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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aircraft measurements of wave cloud" *by* Z. Cui et al.

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Review of Aircraft measurements of wave cloud, written by Cui, Blyth, Bower, Crosier, and Choularton.

Reviewed by Jerry Straka

The paper for consideration by Cui et al. (2012) is a technically and scientifically sound and useful paper for theoretical, observational, and model work.

I would appreciate a very straight-forward purpose statement both in the abstract and right up front in the introduction. This would be useful to place all of your hard work into a certain mind set.

Perhaps the most important aspect of the this short but information packed paper is the potential usefulness of the exceptional wealth of data to compare three-dimensional

bulk and bin microphysics parameterization simulations of wave cloud simulations at warm temperatures of this sort that form without ice, with in situ observations.

With this in mind, I think a table of p, t, td, u, v would be exceptionally useful to readers of this paper. First it puts the structure of thermodynamics and dynamics of the atmosphere in perspective. Second, the vertical structure of the atmosphere in the vicinity of these and similar warm wave clouds is largely unknown. It is important that if you simulate these clouds, that others have the opportunity to do so too for comparisons. As a courtesy it would be very useful that you make it possible for others to do so with the appropriate information directly and quickly available from your paper.

Also it is essential that any simulations that are done of these particular types of clouds be done in three dimensions, as the energetics in two-dimensional models often is subject of much controversy (see Fjortof 1953, Tellus, 5, 225-230, this wonderful classic is widely available on the web for free from Springer).

It would be interesting if a cloud-drizzle bulk parameterization scheme is able to capture the essence of such simulations as a might be found with warm cloud/precipitation bin parameterization model.

Some basic questions include:

Do the size and number concentrations of drop when integrated over the spectrum produce cloud amounts consistent with those observed?

What fraction of aerosols that were observed with FAAM BAe-146 are nucleated and what are the composition of nucleated and un-nucleated aerosols? Last year you published a paper with Dr. Blyth on aerosols on ice clouds (Cui et al. 2011, ACP).

Can some explanation be given for the development of drizzle size drops? I suppose that one could argue that long growth trajectories allows the development of 100-200 micron size drops. Can you estimate with the time of the growth trajectories might be from simple microphysical calculations of diffusion growth to see what role

collision-coalescence might have via differences between diffusion growth and what is observed.

What is the potential for getting mobile radar observations at maybe x-band of these clouds? I do not know if these are as widely available for research in Europe as they are in the States.

Do you have similar observations but in colder, ice laden wave clouds available from the general region available for comparisons.

Finally a new definition of wave cloud was promised. Could this be very prominently stated?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 13337, 2012.