

Interactive comment on “Validating HY-2A CMR Precipitable Water Vapor Using Ground-based and Shipborne GNSS Observations” by Zhilu Wu et al.

Anonymous Referee #1

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The paper “Validating HY-2A CMR Precipitable Water Vapor Using Ground-based and Shipborne GNSS Observations” contain comparative analysis between GNSS PWV and PWV obtained from HY-2A calibration microwave radiometer, which may be used for the purpose of validating satellite data. It also include procedure for reconstruction of coastal PWV, which quality suffer due to the contribution of various land and water emissivity. These both aspects are important for reliable use of spaceborne equipment for PWV measuring. Although paper is structured in proper way it causes problems in the correct and transparent understanding of its content. In my opinion this results from a heterogeneous description of the results. In addition, the Authors quite unsystematically approach the selection of results worthy of additional discussion or comment in the text. In consequence, it seems that all obtained results are in very good agree-

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ment, which in my opinion is not so obvious. This is surprisingly, since detailed analysis would probably bring some interesting results, which could be include to the conclusion section.

Detailed issues:

108-110 and Fig1. I am not sure if there is a point to include this information. Height correction is simply necessary due to the characteristic of vertical distribution of water vapor and it is obvious that higher differences in elevation results in higher differences in PWV.

Line 252-253 “validation could still suffer from contaminated CMR data by the signal on the land, long distance between GNSS station and footprint, and GNSS height, especially for data of higher precision” – I am quite confused here. Several lines above it show (on Figure 6) and pointed in the text, that distance up to 90 km has no significant impact on the differences, as well as station height due to the proper correction conducted at the beginning of calculations. Therefore I am not sure what author would like to say here. What kind of “long distance” is it (more than 90 km?). What GNSS elevation is mentioned here as a source of error, since as it was written in line 244-246 “The right panel confirms that the PWV differences have no correlation with station height, which means that the PWV height correction at ground-based GNSS stations is effective”. Maybe it would be more clear if the Author would specify this “data of higher precision”. Without specifying these information this paragraph is in contradiction with what the Authors have wrote before.

line 264 - “The RMS within 200 km, 150 km, 100 km, and 50 km are 2.89 mm, 1.78 mm, 1.53 mm, and 0.89 mm, respectively”. Here Authors underline that the distance has impact on the differences between HY-2A and shipborne GNSS. This is in contrast to what they have wrote in line 242 – 243 “both the average value and STD of the PWV differences between HY-2A and GNSS show no correlation with the averaged distance ranging” (the mean RMS for ground-bases GNSS was 2.67 mm). Of course

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at this point we have larger distance (up to 200 km), but the RMS for distance 100 km is for about 70% higher than for distance 50 km, while for similar distance during comparison HY-2A to land GNSS (45 km to 90 km) it was 'no correlation'. There is also no comment about differences obtained for ground-based and shipborne GNSS. The mean RMS for shipborne would be about 1.4 mm (Authors did not provide this value), which is two times smaller than the mean RMS for ground base GNSS. In my opinion this indicate that procedure for PWV coastal reconstruction is not without errors. There is no 'ideal' way to reconstruct valid data, but this should be clearly pointed by the Authors. I would appreciate if Authors could provide some explanation about this.

Line 267 " The average bias is 0.32 mm, meaning that there is no obvious systematic bias between HY-2A PWV and shipborne GNSS PWV." In case of ground-base GNSS the mean bias was -0.03 mm. Since this value (-0.03mm) was expressed as 'good agreement', and 0.32 is also expressed as 'no obvious bias' where according to the Authors is a threshold, after which we can talk about systematic bias? In addition, the information about RMS w.r.t. distance were provide – why there is no information about bias w.r.t. distance?

According to Figure 7, mean difference between HY-2A and GNSS is 0.22 mm, 0.20 mm, -0.01 mm and -0.30mm, for threshold distance equal to 200 km, 150 km, 100 km an 50 km. Since 'mean differences' are simply biases, where the value of mean bias equal to 0.32 come from? In addition from what Authors mention results that the biases are not obvious and rather indicate high compliance between PWV from shipborne GNSS and from HY-2A. In my opinion the bias is clearly positive and clearly negative between the two extreme thresholds (50 km and 200 km). I do not see any comment about that. This is strongly related to the Authors 'threshold' for significance bias, which I mention before.

Generally, the results for ground-based and shipborne GNSS should be rewritten to avoid such misunderstandings as I mentioned above.

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Section 5 is not conclusions section. Is rather a (very) short summary of obtained results, without critical and interesting findings which are necessary in such section. There is also no references to similar studies.

After all, could Authors provide more explanation about including shipborne GNSS in this paper. It is not clear why they decided to analyze this data, since (from the selection of only coastal ground-based GNSS stations) the main activity of this study is rather related to the ‘problematic’ coastal area, than to the clear oceans. Please add some information to the text.

technical corrections:

Figure 1, Please avoid in legend such shortcuts as “With” and “Without”. The Figure should be prepare in the way, which will make it possible for anyone to understand it content, without referring to the text

Figure 4 has to be improved. The crossover time cannot overlap the crossover point, especially when green and red colors are used, because it makes it difficult to read them. The crossover time should not also overlap with the ship trajectory.

[Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-503, 2020.](#)

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