



## **Trends of vertically integrated water vapor over the Arctic from reanalyses and station data**

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Our study shows what we know (in)consistently about the vertically integrated water vapor (IWV) trends in the Arctic and what their uncertainties are. For this, we analyze the IWV trends in most modern global reanalyses (CFSR, ERAI, JRA55, MERRA2) over the period covering 1979-2016. The presented monthly spatial trends highlight important differences from month to month and from region to region. Our results indicate the overall positive IWV trend averaged over the central Arctic ( $>70^{\circ}\text{N}$ ), but also highlight the heterogeneous spatiotemporal patterns of the derived trends. Although the across-reanalyses intercomparison suggests an agreement in an Arctic becoming wetter in almost all regions, IWV trends were statistically significant only over specific regions for specific months in all reanalyses. Furthermore, the reanalyses substantially disagree on the regional trend magnitudes. We quantify the differences in the monthly IWV trends and identify the regions and months of greatest difference between the reanalyses. We further discuss the interannual and decadal IWV variations, which underlie the trend. In concert with the reanalyses, we assess IWV data derived from radiosondes at 35 stations north of  $65^{\circ}\text{N}$  and from GPS data at the Arctic station Ny-Ålesund. The reanalyses exhibit in general a remarkable agreement with the station data. We find interesting region-specific annual characteristics in the trends, which are consistent across the data sets. Importantly, our results also demonstrate the large uncertainty in the calculated trends.