

Review for paper „ The CM SAF SSM/I-based total column water vapour climate data record: Methods and evaluation against re-analyses and satellite”

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submitted to Atmospheric Measurement Techniques**

General vote: Minor revision

General comments:

The manuscript presents a climatological assessment of global total column water vapor (WVPA) data obtained by SSM/I satellite observations. Different existing retrieval approaches are compared, in order to assess the accuracy and the stability of these observations. In a further step global analysis (ECMWF) and reanalysis (ERA, JMA) data are used to confirm the results. It can be shown that the stability of the retrievals is sufficient to observe long-term WVPA trends in the atmosphere.

In general, the manuscript is well structured; however some specific comments and technical corrections which request minor revision are listed below.

Specific comments:

In section 2.1 (“Retrieval”), the accuracy of the statistical retrieval by Schüssel and Emery (1990) is given as 0.15 kg m^{-2} . However, in the original publication this is stated as 0.15 g cm^{-2} which translates to 1.5 kg m^{-2} , thus 10 times less!! It has to be seen throughout the manuscript if this has any implications on the discussion of results. In addition, the phrase: “More than 98% of the variance within the training data set could be explained by the regression formula” is not correct, the variance can be explained by the 22 GHz channel only.

Section 2.2 which describes the kriging interpolation is rather detailed for the purpose of the paper and should be shortened.

Technical corrections:

p.6424, l.11: operation capabilities (not operationS)

p.6424, l.13: An objective analysis for interpolation, NAMELY kriging, has been APPLIED (...)

p.6424, l.24: reanalyses (not reanalysis)

p.6425, l.4: better: (...) Earth's energy budget and water cycle (...)

p.6425, l.25 ff.: Please rewrite this phrase for better understanding!

p.6426, l.4-6: Please mention the values for accuracy and stability here!

p.6426, l.14: better: (...) was initiated by WMO in order to establish (...)

p.6427, l.16: (...) have been positively evaluated (...), not HAS!

p.6428, l.10-12: rewrite to: "Using the overlap between the DMSPs, probability density functions (PDFs) based on ten days of brightness temperatures have been calculated and statistically matched in each channel."

p.6428, l.18: rewrite to: The data are available (...)

p.6428, l.18-19: cancel "of the data set"

p.6428, l.27: cancel "or ancillary data source"

p.6431, l.2: rewrite to: The result is a linear set of equations, containing (...)

p.6434, l.1 -7: please rewrite this passage to more fluent sentences

p.6434, l. 21-23: rewrite to: "Nevertheless, the physical retrievals show a significant positive bias and greater RMSE compared to the statistical retrievals which are based on a temporally and geographically limited selection of radio soundings.

p.6435, l.16: must not -> do not need

p.6435, l.26: rewrite to: (...) due to rain are filled (...)

p.6436, l.3: rewrite as: "These considerations will likely lead to patterns of absolute and relative difference as in Fig. 2 because (...)"

p.6436, l.6: afflicted does not seem to be the right word here

p.6436, l.9: deriving -> to derive

p.6436, l.15: add after CM SAF something like: "and will be explained below"

p.6436, l.20: cancel "assessed"

p.6437, l.2: cancel "before"

p.6437, l.17: introduced -> caused

p.6437, l.21: rewrite to: "(...) CM SAF data set that is not using sea surface temperature data."

p.6437, l.28: add "only" between "source" and "allows"

p.6438, l.3: better "removing" instead of "taking out"

p.6438, l.20-21: rewrite to: "(...) within the constraints of the model physics"

p.6438, l.22: use plural ("versions", "systems", "reanalyses")

p.6439, l.3: "In order to assess (...)"

p.6439, l.4: add "additionally"

p.6439, l.11-12: rewrite to: "In all analysis data sets SSM/I information is assimilated either by using retrievals of total column water vapour (ERA40 and JCDAS-25) or by taking directly the SSM/I radiances (ERA-Interim and ECMWF operational analysis)."

p.6439, l.24: cancel: "which is"

p.6440, l.3-5: rewrite as: "This is due to the number of satellites used in the CM SAF data set (see Fig. 3 for SSM/I temporal coverage)."

p.6440, l.26: change to: "bias" (singular) and "analyses" (plural)

p.6440, l.27: "bias" (singular)

p.6440, l.28: "values" instead of "biases"

p.6440, l.29: rewrite to: "In the years after 2002 (...)"

p.6441, l.1: "as bias is concerned" -> "in terms of bias"

p.6441, l.1: but -> and

p.6441, l.3: "temporally less stable" -> "more fluctuating"

p.6441, l.15: "started to be used" instead of "is used"

p.6442, l.19: kg m^{-2}

p.6448, rewrite figure caption to: "Fig. 2. Absolute (in kgm^{-2} , left panel) and relative (in percent, right panel) difference of WVPA between the CM SAF HOAPS v3.1 and the MPI/UHH HOAPS v3.0 averaged over the period 1992–2005."

p.6450: rewrite figure caption to: "Regional trends of monthly mean water vapour derived from deseasonalized CM SAF (left) and RSS (right) data sets for 1991–2006. Shown is the monthly trend of the regression analysis in kgm^{-2} ."