

## ***Interactive comment on “Water vapor mapping by fusing InSAR and GNSS remote sensing data and atmospheric simulations” by F. Alshawaf et al.***

### **Anonymous Referee #1**

Received and published: 15 March 2015

General comment: This paper deals with the fusion of different data sources to derive water vapor maps. Sources include remotely sensed data as well as output from a mesoscale atmospheric model. As more datasets from remote sensing and models become available, competing to derive the same parameters this topic is definitely of interest for the scientific community. The paper is well written with respect to understandability, detailedness and balance between equations and references to methods. Results are significant for a publication.

Specific comments:

You compare WRF simulated data with MERIS data. For the WRF simulations ERA-Interim were applied as boundary conditions. As there are various sources of satellite

C571

data assimilated in ERA Interim, there is definitely a need to explain them and potential relationships to the applied MERIS dataset.

You should tell at least some words about MERIS water vapor retrieval: what are the basics and are there any consequences for your method (e.g. is MERIS able to retrieve water vapor for the complete column in case of clouds or only above the clouds ?)

As units for water vapour you use 'wet delay'. In the satellite community, PWV is the vertically integrated water vapor, where no negative values appear. It would be favourable to distinguish more clear between these units.

On page 373 you talk about the aspects of 'isotropy' and 'anisotropy'. Thinking about the 'regionalized variable' of Matheron and examining PWV maps from satellite (with very sharp edges due to frontal systems), I would like you to elaborate (if possible) more on this issue. Are there e.g. situations (due to data from remote sensing) where only the atmospheric model can capture these 'gradient' due to atmospheric fronts and so becomes invaluable for the method ?

In Figure 11 (and related text), you nicely contrast the influence of the atmospheric model in two cross sections. Is it possible to provide a map depicting directly the influence of the different data sources. Up to now, my feeling is that the influence of the atmospheric model is rather low overall.

Technical corrections / minor remarks:

page 364 line 6: What means 'accurate' here ? Depends on subsequent application of the grids ! page 364 line 17: 'single' - better 'individual' ?

page 365 line 1: better skip 'deluge' from your list page 365 line 4: You talk about water vapor along the path, but what you get is precipitable water vapor, which is vertically integrated, isn't it ?

page 366 line 4: 'arbitrary temporal and spatial': even if you include LES, there is a limit concerning the spatial domain due to the need for parametrization. You are e.g. not

C572

able to model water variability explicitly in the spatial scale needed for evolution within drop size distributions. page 366 line 20: 'which' instead of 'that'

page 367 line 5: 'levels' instead of 'level' page 368 line 5: As you compare your retrieval to MERIS, you should provide at least a broad idea, how PWV is derived from MERIS data (are there any issues / problems / drawbacks the reader should know about this data ?) page 368 line 15: please indicate if it is a 'oneside' or twoside' nest (with respect to feedbacks)

page 369 line 8: 'shows' instead of 'show' page 369 line 10: 'discontinuity' or better 'difference' page 369 line 10: Because WRF needs water vapour as input, the question arises if differences are due to the ERA-Interim data ?

page 373 line 9: 'the the ' skip one 'the' page 373 line 9/10: not feasible anymore

page 379 there are numerous aspects described in the 'results and discussion section' which should be better found in a 'methods' section as they do not include any results.

page 380 line 11: may be it is better to indicate the area you mean in figure 11.

page 386 line 16: 'straight' instead of 'strait'

page 403 The individual parts of the graphic should better be labeled with a), b), ... and these labels should be referenced in the text. Introduction of cross sections 'A' and 'B' should be found in the caption below.

page 393: a coefficient has no unit (%); it would be nice to add a note what the whiten patches mean (no retrieval) and why they exist (clouds ?) page 394: there is something wrong with your scale bar (a 'minus' missing ?)

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 363, 2015.