

Reviewer #2: <https://doi.org/10.5194/egusphere-2023-2508-EC1>

I am providing this comment on behalf of a referee, who sends her/his short report only via email and missed to submit it as a comment in the ACP open discussion.

The reviewer's assessment of the paper was that it does not make any significant new scientific contribution, but rather repeats earlier work. Therefore, the referee recommended rejection of the paper. This assessment was confirmed upon examination of previous articles (examples listed below).

References:

- [1] Chen, B. and Liu, Z.: Global water vapor variability and trend from the latest 36 year (1979 to 2014) data of ECMWF and NCEP reanalyses, radiosonde, GPS, and microwave satellite, *J. Geophys. Res. Atmos.*, 121, 11,442-411,462, 10.1002/2016JD024917, 2016.
- [2] Peng, W., Tongchuan, X., Jiageng, D., Jingmin, S., Yanling, W., Qingli, S., Xin, D., Hongliang, Y., Dejun, S., and Jinrong, Z.: Trends and Variability in Precipitable Water Vapor throughout North China from 1979 to 2015, *Adv. Meteorol.*, 2017, 1-10, 10.1155/2017/7804823, 2017.
- [3] Wang, S., Xu, T., Nie, W., Jiang, C., Yang, Y., Fang, Z., Li, M., and Zhang, Z.: Evaluation of Precipitable Water Vapor from Five Reanalysis Products with Ground-Based GNSS Observations, *Remote Sens.*, 12, 10.3390/rs12111817, 2020.
- [4] Xu, Y., Ma, L., Zhang, F., Chen, X., and Yang, Z.: Accuracy Analysis of Real-Time Precise Point Positioning—Estimated Precipitable Water Vapor under Different Meteorological Conditions: A Case Study in Hong Kong, *Atmosphere*, 14, 650, 10.3390/atmos14040650, 2023.

Reply: First of all, thank you very much for giving some references and helpful comments. However, our manuscript is very different from four references. References [3] and [4] mainly focus on evaluation of real time water vapor and PWV from five reanalysis products, rather than PWV trend analysis. References [2] and [4] mainly study the variation trend of water vapor in northern China and across the world, and the time span does not exceed 40 years. The variation trend of water vapor and reasons are different in different countries and regions, and the variation trend of water vapor in north America is absolutely different from China and the globe.

Compared with the above four references, the main innovations of the manuscript are as follows:

(1) We verify and analyze the consistency of long-term water vapor trends between GNSS and ERA5 PWV from 2010 to 2022, which are different from simple accuracy evaluation of several reanalysis.

(2) We analyze water vapor variation trends and variation reasons throughout the year and in different seasons over an 83-year time span in North America, which is more meaningful for long-term climate change studies.

(3) We analyze and discuss the effect of El Nino events and La Niña events on water vapor change.

Reference:

- [1] Chen, B. and Liu, Z.: Global water vapor variability and trend from the latest 36 year (1979 to 2014) data of ECMWF and NCEP reanalyses, radiosonde, GPS, and microwave satellite, *J. Geophys. Res. Atmos.*, 121, 11,442-411,462, 10.1002/2016JD024917, 2016.

- [2] Peng, W., Tongchuan, X., Jiageng, D., Jingmin, S., Yanling, W., Qingli, S., Xin, D., Hongliang, Y., Dejun, S., and Jinrong, Z.: Trends and Variability in Precipitable Water Vapor throughout North China from 1979 to 2015, *Adv. Meteorol.*, 2017, 1-10, 10.1155/2017/7804823, 2017.
- [3] Wang, S., Xu, T., Nie, W., Jiang, C., Yang, Y., Fang, Z., Li, M., and Zhang, Z.: Evaluation of Precipitable Water Vapor from Five Reanalysis Products with Ground-Based GNSS Observations, *Remote Sens.*, 12, 10.3390/rs12111817, 2020.
- [4] Xu, Y., Ma, L., Zhang, F., Chen, X., and Yang, Z.: Accuracy Analysis of Real-Time Precise Point Positioning—Estimated Precipitable Water Vapor under Different Meteorological Conditions: A Case Study in Hong Kong, *Atmosphere*, 14, 650, 10.3390/atmos14040650, 2023.