



Influence of convection changes on water vapor and its isotope in the tropics

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The Tropospheric Emission Spectrometer (TES) aboard the Aura spacecraft provides global measurements of isotopic composition of free tropospheric water vapor. In this study, we explore how tropospheric El Niño – Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) are linked with the isotopic composition of free tropospheric water vapor. To better understand how the isotopic composition of free tropospheric water vapor changes with convection activities, we analyze the co-located TES observations of cloud optical properties, water vapor (H_2O) and water vapor isotope (HDO), in conjunction with NCEP/NCAR Reanalysis data over the Eastern Indian Ocean (EIO) and the Western Indian Ocean (WIO) in October-December 2005 and 2006. Using the combined TES and reanalysis data, we show differences in water vapor amount and its isotopic composition through changes in convective activities affected by a phase shift of both ENSO and IOD. Over the EIO during the drought induced by the interplay of ENSO and IOD, it is drier and less depleted ascribed to less frequent or weaker convection activity than during 2005. By contrast, over the WIO, a dramatic increase in water vapor and more depletion in water vapor isotope (i.g. the “amount effect”) is caused by enhanced convection activity in 2006.