

Water vapor pathways and cycling rates deduced from global water isotope measurements

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Changes in the atmospheric hydrologic cycle that accompany climate change are profound, yet many aspects of the process which control the humidity of the atmosphere remain uncertain. The isotopic composition of water vapor gives insight into the balance between moisture transport and exchange processes because isotopes reflect the history of moist exchanges. HDO measurements from the Tropospheric Emission Spectrometer on NASA's Aura spacecraft are used to evaluate the large-scale circulation of water in the tropics and subtropics.

It is found that the convectively active regions experience substantial re-moistening via evaporation of falling rain, while the more arid areas of the subtropics are a balance between moistening during shallow convection and drying by mixing with air that was once at high latitudes. Because the isotopic information naturally reflects flux quantities, the observations are used to make estimates of the local recycling rates and the rates at which water is lost via precipitation. As such, the isotope data gives insight into aspects of the global hydrologic cycle that have been elusive in the past.