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Rain- vapour isotopic interaction over the south-west coast of India

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Boundary layer water vapor isotopic composition (δ_v) is an important factor that controls the isotopic composition of evaporation flux and modulating the δ^{18}O of tree ring cellulose through plant physiological cycle. But due to the difficult sampling procedure for water vapor, δ_v has rarely been quantified. Since many simple isotopic models require $\delta_v$as an input, mostly we assume that the water vapor is in isotopic equilibrium with $\delta$of monthly rain (δ_r). Here we present simultaneous observations of water vapour ($\sim$ 300 samples) and rainfall ($\sim$200 samples) isotopic ratios from two stations in the south-west coast of India (both the stations are located in the west of Western Ghats), sampled during April- October, 2012. Daily rain water and water vapour (cryogenic trapping method) were collected according to the IAEA protocol and the isotopic analyses (D and ^{18}O) were done using a Thermo Fisher Delta V^{+} Isotope Ratio Mass Spectrometer. We observe that, water vapour and rain are close to the equilibrium values during pre monsoon (April-May, ε = $\delta_r - \delta_v$= 8.9 $\pm$ 1.4 $\%_{\circ}$), summer monsoon (June-September, ε = 9.0 $\pm$ 1.8 $\%_{\circ}$) and North- East (NE) monsoon (October, ε = 7.9 $\pm$ 2.9 $\%_{\circ}$) seasons. However, some individual rain events show more deviations from the equilibrium values. NE monsoon rainfall and water vapour are isotopically more depleted in ^{18}O compared to the pre monsoon and summer monsoon seasons, in which the depletion is more in rain ($\sim$4 $\%_{\circ}$) compared to water vapour ($\sim$2 $\%_{\circ}$). This is because of the ^{18}O enrichment of ground level vapour due to local evapo- transpiration (stations are at the leeward side of the Ghats), while rainfall is directly formed from the NE monsoon clouds which is more depleted in ^{18}O. These results will be useful for the interpretation of δ^{18}O of tree rings from south west.