

## ***Interactive comment on “Ice cloud microphysical trends observed by the Atmospheric Infrared Sounder” by Brian H. Kahn et al.***

**Anonymous Referee #2**

Received and published: 22 February 2018

This is not a full review of this paper, but a request for clarification about the sampling of clouds by AIRS. I hope that the authors can reply to these questions promptly and at least before the end of the discussion period, so that I can adjust the full review accordingly. More information about the sampling is essential for interpreting the results and comparisons to earlier work.

It is not clear to me which clouds are included in the sample. The authors state that "AIRS sensitivity is maximized for optically thinner cirrus with  $\tau \leq 5$ ". Given that the ice cloud properties are derived from infrared measurements, I interpret this as meaning that there is no information on optical depth or effective radius in these measurements for clouds with an optical thickness larger than 5. Yet, parts of the paper focus on convective clouds, of which larger parts would have optical thicknesses much larger

C1

than 5. For example, figure 10 suggests that the properties of a cirrus above deep convection is retrieved. However, only the parts over thick outflow of that system would have column optical thickness lower than 5. If I am correct, AIRS would only sample the thick anvils of such clouds. Is this indeed the case?

I might be wrong though. Another interpretation is that there is no sensitivity to optical thickness for clouds with an optical thickness larger than 5, but there is still sensitivity to effective radius for these clouds in the AIRS wavelength range. In this case the sample would include essentially all clouds. The optical thickness would be  $\leq 5$  for any cloud thicker than that. Is this maybe the case?

Related to that, I am confused what sample of clouds are included in the 'opaque' cloud selection. Opaque is defined related to the effective cloud fraction, but it is unclear which optical thickness that would correspond to. If cloud with optical thicknesses larger than 5 are included in the sample, my guess is that these are opaque. If only clouds with optical thicknesses lower than 5 are included, what optical thickness range would correspond to 'opaque' clouds then?

---

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1216>, 2018.

C2