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Atmospheric Measurement Techniques Discussions

Interactive comment on "1-D-Var retrieval of daytime total columnar water vapour from MERIS measurements" *by* R. Lindstrot et al.

Anonymous Referee #1

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General Comments:

In the paper a new approach to derive total column water vapour (TCWV) from MERIS measurements is described. The new water vapour columns are then validated by comparisons with various correlative data sets over water and land. Overall, the paper is well organised and written. Methods and results are presented in a clear way. However, some more information about the used correlative data sets (specifically Aeronet, GUAN, SSM/I) would be appreciated, especially version numbers and references in which the accuracy of these data is shown.

The paper may be published in AMT after implementation of some mainly minor cor-

rections addressed below.

Specific Comments:

1. Introduction:
   There is also an operational water vapour product from SCIAMACHY on ENVISAT available which should be mentioned. Since MERIS is on the same platform, a comparison (outside the scope of this paper) would probably be interesting.

2. p. 6813, l. 27:
   ENVISAT equator crossing time is 10:00, not 10:30.

3. Section 3:
   There is also an operational MERIS TCWV product. Is this based on the same algorithm as described in the present paper? Please clarify and specify potential differences.

4. p. 6817, l. 12/13:
   Where is the solar incoming irradiance E_i taken from? Please provide a reference.

5. p. 6818, l. 8–10:
   'the transmittance is calculated for the four look-up table grid points closest to the actual surface pressure and temperature of the considered scene':
   How is the actual surface pressure and temperature derived, or is it taken from an external data set? Please clarify.

6. p. 6818, l. 11/12:
   'The final transmittances of MERIS bands 14 and 15 are then calculated as a

weighted average':
Please explain which weights are used.

7. p. 6818, l. 24/25:
'The albedo retrieval over land can thus be performed using climatological mean values in case there is no additional information available.':
Does this mean that it is possible to use climatological albedo data over land, or does it mean that other climatological data are used to determine the albedo? Have climatological data been used in the context of this study? If yes, which data? Please clarify.

8. p. 6820, l. 11/12:
The bias of 10—30% in TCWV mentioned in the text seems to be somewhat too high compared to Fig. 1. Does this mean that the bias is larger for other viewing geometries?

9. p. 6823, l. 8:
Where is the NDVI taken from? Please provide a reference.

10. p. 6823, l. 19–23:
Please give typical numbers for the overall uncertainties of the retrieved TCWV.

11. Section 4:
After spatial averaging measurements were rejected which contain too few 'valid' MERIS data. What is the definition of 'valid'? Why is the filter criterium different for the different comparisons (e.g. 20% for Aeronet, 30% for SSM/I, 25% for MWR).

12. p. 6825, l. 16/17: 'The filtered subset was additionally screened for high aerosol loadings, undetected clouds and outliers, deviating by more than 3σ.':
Please clarify: Is additional (external?) cloud/aerosol information used to identify cloud contamination or high aerosol loading, or is only the 3σ criterium used?

13. p. 6825, l. 20:
Please provide a reference for the dry bias of the Aeronet measurements.

14. p. 6826, l. 9:
Please provide a reference for the GUAN radiosonde uncertainty.

15. p. 6827, l. 13/14:
'A relatively large portion of points, sitting in the lower right part of the plot,...':
This probably refers to the lower *left* part of the plot. Please confirm.

16. Section 4.2.1:
There are several SSM/I data sets and versions, please specify which one has been used and provide a reference.

17. p. 6831, l. 8/9:
'Note that all shown configurations result in a wet bias of MERIS, except for setup 4':
It seems from Fig. 8 that also setup 3 ($2 \times$ continuum) does not result in a wet bias. Please explain.

Technical Corrections:

1. p. 6812, l. 19:
'du' $\rightarrow$ 'due'

2. p. 6815, l. 15:
'located in the in the shortwave end' $\rightarrow$ 'located in the shortwave end'

3. p. 6818, l. 19: The variable α has not been used before (probably albedo?). Please define it in the text.

4. p. 6818, l. 21:
   'distribtion' → 'distribution'

5. p. 6821, l. 6:
   'tabels' → 'tables'

6. p. 6822, l. 25:
   'uper' → 'upper'

7. p. 6824, l. 22:
   The reference to Fig. 6 occurs before the first reference to Fig. 5. Probably the numbering of these figures should be changed.

8. p. 6826, l. 19:
   'colum' → 'column'

9. Figs. 4, 6 and 7:
   Please add colour scales.

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