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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Deep convective clouds at the tropopause" *by* H. H. Aumann and S. G. DeSouza-Machado

Anonymous Referee #1

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Review of "Deep Convective Clouds at the Tropopause" by Author(s): H.H. Aumann and S.G. DeSouza-Machado MS No.: acp-2010-308

This paper uses radiance (brightness temperature) differences between different wavelengths to investigate the presence of clouds near, at, and above the tropopause. The manuscript is generally well written, but is difficult to follow. To be publishable in ACP this manuscript probably needs more explanation of key terms and a better description of some of the implications of the results. The authors could do a better job in particular of explaining in more detail how they go from the brightness temperature differences at various wavelengths and interpret these physically. The authors are experts and know the material, but I do not think enough description is provided to enable most readers to understand the implications of the results, or how the authors get to their implications.

These points are explained in more detail below.

General question: can you do this over land? The channels do not seem to be affected much by the surface properties, so would this be possible? It would add a nice dimension to the paper and the analysis.

Specific comments:

P16479, L20-30: This paragraph needs more explanation. Many of the lines are presented and not mentioned. What do they indicate? Perhaps a spectrum from AIRS showing these lines and what they mean would help. This could be used to better explain the geophysical inferences.

P16480, L1-2: Again, what do DT, DW and DC represent? I am assuming water vapor, temperature and carbon dioxide.

P16480, L17: What is the additional information, and what does it tell us?

Figure 1-3: For the scatterplots, some estimate of signficance needs to be shown to reflect the scatter.

Figure 4: this does not appear to be very significant given the huge scatter here.

P16482, L7 (Figure 4): based on the large scatter, what is signficant here?

P16483, L1: You go into this a bit later, but looking at where the clouds are 'unphysically high' (tops with P< 80hPa or so) would be useful to help sort out what is not a physically realizable state.

P16484, L10: the other work should be noted here (Liu & Zipser, 2005, Gettelman et al 2002)

P16484, L16: Why does the BT difference separate these cloud tops. Please explain.

P16484, L25: again, it is not clear what the physical explanation of DC is.

P16485, L24: this seems like pure speculation without much foundation. A cold 'bulge'

is a hydrostatic response to convective heating below. It does not appear that there is mass transfer going on at all here. You would have to have some mechanism for that: air is not going to transport humidity and pollutants above the cloud top: which you note is basially at the tropopause. I do not think what you are proposing is the same as Randel et al 2010.

P16488, L8: I do not think you have shown any evidence for mass transport into the lower stratosphere in these bulges and suggest that this statement should be eliminated.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 16475, 2010.