

Interactive  
Comment

## ***Interactive comment on “FAME-C: cloud property retrieval using synergistic AATSR and MERIS observations” by C. K. Carbajal Henken et al.***

**Anonymous Referee #2**

Received and published: 3 July 2014

This paper describes the development of an optimal estimation cloud retrieval scheme that is applicable to both the AATSR instrument and MERIS instrument. It is an algorithm paper that needs to be written as it describes one of the algorithms used in the ESA CCI program. The paper is essentially 3 different retrieval schemes with a link via the transfer of optical thickness information into the CTP MERIS products. The paper is reasonably clear and the results what I would expect although in some cases lack convincing statistics.

The ‘synergy’ aspect of the paper is weak at the moment except for the cloud mask. I would suggest the author make clear the impact of using the AATSR COT information in the MERIS product and tie together the CTT/CTP more clearly.

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The paper should be read over by a native English speaker to improve some of the grammar and sentence structure. A spell checker should be used. In general the author should be careful to avoid beginning sentences with 'Also' or 'From' for example.

Specific comments:

ENVISAT →→ Envisat

L9 accuracies →→ agreement

P4911

L5 70% of earth's surface needs a reference- could be GEWEX paper.

L25 Should also mention AATSR participation as more relevant to this paper.

P4912

14 ORAC is not a participant in CREW, however did participate in GEWEX

P4914

L5 Check you have the appropriate AATSR channel numbering here and be consistent throughout

L8 better reference needed here [http://www.esa.int/esapub/bulletin/bullet105/bul105\\_1.pdf](http://www.esa.int/esapub/bulletin/bullet105/bul105_1.pdf)

L18 What are the cloud abundance parameters how do these differ from cloud mask/fraction?

L20 AATSR has 512km swath

L24 2nd not third reprocessing

P4915

L11 What does 'conservative scattering' mean?

L23 Wavelength seems to be used not removed in the equations below as suggested

C1496

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in the text.

L26 Should Rayleigh scattering below the cloud be significant, particularly for thin cirrus?

How were the channels selected for the microphysical retrieval why only 0.6um channel and not other AATSR and MERIS channels?

P4917

L2 Where does value of 0.044 come from (reference or assumptions in the calculation should be specified)

P4918

L1 Effective variance of what is a reference needed here?

L10 What defines a 'thin' ice cloud?

P4919 Be consistent on channel descriptions sometimes 11um used sometimes 10.8

P4920

L21 Better reference required for RTTOV

L26 Which NWP model? ERA Interim is mentioned later on?

P4921

L14 Is the impact of using a standard atmosphere significant?, has it been quantified? Cloud phase seems to be determined in 2 different ways for MERIS and AATSR retrieval, Do the retrievals ever conflict in phase and how is this be resolved?

L24 What are the other error sources?

P4922

L1 Radiative transfer calculations are performed for varying centre wavelength then are

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they combined?

L27 What values of surface albedo and emissivity are used?

L12 Please explain in a little more detail how the extinction profiles are used.

L12 Given that the MERIS retrieval has a strong negative height bias ( shown later) what would be the impact on the retrievals of assuming too low height and using an incorrect profile. Is this significant?

P4923

L3 How are the albedo adjusted?

P4924

L2 What variables are in each of the state vectors?

L3 What iterative process is used i.ee minimisation method?

L4 What first guess is used- This would be useful to know in case it has a strong bearing on the values retrieved.

L5 What is the convergence criteria?

L8 K is not averaging kernel but weighting function

P4925

L10 What is a very high value? This is a bit vague

L12 What is the reference for the forward model parameter uncertainties?

L15 What values are assumed for the uncertainty between ice and water cloud or how is it parameterised.

It would be useful to list somewhere perhaps in table 2. The maximum and minimum range of values for the state vector parameters if any?

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L20 in figure 3 the CTT and CTP plots show a similar number of retrievals yet later on (P4930) you mention MERIS retrievals fail approx. 50% of the time. This seems quite serious so I think it needs more explanation/clarification on why they are failing i.e cost, convergence ,other?

In Figure 5 the results seem to be limited by a lack of statistics as the results are for only a single scene would it be possible to produce the same plot using the data used in Figure 7.

Also the uncertainties are only valid when the model is a good fit. i.e. when the cost is low (Theoretically 1) This would I presume reduce the number of retrievals further. This plot should only display uncertainties when costs is low this should be made clearer.

P4927

L9 What quality flag was used?

L6 Is the effect of excluding water particles > 30um significant?

L9 How often does the retrieval converge, why not? is this significant?

L21 Cirrus contaminated pixels these are removed how? An optical depth threshold?

P4928

L1 How often do you get a successful retrieval? What is the definition of a successful retrieval?

P4929

The plots in Fig. 8 are rather sparse and quite a few conclusions although possibly valid are drawn on the basis of a few points. Why are only 2 ARM sites used. If more ARM sites were used there would be more points and the analysis would be valid for a better range of meteorological situations. Please investigate incorporating data from more ARM sites. Add correlation to the plots.

Given the paper is focussing on uncertainty and there are not many points, uncertainty on each point could be added to the plot.

Some discussion needs to be added here that radar and IR/thermal and MERIS cloud top heights are not actually measuring the same 'height' needs to be added here i.e I would expect a negative bias comparing IR and radar heights.

As mentioned before the QC applied to the CTP and CTT retrievals before comparing needs to be explained.

P4929 How are the MERIS and AATSR Cloud height products combined in the CCI product?

Minor comments

Abstract

L14 Revise sentence structure.

P4913

L2 'once' used incorrectly

Figure 2. ISCPP→ ISCCP

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Interactive comment on Atmos. Meas. Tech. Discuss., 7, 4909, 2014.

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