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Large regional control of water isotope in atmosphere vapor, precipitation and ice core record in the southern Tibetan Plateau

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Water isotopes are natural tracer for hydrological cycle and potential indicator for paleoclimate changes in the Indian monsoon region. Yet the understanding of water stable isotope variations in different forms of water and their controlling are important in the regional hydrological cycle and paleoclimate rebuilding as well. The continuous observation of seasonal vapor δ18O at Lhasa, the southern Tibetan Plateau, indicates a combined effect of temperature effect in the broad region in non-monsoon season, and a strong convection precipitation influence in the source region in monsoon season. In summer monsoon season, the high frequency fluctuation of near surface vapor δ18O lasting for a few days, is inversely related to precipitation, and vapor d-excess show corresponding change, reflecting the significant influence of raindrop evaporation. Interannual variations of precipitation δ18O in the Asia monsoon region, is significantly related to the large regional cloud top height, with the underlying mechanism that the higher precipitation in the source region depleted the vapor isotope and hence the subsequent precipitation δ18O region, and therefore related to the ENSO cycle. An ice core drilled in the middle Tibetan Plateau in 2014, preserved an preciously dated interannual δ18O record. The interannual δ18O in the past decades is significantly related to Southern Oscillation Index, rather than the local climate, highlighting the large reginal control of monsoon type precipitation isotope and potentially in isotope record in varies paleoclimate proxies.