

# Controls on seasonal elemental variation in tropical rivers in Goa, India

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Silicate weathering is of primary importance in the long term global climate due to associated CO<sub>2</sub> sequestration. This study aimed to determine the controls on chemical weathering over a 15 month period (May 2007 – July 2008) in a sub-tropical, monsoonal climatic regime in western India. Here, highly seasonal rivers rising at the Western Ghats escarpment discharge into the Arabian Sea. The Ghats present a topographical barrier to the SW monsoon, and thus generate one of the world's highest orographic gradients.

Two river basins were selected for this study, the Zuari and the Chapora, both characterised by high seasonal precipitation and run-off, with c. 85% occurring during the monsoon months (June – September). The rivers flow steeply down the Ghats then across the low-lying Konkan - Kanara coastal plateaux much of which is heavily weathered and covered by laterite. The water samples (n = 13 per month) were collected from seven sites along the Zuari River and six sites along the Chapora River. The samples were analysed using ICP-MS for cations and ion chromatography for anions.

Major and trace element concentrations were found to be very low throughout both basins, although a marked increase was observed for various elements (e.g., Ca, K, Mg, Na, Rb, Sr, V, Cr, Mn, Fe, Co, HCO<sub>3</sub><sup>-</sup>) shortly after the onset of the monsoon. We interpret this as a 'rinse-out effect'. Despite absolute concentrations decreasing with increasing river run-off, total element fluxes increase during the monsoon. Additionally, due to the low elevation of the coastal plain, tidal effects are observed c. 40 km inland becoming forced seaward during the monsoon by high river flows.

Continental weathering is controlled by numerous factors, including lithology, climate, vegetation and anthropogenic effects; it is highest in the humid tropics due to high temperatures and precipitation. This study shows that the degree of weathering and the extent of weathering residuum are also major limiting factors for elemental fluxes in tropical catchments.