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## Long-Term Water Vapor Observations at the Arctic Research Station AWIPEV, Ny-Ålesund (Svalbard)

Water vapor (WV) is an essential component in the water and energy cycles of the Arctic. Especially in the light of Arctic amplification, changes in water vapor are of high interest but are difficult to observe due to the sparsity of data in that region. This makes the long-term observations of water vapor at the Arctic research station AWIPEV at Ny-Ålesund, Svalbard, even more valuable: in addition to an enhanced process understanding, they can also serve as a reference for models and satellite products. At Ny-Ålesund, climate change is strongly pronounced, i.e., a significant increase of annual mean 2 m temperature of  $+1.2 \pm 0.6$  K/decade is observed for the time period 1994-2023, with the largest increase in winter ( $+2.1 \pm 1.6$  K/decade). Radiosonde measurements date back to the beginning of the 1990s and allow for the detection of WV trends: radiosonde time series of vertically integrated water vapor (IWV) reveal a significant moistening trend for 1993-2022, in particular in autumn ( $+0.8 \pm 0.6$  kg m<sup>-2</sup> /decade). The daily radiosonde IWV data is complemented by temporally highly resolved (2-3 s) ground-based microwave radiometer observations (since 2012), which allow for a more detailed assessment of the temporal water vapor variability at that site with values ranging from low as 0.5 kg m<sup>-2</sup> to high as 33.8 kg m<sup>-2</sup>.

In addition to the column amount of water vapor, we will also analyze its vertical distribution, particularly water vapor inversions. These are a common feature of the Arctic atmosphere impacting e.g., cloud formation/persistence and surface radiation. Statistics, e.g., on their occurrence and strengths, as well as potential trends, will be discussed.