Author Response to Review of

Tropospheric water vapor: A comprehensive high resolution data collection for the transnational Upper Rhine Graben region

Benjamin Fersch et al.
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RC: ***Reviewer Comment***, AR: *Author Response*, ☐ Manuscript text

Dear Referee,

we would like to thank you very much for taking the time to review our work. Your comments and constructive suggestions to our manuscript are highly appreciated.

1. General comments

RC: ***Water vapor is a crucial constituent of the atmosphere, not least because of its importance for severe weather events and climate change. The authors describe GNSS and InSAR datasets as input for assimilation in atmospheric models, along with the applied methods for merging. The datasets encompass the Upper Rhine Graben Region. The data are valuable and an interesting contribution for the scientific community.***

AR: *We are pleased having created a data set that is useful and valuable for the scientific community.*

RC: ***The article is not always easy to read, but I understand that this is due to the fact that different communities (GNSS, InSAR, WRF, ...) are coming here together for this joint work. Moreover, some abbreviations are not understandable at first reading. There is an appendix with the explanations, but it would be appreciated if more explanations are added in the text.***

AR: *We agree with the reviewer's impression that due to the multi-disciplinarity of the scientific content it is not easy to memorize the abbreviations and to understand the connections between the different parts. We will go through the text and see where we can add further explanations and repeat the definitions for abbreviations that are not used awhile.*

2. Specific comments

RC: ***line 12: What is meant with 2.5 mm global mean water equivalent? Average precipitable water? If yes, I would have expected a larger value.***

AR: *The reviewer is correct about the impression that 2.5 mm are too small. It's 25 mm or 2.5 cm. We will correct*

for that typo. The numbers were by the way taken from the https://doi.org/10.1063/PT.3.2009 reference.

RC: ***185: are applied***

AR: *Will be changed.*

RC: ***Equation 1: I suggest adding the gradient mapping function to grad(a,e)***

AR: *We will add the gradient mapping function as follows*

$$grad(a,e) = G_{NS} \cdot mf_G(e) \cdot \cos a + G_{EW} \cdot mf_G(e) \cdot \sin a \quad (1)$$

$$mf_G(e) = 1/(\sin e \cdot \tan e + 0.003) \quad (2)$$

RC: ***277: Where is Figure S4?***

AR: *Figure S4 is contained in the supplemental material (`https://doi.org/10.5194/essd-2022-57-supplement`). We will check how we can improve the reference.*

RC: ***Equation 3: is there a certain reason to use * instead of . ?***

AR: *That's a typo and will be changed.*

RC: ***466: derived***

AR: *Will be changed.*

RC: ***Figure captions 9 and 10, and others: please provide all the information in the figure caption, which is necessary to understand the figure.***

AR: *Thank you for pointing this out. We will extend the figure captions accordingly.*

RC: ***493: datasets***

AR: *Will be changed.*

RC: ***Equation A1, and other equations in the appendix: please add units***

AR: *We will check the equations in the appendix and add missing units.*

RC: ***Equations A8 and A9 denote the ZWD delay as a pure "wet" delay. On the other hand, A3 refer to a non-hydrostatic delay (not wet in the strict sense). Does this (small) difference cause any inconsistencies?***

AR: *You are right. There is a subtle difference between these two. The ZWD in Eq.A3 is an intermediate parameter that used for the conversion of GPS-derived IWV. However, the ZWD in Eq. A8 and A9 lack a term in the ZWD in Eq. A3:*

$$-10^{-6} k_1 \cdot R_d \cdot \int \rho_w \, \mathrm{d}h \quad (3)$$

This difference causes about 3% difference in ZWD. Nevertheless, as the ZWD in Eq. A8 and A9 just help to provide some information for the calculation of InSAR-derived ZWD, its influence is minimal.