

Answer to Reviewer #1

We would like to start by thanking you for all the time and effort which you spent reviewing our paper. All your comments, suggestions, and questions were taken into account and all the necessary corrections were made in the revised manuscript.

General comments:

This is an interesting study, which provides a description and results of experimental application of a potentially useful methodology for estimation of the regional distributions of integrated water vapor (IWV) based on satellite measurements opening new perspectives for climate and weather prediction research applications. However, to be accepted for publication in Special Issue: Advanced Global Navigation Satellite Systems tropospheric products for monitoring severe weather events and climate (GNSS4SWEC) the manuscript needs a revision including a deeper discussion of results of earlier achievements in the area, presenting additional results of verification vs existing observational data and editing.

We have revised and edited the entire manuscript and added a deeper discussion of results of earlier achievements in the area. We have also added additional results of verification.

Major comments:

1. Despite the availability of remote sensing measurements contemporary weather and climate analyses still significantly rely on conventional observation data. With the progress in the understanding mechanisms responsible for extreme weather and climate events the need for a more active use of the satellite data becomes clear. The study under the evaluation represents a new step in this direction which is focused on the determination of distribution of vertically integrated water vapor over the area of Israel based on GPS meteorology coupled with METEOSAT surface temperature. Results of application of the methodology in Israel are analyzed based on the mean for the whole period (about 240 days) values of the correlation between IWV and air temperature time series. A more detailed evaluation is performed for only one day (1200 UTC August 21, 2015). Presenting and discussing of additional information on the accuracy of the calculations (e.g. maximum errors, absolute and mean errors) and especially their variation during the year.

We have extended our detailed evaluation for more days and added all the additional information regarding the accuracy of the calculations and their variation during the year. All the necessary corrections are implemented in the revised manuscript.

2. Only a relatively short discussion of the earlier research efforts is presented. Please consider the possibility of discussing of some of the following publications.

We have revised the introduction part and included more recent related research efforts.

Editorial comments:

Line 39 “exceptional distribution” – do you mean “resolution”? We have changed the sentence to: “The presented strategy can provide high temporal and special IWV/PWV resolution...”.

Line 78 -79 “conduct upper-air measurements to characterized the temporal behavior of atmospheric boundary layer” - why in the BL only? Please rephrase. We rephrased the sentence to: “which conduct upper-air measurements to characterized the temporal behavior of the lower atmosphere from a single permanent sounding site...”

Line 84 “When electromagnetic signal (s?) travel through the troposphere they are delayed and therefor (e?).” - Please correct. Corrections were made in the revised manuscript.

Line 85 “amount of delay” (??) - Please consider rephrasing. We choose to leave it as is: “When electromagnetic signals travel through the troposphere they are delayed and therefore slowed down. The amount of delay depends mainly on...”.

Line 86 “vary constantly” – significantly? ”? We have changed the sentence to: “The amount of delay depends mainly on the pressure, temperature, and water vapor content, which vary significantly both in space and time”.

Line 93 “upwelling IR” - (Upwelling is just an oceanographic phenomenon) – Please rephrase. We rephrased the sentence to: “of the reflected IR radiation...”.

Line 100-101 “WV channel observations are taken in the engineering quantity “count” mode, and has (have?) to be converted into equivalent physical “radiance” unit “ - (units?), please consider correcting, rephrasing. Corrections were made in the revised manuscript.

Line 106-107 “the main advantage to obtain” -??? Please rephrase. Corrections were made in the revised manuscript.

Line 125 “allow us”- (allows?) Corrections were made in the revised manuscript.

Line 132 -132 “A 7° minimum elevation cut-off for the satellite observations was applied along with the Vienna Mapping Function” - Please clarify or rephrase. We are simply describing our GPS analysis strategy. This is informative description based on GIPSY-OASIS software and the possible input parameters for obtaining PPP or tropospheric delays. This is a common description among GPS software’s users. We choose to leave it as is.

Line 134-138 “(VMF1; Boehm et al., 2006). Zenith hydrostatic delay (ZHD) values from the ... but may change from one time step to another”- This part is not clear. Please rephrase. Again, we are simply describing our GPS analysis strategy. This is informative description based on GIPSY-OASIS software and the possible input parameters for obtaining PPP or tropospheric delays. This is a common description among GPS software’s users. We choose to leave it as is.

Line 171-171 - Your statement “The correlation between the two is fairly good (R2=0.79)” contradicts to line 183 “moderate correlation (R2=0.79) between the surface temperature” – please rephrase. Corrections were made in the revised manuscript.

Line 192 “...can be simply (?) explained due (?) to the fact that the extracted IWV has a stronger dependency” – Please rephrase. Corrections were made in the revised manuscript.

Line 251 “accurate (compered with PW radiosondes measurements)” – compared? Corrections were made in the revised manuscript.

Line 244-245 and line 263 “the most straightforward approach ... “the best way”. Corrections were made in the revised manuscript.

Line 275 “The relatively large differences appear near” – please provide the value. The values were added.

Line 293 “Therefore, It (it?) is useful to”. Corrections were made in the revised manuscript.

Line 309 “relatively small (???) resolution of METEOSAT-10 sensors (5x5 km2/pixel)” – Do you mean high? Corrections were made in the revised manuscript.

Line 314 “However, a special care is needs” – Please correct (is required?). Corrections were made in the revised manuscript.

Line 315 “surface temperature due to the existent (existence?) of clouds” – please correct. Corrections were made in the revised manuscript.

Line 317 “The presented strategy discussed above (the last two words are probably not necessary?)” – Please check. [Corrections were made in the revised manuscript.](#)

Line 318 “provide unprecedented temporal and special IWV/PWV distribution” Why it is unprecedented” – please explain or rephrase... [Corrections were made in the revised manuscript.](#)

Line 319-320 “part of the accurate and comprehensive initial conditions provided by upper-air observation systems at temporal and spatial resolutions consistent with the models assimilating them” -Please rephrase. Please consider using “comprehensive observation data for application in modern data assimilation systems required for increase in the accuracy of the forecasts with the contemporary state of science regional numerical weather prediction systems”. [We changed the sentence according to your suggestions: “The presented strategy can provide high temporal and special IWV/PWV resolution, which is needed as part of the accurate and comprehensive observation data integrated in modern data assimilation systems, and is required for increasing the accuracy of regional Numerical Weather Prediction \(NWP\) systems forecast”.](#)