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Comment on amt-2021-113

Anonymous Referee #1

Referee comment on "A new zenith hydrostatic delay model for real-time retrievals of GNSS-PWV" by Longjiang Li et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-113-RC1, 2021

Review of the manuscript by Longjiang Li et al. with the title "A New ZHD Model for Real-Time Retrievals of GNSS-PWV".

For the derivation of precipitable water vapour (PWV) from GNSS zenith total delays, it is important to have accurate values of zenith hydrostatic delays (ZHD). In the best case, the ZHD are calculated from measured pressure values at the sites. In case those measurements are not available and the PWV need to be determined in near real-time, users often refer to empirical models, such as those from the GPT series. However, these blind models are not able to capture real pressure variations; thus, significant errors can show up in PWV. Consequently, the authors have developed a GZHD model based on the back propagation artificial neural network where they use measured zenith total delays to get improved values for the ZHD. With comparisons against radiosonde data and ERA5 they show that the new GZHD models provides improved ZHD values with respect to GPT3.

While I like their approach and find it very interesting, the motivation is not that clear. I would assume that forecast numerical weather models with pressure values will be available to users investigating the near real-time determination of PWV, so line 54 is not entirely correct. These forecast pressure values will be more accurate than the values from the GZHD model.

But as I said, I find the approach itself very interesting using the ratio between total and hydrostatic zenith delays as key parameter and an artificial neural network. I have not seen that before.

The biases in Figure 8 for GPT3 are rather large and systematic. Which 2.5 x 2.5 degree topography did the authors use and how did they interpolate within the ERA5 profiles?

Figure 3 caption: Ratio of total and hydrostatic zenith delays ...

110 four times

277 high-latitude

305 vertical axis