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Atmospheric Measurement Techniques Discussions

Interactive comment on "Estimating trends in atmospheric water vapor and temperature time series over Germany" *by* Fadwa Alshawaf et al.

Anonymous Referee #1

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The study of Alshawaf et al. (2017) mainly presents an interesting trend analysis of PWV of the GPS station network in Germany. Generally this study is appropriate for AMT. However the presentation could be improved. For example, by reading the abstract and the conclusions it is not so clear which trend values were derived in the study.

Point 1: There is a confusion about what are the main results of this study? Is it the positive trend in Table 1. Is it the map in Figure 10c? Or is it the map in 14c? I would say that Figure 10c is the most important result.

Point 2: I would suggest to give a theoretical explanation for a correlation between a temperature change and a change in water vapor pressure e.g. derived from the Clausius Clapeyron equation. Often one can read that a 1 Kelvin change gives a 7%

change in saturation vapor pressure (Held and Soden, 2000). If the relative humidity is constant then one can derive the expected increase in water vapour pressure too. Does this agree with your results of the trends in T and PWV? Is RH constant over the years?

Held, I. M., and B. J. Soden, 2000: Water vapor feedback and global warming. Annual. Review of Energy and the Environment, 25, 441-475

Point 3: You make a long statement about GPS PWV from mountain regions. I would consider results of this study:

J. Morland, M. Liniger, H. Kunz, I. Balin, S. Nyeki, C. Mätzler, N. Kämpfer: Comparison of GPS and ERA40 IWV in the Alpine region, including correction of GPS observations at Jungfraujoch (3584 m), Journal of Geophysical Research, Atmospheres, vol.: 111, no.: D04102, pp.: 1-12, 2006

Point 4: - Colors in Figure 7 should have more contrast - title in Figure 15 a and c should be T rate instead of PWV rate

Minor corrections:

page 1

line 9: "deseasonalized" is clearer than "seasonally adjusted"

line 13 it is unclear to what "the former" is related. In addition it is unprecise to say the trend is below a certain number. The trend should be equal to a mean value +/- the standard deviation.

page 3:

line 7: There was a study from the Netherlands which showed that PWV has the strongest correlation with the humidity at ca. 1.5 km altitude. Unfortunately I forgot the citation. Such a study demonstrates that surface data cannot be a full substitute for a PWV measurement.

line 20 I would use "finally“ instead of "ultimately“

section 4.1 : this method looks a bit unorthodox. I would prefer a trend model and solving the equation system in one step for seasonal oscillation and the linear trend. For equal weighting of the data it would be good to have a complete series of monthly means before analysing the trend.

page 9 line 13 : are available in Figure 9

page 11 line 11 comparison instead of Comparison

line 15 "We found that the trend tends . . .. It is not clear for me if it is just a result of ERA or if it comes from the GPS measurements too. Figure 10 a and c do not show such a horizontal gradient in the trend

Figure 2 caption please define the "difference“. Is it ERA-Interim - GNSS ?

Figure 7 how is the mean difference defined?

Figure 14 and in general: I don’t understand why you come up with the dew point-based PWV? Actually you have good and plenty of GNSS data of PWV. Don’t you believe in the GNSS PWV trend map , e.g., Figure 10c?

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