

Interactive  
Comment

## ***Interactive comment on “Exploiting the sensitivity of two satellite cloud height retrievals to cloud vertical distribution” by C. K. Carbajal Henken et al.***

### **Anonymous Referee #1**

Received and published: 23 April 2015

#### Overview

Overall the paper and its results represent a valuable contribution to the subject area demonstrating that for optically thicker clouds ( $>10$ ) there is a solid relationship between geometric vertical extent and the top height retrievals made using A-band and thermal measurements. The paper is structured well but suffers from being careless or imprecise with explanations. The sensitivity part using homogeneous and CPR derived vertical profiles is hard to follow and, I at least, am still not sure whether it is needed or not – whether the investigation, results and explanation could not be based purely on the standard instrument retrieval results and the ARM measurements?

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## Science or technical issues

2625 – 14 Sentence “Accurate..” should have a reference as it is the key motivation for the research. 2625 – 16 “In Jang ..” to end of paragraph: is not really focussed and only hints at the need for vertical extent measurements. Could be more precise. 2626 – 19 is it really ‘poor spatial coverage’ in the context of climate modelling? 2627 – 2 “vertical and latitudinal monthly mean of the vertically distributed volume cloud occurrence frequency” is too much to assimilate; could this be explained in simpler terms – especially the relevance to the study.

2627 – 13 “enhancement” – need to add what this is due to...

2628 – 15 The phrase should be ‘large error’ and not a ‘large bias’, or is it really systematically biased?

2630 – 8 No doubt not very significant but the surface IR emissivity should be specified.

2631 – 3 ‘selected CGT and COT’?

2633 – 10 I think it is necessary to describe in a couple of sentences how the CTT is derived from the AATSR measurements (even if a reference is provided elsewhere).

2635 – 10 Why is the ‘height of the top height of the highest layer’ used? Would seem to select the outlier. Why not the mean cloud height?

2635 – 15 Some justification for the (5 min) and 9x9 averaging regions would be good.

2635 - 21 Unclear description of the selection criteria. Should ‘More precisely’ read ‘Moreover’ or ‘In addition’? What is the FAME-C ‘cost’?

2366 – 21 Why is it so sure that the AATSR CTT is incorrect and not a MERIS CTH error?

2367 – 2 Variability will have a contribution also from errors in the retrievals.

2367 – 11 The multi-layer case might also have a contribution from AATSR CTHs falling

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towards the middle of the layers?

2637 – 17 et seq. I do not understand this paragraph: neither the relevance to the previous nice demonstration of the relation of CVE to dCTH nor the fact there seems to be no supporting figures or tables. If it is needed, perhaps it can be expanded to explain its relevance and give the supporting figures etc.

2638 -8 True color? What is input to the RGB?

2638 - 11 What saturation occurs in AATSR? BTs below 190K?

2638 – 18 The sentence ‘The overpass..’ is out of place and ‘Further..’ seems irrelevant or out of place.

2641 – 4 ‘center of the cloud’, not ‘cloud top’.

2641 – 9 ‘estimate’ and ‘qualitative’ are not really compatible. I think the method shows a quantitative relationship.

2641 – 13 .. and I think the plausibility comes more from the ARSCL data comparisons than from the poorly collocated CPR/ENVISAT.

2641 – 14 ‘A limited..’ – what is this referring to?

Pure editorial issues

2624 - 20 “similarly to” not “analogously to” 2626 TBD! 2627 > clouds observed from different viewing angles Fig 3 Same ordinate scale would be nice. 2636 – 5 X,Y,Z! 2638 Fig 7 not 6?

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 2623, 2015.

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