

Interactive comment on “Global IWV trends and variability in atmospheric reanalyses and GPS observations” by Ana C. Parracho et al.

Anonymous Referee #1

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General Comments

The manuscript presents results for IWV mean values and linear trends over time periods of 15-20 years in a global perspective. As far as I know this paper is unique and it offers additional knowledge to the paper by Wang et al. (2016) which in some aspects is similar, such as the use of the GPS dataset from the IGS.

At places I think the manuscript reminds of a text book. For example, I think there is no need to explain the general distribution of the IWV, as in the beginning of Section 3, with mean values of the IWV for different areas. In general I find the text to use too many words. I will mention a couple of additional examples below. If the text is more focused on what is new it will be easier for the reader to grasp the important results, i.e. these that are new or are contradicting previously published results.

It is a bit disturbing that the time period with GPS data ends in 2010, covering a 15 year period, when we are now in 2018. I wonder if the additional 5-7 years of data would influence the overall results. Trends are small and a longer time period would be beneficial. Perhaps also the GPS stations have been more stable in terms of less changes of equipment during the recent years? Perhaps there is a another manuscript in preparation?

I note that the last section is called "Summary" rather than "Conclusions". Perhaps this is intentional? I miss conclusions in terms of what have you found that affects other studies? Do you have recommendations concerning the use of the different data sets? What are the future problems to address, et cetera? Given that the summary section to large extent repeats results already presented, it can be significantly shorter.

Specific comments

pages 2-4: The introduction could be much more focused. Many of the issues here are not addressed by the results presented later.

page 5, line 20: I do not see a problem of using all the 20 stations in the western USA, because you never present any global averages or trends. Please explain why overrepresentation would be an issue.

page 6, lines 8-11: I would like to see more strict requirements on the data availability in order to have representative values for a month and for a season. It is stated that GPS offers continuous data coverage back to 1995 so from that point of view it does not make sense to be so "generous" when accepting data.

page 6, subsection 2.3: This method used for the calculation of the trends has become popular recently. Here I miss one ore more quantitative example(s). All IWV results are presented as absolute ($\text{kg/m}^2/\text{decade}$) or relative ($\%/decade$) trends for the IWV. Temperature trends are presented e.g. in Subsection 5.3. What are the corresponding resulting uncertainties obtained with this method compared to the classical least

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squares fit? Furthermore, it would indeed be interesting (for at least a few sites) to present the differences between trends obtained by these two methods.

page 7, line 23: The words "good agreement" needs to be defined. Actually I think there is no information in this sentence. The quality of the agreement is discussed in detail thereafter and "good" means different things to different readers.

page 10, lines 3 and 6: again unclear, what is good agreement?

page 10, line s 14-16: This statement is not needed. It is just statistics (that are expected) and not used later.

page 11, lines 3-4: It is a bit unclear if all coastal and mountainous sites have a problem with representativeness? Otherwise is not this too much hand waving?

page 11, line 9: again the term "good agreement" is used. Try instead to describe quantitatively how they agree (and perhaps not agree? For example if a difference between two trends is $0.2 \text{ kg/m}^2/\text{decade}$, is that a good agreement or is it a disagreement?

page 11 line 11: "... none of the values computed by Wang et al (2016) are significant but the drying over western Australia is also observed." How is it observed when the values are not significant?

page 11, line 15: Here is an example where you refer to "low values". Does that mean that they are comparable to the uncertainties (in $\text{kg/m}^2/\text{decade}$, this connects to the comment on page 6)?

page 12, line 20: Here you define that "good agreement" means that some features are confirmed. However, you can just state that the features are confirmed and ignore to add the subjective wording "good agreement"

page 19, line 3: define "high IWV gradients"?

Technical Corrections

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page 1, line 18: "Monthly IWW trends" is unclear, trends over a month or trends for all the January months et cetera, or (total) trends based on all monthly means?

page 1, line 25: "found to not" → "found not to"?

page 1, line 30; and page 2, lines 3 and 4 (as well as many additional places in the manuscript): Leave a space between a value and its unit, according to SI also for the units percent (%), degree north and east (°N and °E), and degree centigrade (°C).

page 2, line 6: IPCC report is not in the reference list, specify which year and give an URL address?

page 2, line 11: Tropics → tropics (not a name)

page 3, line 5: annual and → annual, and

page 3, line 9: GPS data has → GPS data have

page 3, line 11: data is → data are

page 3, line 14: This data is → These data are

page 3, line 15: ERA-Interim , → ERA-Interim,

page 4, line 1: e.g. dynamical → e.g. the dynamical

page 4, line 8: In section 5 – > In Section 5

page 5, line 23: rate → temporal resolution (rate is not measured in minutes)

page 6, line 7: such a statement requires a reference, otherwise it should not be stated.

page 6, line 23: no need to repeat the requirement from above

page 8, line 6: section 2 → Section 2

page 10, lines 5-6: well documented → well sampled ?

page 11, line 1: section 5 → Section 5

page 12, lines 18-19: "More details will be given in the discussion section." There is no section with the title "Discussion"?

page 12, line 28: In this section MERRA-2 is → MERRA-2 is now?

page 13, line 31: (Fig. 9c and d) → (Figs. 9c and d)

page 14, line 1: (Fig. 5c and d) → (Figs. 5c and d)

page 14, line 2: (Fig. 9d and d) → (Figs. 9c and d) ?

page 15, line 23: (Fig. 11d, h) → (Figs. 11d and h)

page 15, line 23: (Fig. 11b, f) → (Figs. 11b and f) and again two times on line 27, same page, and many times on pages 17 and 18 ...

page 18, line 22: the dry season flow → the flow in the dry season

page 19, line 2: In this paper we → We

page 19, lines 10-11: again, define "monthly trends"?

page 19, line 20: seasonal trends → long term trends for winters and summers? (this is the same language issue as "monthly trends")

page 25: font size of station names is too small to be readable

pages 38 and 41: font size of the text within the figure frames is too small to be readable

page 41, fig. 16 → Fig. 16

page 41, caption: siries → series

— End of Comments

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