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A twelve-year high-resolution climatology of atmospheric water transport on the Tibetan Plateau

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A number of studies have examined atmospheric water transport (AWT) to and on the Tibetan Plateau (TP) and adjacent mountain ranges (High Asia), in order to quantify the respective influences of the Indian and East Asian summer monsoon systems on both TP precipitation and regional water resources. Previous studies have often focussed on the summer period and relied on coarse resolution datasets (e.g. global reanalysis), which poorly represent the complex topography of the TP ridges and therefore presumably underestimate the orographic barrier effect on AWT.
Here we present a twelve-year-climatology (2001-2012) of AWT on the TP based on the High Asia Reanalysis (HAR), a new atmospheric dataset with high-spatial (30km and 10km) and high-temporal (3h and 1h) resolution. We focus on the effect of increasing spatial resolution on AWT, as well as the seasonal and spatio-temporal patterns of the transport fluxes.
Our results show that water vapor transport dominates, but the transport of cloud particles in liquid and solid phases is non-negligible in winter in the Karakoram and western Himalayan regions. The AWT from west to east is dominant in the central TP over the year, which suggests that the westerlies have a distinctly higher share in summertime AWT than assumed so far. High-resolution products show that high mountains inhibit the AWT to a large extent, and that the meridionally orientated Himalayan valleys facilitate the AWT to the TP from the south. This leads to considerable differences in AWT amounts between the HAR 10km and 30km datasets and calls for a re-evaluation of previous results based on coarse resolution datasets.