



Dual monsoon influenced water circulation in a Western Ghat river debouching into the Arabian Sea: A case study from Periyar river basin

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Western Ghats, the 1600 km long stretch of mountain ranges running parallel to the west coast of peninsular India is the source for numerous small and large rivers. These rivers either flow westwards or eastwards debouching into Arabian Sea or bay of Bengal respectively. Kerala State located on the southwestern side of Western Ghats, marks the onset of Indian summer monsoon rainfall in Indian sub-continent. Dual monsoon (south-west monsoon, SWM and north-east monsoon, NEM) controlled rainfall events in the state feed many short and swift flowing rivers originating in the Western Ghats. This study presents the water circulation mechanism on seasonal scale in the Periyar river basin, the longest river in the state, since June 2016 to July 2017. Seasonal variations in $\delta^{18}\text{O}$ of precipitation events are observed to follow the changes in the sources and trajectory of air mass. However, the seasonality of isotope signatures in surface and subsurface waters recorded feeble response to that of rainfall. Coastal surface water in the basin were highly enriched in $\delta^{18}\text{O}$ during the lean flow seasons (NEM and pre-monsoon) (0.21 to 0.91‰), suggesting the mixing of evaporated water with salinity incrustated from the Arabian Sea. Continental effect is observed to be a dominant factor controlling the variation of stable isotopes in the basin rather than the altitude effect during southwest; though both effects were found to be stronger during north-east monsoon. The highest depletion ($\sim -5.6\%$) in surface water belonged to samples collected outside the basin, whereas water originating from highest peaks of Western Ghats (2600 m above mean sea level) was relatively enriched (-4.0%). This observation is quite different to that made by Lambs et al., 2014 ($\sim -9.0\%$) and can be attributed to the changes in the dominant moisture source. The present study is confirming that altitude effect is not the dominant factor controlling the distribution of stable isotopes along Western Ghats; rather it is the continental effect and changes in moisture sources associated with the dual monsoon circulation.