

**Evaluation review of the manuscript** amt-2016-217 “Combining METEOSAT-10 satellite image data with GPS tropospheric path delays to estimate regional Integrated Water Vapor (IWV) distribution by A. Leontiev and Y. Reuveni

**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 vapour (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.

**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.
- 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.

M. P. Cresswell, A. P. Morse, M. C. Thomson, S. J. Connor (1999) Estimating surface air temperatures, from Meteosat land surface temperatures, using an empirical solar zenith angle model, *International Journal of Remote Sensing*, 20:6, 1125-1132, DOI: [10.1080/014311699212885](https://doi.org/10.1080/014311699212885)

G. Guerova, J. Jones, J. Dousa, G. Dick, S. de Haan, E. Pottiaux, O. Bock, R. Pacione, G. Elgered, and H. Vedel (2016) Advanced global navigation satellite systems tropospheric productions for monitoring severe weather events and climate (GNSS4SWEC) DOI: 10.13140/2.1.3351.2968

S. Hagemann, L. Bengtsson, G. Gent (2003) On the determination of atmospheric water vapour from GPS measurements, *J. of Geophys. Res.*, 108, NO. D21, 4678, doi:10.1029/2002JD003235

S. Heise, G. Dick, G. Gendt, T. Schmidt, and J. Wickert (2009) Integrated water vapor from IGS ground-based GPS observations: initial results from a global 5-min data set *Ann. Geophys.*, 27, 2851–2859, 2009 [www.ann-geophys.net/27/2851/2009/](http://www.ann-geophys.net/27/2851/2009/)

Hordyniec P., Bosy J, Rohm W (2015) Assessment of errors in Precipitable Water data derived from Global Navigation Satellite System observations, *Journal of Atmospheric and Solar-Terrestrial Physics*, 129, Pages 69–77

Vedel, H., Huang, X.-Y., Haase, J., Ge, M., Calais, E. (2004) Impact of GPS Zenith Tropospheric Delay data on precipitation forecasts in Mediterranean France and Spain In: *Geophysical Research Letters*, 31, No. 2, L02102. DOI: 10.1029/2003GL017715

Wang, J., Zhang, L., and Dai, A.: Global estimates of water-vapor-weighted mean temperature of the atmosphere for GPS applications, *J. Geophys. Res.*, 110, D21101, doi:10.1029/2005JD006215, 2005.

## Editorial comments

Line 39 “exceptional distribution” – do you mean “resolution”?

Line 78 -79 “conduct upper-air measurements to characterized the temporal behavior of atmospheric boundary layer” - why in the BL only? Please rephrase.

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

Line 85 “amount of delay” (??) - Please consider rephrasing.

Line 86 “vary constantly” – significantly?

Line 93 “upwelling IR” - (Upwelling is just an oceanographic phenomenon) – Please rephrase

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.

Line 106-107”the main advantage to obtain” - ??? please rephrase.

Line 125 “allow us”- (allows?)

132 -132 “A 7° minimum elevation cut-off for the satellite observations was applied along with the Vienna Mapping Function” - Please clarify or rephrase.

134 - 138 “(VMF1; Boehm et al., 2006). Zenith hydrostatic delay (ZHD) values from the ... but may change from one time step to another”- This para is not clear. Please rephrase.

Line 171-171 - Your statement "The correlation between the two is fairly good ( $R_2=0.79$ )" contradicts to line 183 "moderate correlation ( $R_2=0.79$ ) between the surface temperature" – please rephrase.

Line 192 "...can be simply (?) explained due (?) to the fact that the extracted IWV has a stronger dependency" – Please rephrase.

Line 251 "accurate (compared with PW radiosondes measurements)" – compared?

Line 244 245 and line 263 "the most straightforward approach ... "the best way"

Line 275 "The relatively large differences appear near" – please provide the value.

Line 293 "Therefore, It (it?) is useful to"

Line 309 "relatively small (???) resolution of METEOSAT-10 sensors ( $5 \times 5 \text{ km}^2/\text{pixel}$ )" – Do you mean high?

Line 314 "However, a special care is needs" – Please correct (is required?)

Line 315 "surface temperature due to the existent (existence?) of clouds" – please correct.

Line 317 "The presented strategy discussed above (the last two words are probably not necessary?)" – Please check.

Line 318 "provide unprecedented temporal and special IWV/PWV distribution" Why it is unprecedented" – please explain or rephrase..

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".