

## ***Interactive comment on “Ice water content vertical profiles of high-level clouds: classification and impact on radiative fluxes” by A. G. Feofilov et al.***

**Anonymous Referee #1**

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[a4paper,10pt]article

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### **1 General Comments**

This article addresses some of the main uncertainties in retrievals of cloud bulk micro-physical properties from passive sensors, where the retrievals assume homogeneous distributions of ice water content (IWC) and cloud particle effective diameter ( $D_e$ ).

The conclusion, “We have shown that for clouds with  $IWP < 100$  (80 % of all high ice

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clouds), it is feasible to use a constant IWC profile in the retrieval.”, is a strong and useful statement made for those retrieving cloud properties from passive down-looking sensors

The article provides an answer to under which conditions (measured in terms of IWP amount) it really is “valid” to assume a homogenous vertical distribution of IWC, and otherwise what shape the IWC vertical distributions cirrus clouds tend to have as a function of IWP. The authors show that for clouds with  $IWP < 100$  the vertical distribution of IWC is fairly constant, and for clouds with high IWP there is more IWC at lower layers. Simple shapes of vertical distribution of effective radius are also shown as a function of IWP. I believe these proposed statistical classifications of a just a few simple “vertical distribution”-shapes of IWC and  $D_e$  as a function of IWP, will be useful in producing better retrievals of some bulk cloud properties measured from passive down-looking instruments. The authors assessed the radiative effect of assuming one shape over another and state that “effects of different shapes are noticeable.”

I found this article interesting, well written, easy to follow and believe it will be quite useful for future retrievals for satellite measurements from passive down-looking sensors. I have no specific comments and feel the article can be accepted “as is”.

### **2 Technical comments**

- Abstract: line 6. “which sufficiently well represents the IWC profiles”. Shouldn't it be “which represents the IWC profiles sufficiently well”?
- Page 16331, lines 24–25. “AIRS footprint can up to CALIPSO L2 samples at 5 km resolution”. A word is missing. Should it be “can collocate with up to”?
- Page 16337, lines 22–24. I think something happened to this sentence, as I can't make sense of it.

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