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Atmospheric Measurement Techniques Discussions

Interactive comment on "An intercalibrated dataset of Total Column Water Vapour and Wet Tropospheric Correction based on MWR on board ERS-1, ERS-2 and Envisat" *by* Ralf Bennartz et al.

Anonymous Referee #2

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The paper presents a new water-vapour data record for climate, compiled from a series of different microwave missions. The manuscript is found well structured, clearly presenting in sequence the background information on the objectives and instrumentation, the measurements and their calibration, the retrieval methodology and in the end some validation results. The manuscript will be an important documentation of the dataset agregating results from a series of different missions to compile a climate data record of water-vapour. It is recommended to consider the comments below before publication.

A General comment: the methodology deployed in this paper seems to clearly indicate that anchors are defined on a monthly basis on ERA-Interim to perform the bias cor-

rection of the microwave measurements. In turn, the TCWV retrieval is expected to be subsequently anchored on average on the model itself. This deserves some more discussions in the paper and clear statements as to what added-value this TCWV dataset is bringing in the scope of climate studies, wrt trend assessment of average quantities for instance.

Specific comments (Px.Ly stands for page x and line y)

Abstract L30-L32: not clear which products are referred to when stating on 'superiority' (L30) and 'improvements' (L31). is it compared to previous versions of the same processor, to numerical model forecasts/analyses, to other intruments' WTC products, to other institutes' MWR WTC products ? I suggest making specific references here to highlight more to what the proposed dataset is adding value.

p3.L3: typo "it's" –> "its"

p3.L14: suggest adding a reference were the bias in v2.1 is characterised.

p4.L3, editorial: first sentence is confusing

p4.L16-17, editorial: unnecessary repetition of the same info

p4.L24: were the uncertainties on the fixed SV parameters taken into account in the observation error matrix?

p5.L2: Rodgers 2000 does not explain specifically how the Sa and So matrices were established for this particular retrievals. It is essential information to understand the new product. In particular also if that differs from the retrieval methodologies in other products. It is said in introduction that So includes forward modelling error and instrument noise. How was this estimated? Similarly, how was Sa determined?

p5.L11: does the retrieval methodology produce negative TCWV ? That reads odd, clarification of why/what is meant here may be required at this stage.

p6.L25: Is this empirical bias correction assessment performed on cloud-free pixels

only ? This is what I would guess from the statements made in the bullet point above. If some cloud screening was applied it should be made explicitly clear here and described. Figure 1: The fitted Gaussian on the main mode is presumably covering the cloud-free scenes. The Authors explain that the negative values result from the random instrument noise. At the same time the positive values outside this Gaussian fit are associated to cloudy scenes. However, the negative values go as low as 100g/m2, which is of the same magnitude (in absolute terms) as the LWP in cloudy cases. This suggests that the effect of the instument noise has a very strong and direct impact on the precision of the retrieved quantities including in cloudy scenes. Can the Authors comment on this and what limitations this has in view of the climate application sought here? Possibly reflect some of this in the manuscript?

p6.L28: The reader would benefit from a brief explanation about the rationale and purpose of the 4% subsampling

P8.L29: typo, double '. '

Conclusions: it is not clear why the WTC record is still proposed by the Authors whilea, according to their assessment, this dataset is showing less skills than the operational one established by ESA. It is strongly recommended to elaborate and highlight more specifically the potential advantages of this dataset or the necessity to provide this independent record, for clarity to the reader.

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