

Answers to Referee n°2

We thank the referee for the taking the time to review this paper and providing short comments. The referee's comments are repeated below in black italics and our answers are given in blue.

The manuscript examines the consistency and representativeness differences of daily IWV data from ERA-Interim reanalysis and GPS observations at 120 global sites. The differences are analyzed in details by correlating with various factors and developing a representativeness error statistic using the reanalysis values over the four grid points surrounding the GPS station. The study itself has some values although the scientific originality and applications are not very appealing.

We think the study is important to the GNSS community according to our experience and discussions within the COST Action GNSS4SWEC, and thus fits well into the scope of this Special Issue.

Minor comments:

1. I think that one of main motivations for studying the spatial representativeness error is to provide such information to the data assimilation. This should be mentioned in the introduction along with the current knowledge of the spatial representativeness error of the GPS derived PWV and whether and how this study tackles this issue. For example, Liou et al. (2001, Comparison of precipitable water observations in the near tropics by GPS, microwave radiometer, and radiosondes. J. Appl. Meteor., 40, 5–15) discussed the sampling differences among different measurement techniques.

We agree with the referee and added the following sentence near the end of the Introduction:

“This study may also contribute to a better treatment of ground-based GNSS observation error in data assimilation, e.g. by establishing a parametric model of observation error depending on the spatio-temporal variability of IWV around the GNSS site computed from the model fields.”

The current knowledge of the spatial representativeness error of the GPS derived PWV is actually poor as mentioned P2L15.

2. Page 3, L17-19: “Indeed, large representativeness differences put a limit to the use of reanalyses data as a reference for detecting breaks in the GPS time series. Outlying sites should be detected and discarded.” This is a very good point. Comparing the point measurement with the reanalysis has been often used for homogenization. It would be useful to have some results or at least more discussions on this application.

This is one of the motivations of this work as also highlighted by Referee n°1. So far, we propose a method to detect the cases where ERA-Interim reanalysis cannot be used to compute reliable IWV differences with the GPS time series. We cannot go further into this discussion for now as explained in the answer to Referee n°1.

3. Page 4, L21: averaging the values from the surrounding four grid boxes has been used in Mears et al. (2014, Intercomparison of total precipitable water measurements made by satellite borne microwave radiometers and ground-based GPS instruments, J. Geophys. Res. Atmos., 120, doi:10.1002/2014JD022694) for satellite data.

We don't understand the goal of the referee's comment. Actually, Mears et al., use a slightly different method. They make a bilinear fit of the IWV field from the gridded satellite data (the fit is made in a 7x7 grid cell region surrounding the GPS station). In our case, we use a bilinear interpolation based on the four surrounding grid points but nowhere we write that this method is new. Indeed, it has been used in many past studies. What is maybe original in our study is that we

compare the GPS data to both the interpolated values and to the values of the four grid points. From there we conclude that in general the representativeness of the interpolated values is higher (P7L6-L21).