontally the fluid) into an open one, at least in some cases. Could it be that some proportion of individual Sc cells, grouped spatially, undergo a lifecycle resulting in their opening up eventually, forming a new POC? And would such a lifecycle be consistent with the observed properties of the open cells?

2. As suggested by the reviewer, spatial averaging must be done with care in the open-cell region. I recommend that statistics be conditioned on the data within the open-cell region, such that heavily precipitating regions are segregated from relatively clear regions. Enough data exist to do a conditional analysis with statistical confidence.

Other comments:

3. In or near the Conclusion, provide a succinct summary of aerosol-cloud-precipitation interactions. They can be labeled according to your confidence (speculation is ok). The important thing is to put these inferences together in one place, as they are presently scattered about. The "a-c-p" (no pun intended) interaction is one of the underlying motivations for the study, though not the major theme of this paper.

4. The visual impression of open vs closed cells suggests the naive idea that vertical motions in the closed deck consist of subsidence along creases between individual cells, whereas in the open-cell region it is the updrafts that are spatially concentrated with slow subsidence in the surrounding part of the cell. With respect to vertical motion, the two regions are a mirror image of one another. It would be interesting to hear the authors' view on this interpretation.

5. On oscillations of w and N_a in POC outside the active Cu: hints of gravity waves on the strong vertical gradient of N_a (Figures 17, 18, 21).

The authors are commended for making good use of ACP's excellent color graphical capabilities.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 17911, 2010.