

Review of version 2 of manuscript acp-2020-77 “Trends of atmospheric water vapour in Switzerland from ground-based radiometry, FTIR, and GNSS data” by L. Bernet and co-authors.

Regarding your answers to my general comments

I am still wondering why all the corrected GNSS trends are positive and larger than the uncorrected trends. Regarding the sign of the trend, it is plausible that it is the same at the scale of a country (Switzerland). However, why would all the corrections have a similar sign? You suggest that all the GNSS data have a positive bias in the earlier years (or negative in the later years) which leads to decrease the uncorrected trends. Could you elaborate a bit more on the actual reasons explaining such a global bias? (changes in instrumentation, processing, etc.)

Your approach to correct the biases in the data in order to retrieve correct trends looks promising. However, it seems quite sensitive to the choice of the observation and bias uncertainty. This point should be discussed further.

You mention that you increased the observation uncertainty for TROWARA and GNSS during the revision (from 1.5% to 5% for GNSS) which improved the bias correction. How is the improvement assessed?

In the simulation example added to section 3.1, which data block is considered as the reference? As you mention at the end of your Authors Comments, the trend estimates depend on this choice. You changed your approach to using the longest data subset. If this is a general recommendation of your method, it should be stated in the paper.

Regarding your answer to my comment “P4L99: could there be an effect of the changes of the TROWARA instrumentation in 2002 and 2004 on the IWV data and IWV trend estimated with the radiometer? Is there a bias adjustment similar to that applied to the GNSS data or any kind of recalibration?”

Your answer: “Change points in TROWARA data due to instrumental changes before 2009 have been detected and corrected by a careful comparison of the TROWARA time series with a co-located weather station (Morland et al., 2009). No instrumental changes have been performed in recent years. We therefore presume that the data is well homogenized and use no bias correction in the TROWARA trend estimates.”

=> Please add this information in the paper and also explain what you mean by “harmonized” (P4L108)

As already mentioned in my first review, the MERRA2 data presented in Fig. 14 (new manuscript) are really suspicious. Such a large bias is unlikely due to a change in the observation system nor in the assimilation system. If no proper explanation is given, I recommend to remove this figure. The fractional change of water vapour can still be discussed from ERA5 (Fig. 13) as are the RH trends (Fig. 15).

Minor edits to the revised version

P8L212: with  $\sigma$  the standard deviation of the monthly measurements and  $n$  the number of measurements per month

P9L248 : a possible jump in the GNSS height data