

## ***Interactive comment on “Comparison of total water vapour content in the Arctic derived from GPS, AIRS, MODIS and SCIAMACHY” by Dunya Alraddawi et al.***

### **Anonymous Referee #1**

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This article, written about Total Column Water Vapor (TCWV) in the 3 Arctic sites, inter-compares ground-based in situ measurements (GNSS TCWV used as a reference) with TCWV from satellite platforms. The topic and results are attractive for climate research communities for having better overview about instrumental biases, including latitudinal and seasonal variability caused by cloud impact.

The topic is relevant to the scope of AMT. It is not the first in its art, but is targeted to the Arctic and will give valuable information about satellite-derived water vapor accuracy compared to GNSS and cloud impact on the results in Arctic region.

The article relies on known concepts and the authors have used data delivered by

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known agencies. Reference GNSS data is processed by Geodetic Observatory Pecny (repro2 solution) with using supporting meteorological data from ERA-Interim, following the best known practices.

The abstract provides a brief overview and a concise summary. The overall structure of the article is clear. The conclusions based on practical data analysis comprise the results of the work with suggestions for better reducing TCWV biases in the Arctic. The article is supported with appropriate references.

The article needs some minor revision before it's ready for publication.

Questions: 1. Can it be explained what does AIRS clear-sky forward mode absolute accuracy 0.2K mean for TCWV derivation (for MODIS given 5-10% TCWV accuracy, page 4, line 35)? 2. Section 4 describes an impact of clouds on satellite TCWV measurements as a source of uncertainties. Is it the only or main factor creating the biases or does there exist any other factors like latitudinal dependence? Is it possible to quantify all the disturbing factors? 3. Figures 7, 8, 9 – is there any idea why Sodankyla is excluded from these figures, however discussed in sections 4.1, 4.2 and 4.3? 4. What can be concluded about the total uncertainties of the space-born instruments and deriving TCWV (instrumental uncertainties, models, ...)? The outlook for calibrating satellite measurements with GNSS TCWV?

Suggestions: 1. GPS  $\longleftrightarrow$  GNSS, if it cannot be claimed that the authors have used solely GPS-data (i.e. without GLONASS) what is very unlikely for repro2 solution, then the authors should better use GNSS instead of GPS in the title and the following text. 2. Page 4, lines 19-20 as “inter-annual variability (Fig. 2)”, and Figure 2: Monthly time series ... It could be more informative to give inter-annual variability as a table. It is hard to notice/quantify the variability from 10+ year TCWV time series (too much squeezed). Or, it could be pointed on Figures 7, 8 and 9?

Some technical corrections: Typos like Page 10, line 23: "Table. 3" ...

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