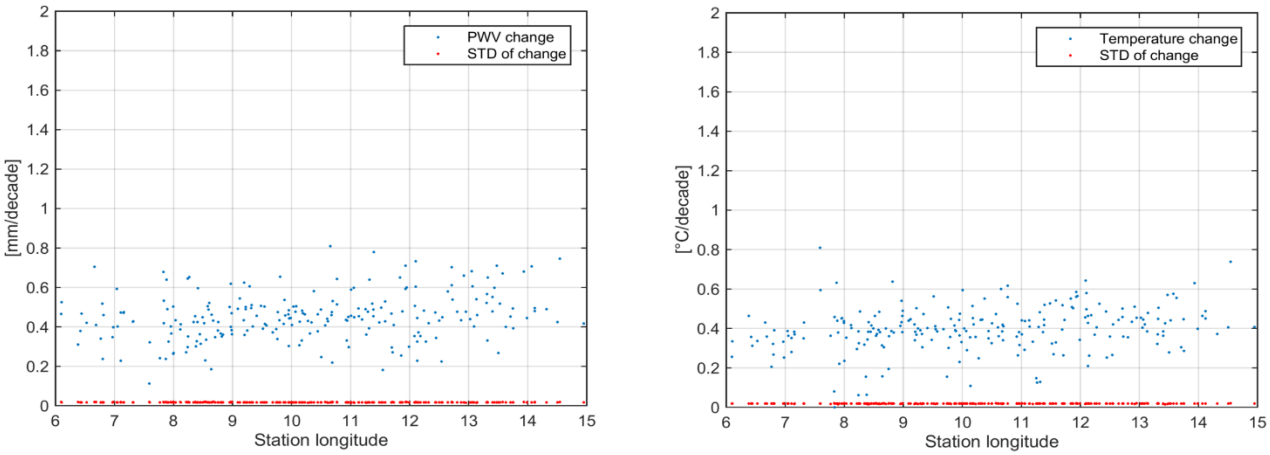
Response of the authors:

The authors would like to thank the editor and the reviewers for the time investigated to review this paper. We addressed the suggested points. The current version contains all changes according to the reviewer suggestions.

Referee#1	**Response of the authors**
Major comments: 1. Page 3, line 10: "Homogenous time series with an average length of 14 years are available from 84 sites". The total number of sites is 278. What with the rest of stations? Are the time series also homogenous? A comment on homogenization is needed here: give a total number of epochs applied, a maximum change in trend, a maximum change in standard deviation. Please, quantify a task of homogenization.	Of the 278 sites, the time series at 84 sites are longer than 10 years. Since the length of the time series is critical for climate studies, we involved only these 84 sites in the trend analysis. Because these time series are still not sufficiently long for climate studies, we used other data sets. We agree with the reviewer that homogenization is a great topic for this work. We have here a paper on homogenization for global network Ning, T.,Wickert, J., Deng, Z., Heise, S., Dick, G., Vey, S., and Schöne, T.: Homogenized time series of the atmospheric water vapor content obtained from the GNSS reprocessed data, Journal of Climate, 2016. No critical change points were observed for the sites in Germany; however, we are currently working on this specific area to evaluate the ZTD and PWV products. This will be published in another paper.
2.Page 5, line 10: "We observed that the higher the GNSS antenna is located, the larger the bias." How many stations are affected by this bias? Are the mean value and STD directly correlated with height? A comment on it is needed.	For most regions, the topography is rather flat. This effect is observed in the Alps region, where an ERA-Interim cell over 70 km in each direction averages the topography around the Zugspitze and in here, we observe the bias between GNSS and ERA-Interim. Within that cell, there exist 3 GNSS sites and based on them we cannot judge the dependence of the mean and STD on the height, but apparently for these 3 sites the mean did.
3. Page 8, fig. 4: site 0285: Where does the difference between Tm's below 260K come from? A comment on it should be added.	Not only surface pressure grids are inaccurate in mountainous regions (Figure3-d), but also pressure profiles because of the coarse grid of ERA-Interim. Also, the temperature profiles have inaccuracies even though less than that for the pressure. By using the integration in Eq. 9, the accumulated error in the calculated Tm will be higher; and the bias between this Tm and the Tm calculated using only the surface temperature will increase, as observed from the right plot in Figure 4. Comment added in text.
4. Page 10, line 3: You mentioned seasonal and cyclic component of ZTD data. What do you mean by cyclic? What is the difference between seasonal	We agree with the reviewer on this point. However, we used a model developed by econometricians, who defined a cyclic component as a seasonal

and cyclic? Why two terms should be mentioned? I would prefer to name cyclic as seasonal as well.	signal of period of several years. We presented the term for completeness, but we only stayed with the seasonal component.
5. Page 10, line 10: “It represents the irregular (stationary) stochastic com- ponent with short temporal variations.” The stationarity and short temporal variations are too optimistic to be assumed. In this way you input that the irregular component has no or little influence on determined parameters: trend and seasonal component. What if the stochastic component was correlated in time and in this way brought large uncertainties of trend and seasonals?	According to our tests, the stochastic signal might show temporal correlation up to 7 days but not longer. For the trend analysis, a temporal filter of 1 year is used to remove its effect. And the seasonal component is estimated first and removed. This is all done iteratively until the three components are distinguished. If that does not answer the question, we will be thankful if you suggest a reference to read.
6. Page 11, fig. 6: The long-term variations you name as “trend component” may be related to noise model being far from white noise assumption you made. In fact, noise in PWV is close to autoregressive process. This is why the trend you estimate may be over/underestimated due to autoregressive trend and not necessarily real changes noticed in PWV data. Did you consider any other process being hidden in irregular component? A detailed comment on it should be added.	No we did not, but according to this comment we will invest more analysis on this component. Thank you.
7. Page 13, line 1: “while a bias is observed in mountainous regions”. Can you quantify this bias?	Added to text
8. Page 14, fig. 9: Can you add the errors of estimated trends? It would help a reader to judge on its significance.	Added
9. You show results for 3 different stations. Can you please add the statistics for all stations examined? It would give the overall view on stations and their (dis-)agreement with ERA-Interim and meteorological data.	We are still working on the entire network. It is early to make conclusions, but a preliminary result of the change at all stations is shown in the figure below.
10. Can you provide errors of all values of trend/slopes provided within the text. Now, a reader is not aware of significance of each value given.	Added

Minor comments: 1. Time in figures is given in "years", not "days". 2.	Done
Page 1, line 10: "PWV trend component estimated from GNSS data strongly correlates with that :::"	Added
give numbers to justify this "strong correlation".	Added
3. Page 1, line 12: "0.3-0.6" an error must be added here.	
4. Page 1, line 18: "a mount", change into "amount".	Done
5. Page 5, line 7: double "of" 6.	Done
Page 7, fig. 3: the caption of bottom axis is not visible.	



The change of PWV and temperature over the previous 30 years