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Quantifying the moisture and precipitation sources over Northwest China and investigating the source differences in dry and wet summer seasons

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The northwest China (NWC) is situated in an arid and semi-arid inland, rendering its ecosystem highly susceptible to precipitation changes. Previous studies have revealed the wetting trend and potential moisture sources of the NWC, while not clearly quantified the moisture (water vapor and precipitation) sources and its interannual variability. Here, by performing and analyzing CAM5.1 simulation for 40 years, with a coupled atmospheric water tracer algorithm (AWT), we find that the dominant sources of summer moisture over NWC are from terrestrial sources (81.8% of vapor and 77.4% of precipitation), i.e. from the North Asia (NA), Europe (EUP), southern Tibetan Plateau (STP), and southeastern China (SEC), rather than the oceanic sources. Due to the influence of synoptic patterns, the precipitation-conversion efficiency of water vapor from the southwest airflow (STP and SEC) is higher than that from the northwest airflow (NA and EUP). We also find that despite a general increasing trend in humidification, the fluctuation from relatively dry to wet years still persists in the NWC influenced by the increased transport of moisture from terrestrial sources (NA and STP).