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Biogeochemical cycles in tropical Oceania: insights from Magnesium isotopes in the Liwu river, Taiwan.

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We analyzed the isotopic composition of dissolved Mg in the Liwu catchment, Taiwan, impacted by typhoon events to understand the control on the temporal variability of water chemistry. The river chemistry is driven by the mixing of three water masses, characterized by constant and distinct chemistry composition: Rapid Surface Runoff (RSR), Slow Surface Runoff (SSR) and Deep Ground Water (DG). The relative contribution of these end members is estimated using a hydrograph separation model. A dense tropical forest covers the Liwu catchment and might affect the chemistry of the river. In fact, plants absorb their essential nutrient such as magnesium (Mg) from the draining water. Such biological pumping introduces an isotopic fractionation in the river water. With the consideration of other processes like chemical weathering and hydrological mixture, this study aims to bring out the biogeochemical cycle of Mg and consequently to quantify the feedback of biological factor on the river chemistry. Magnesium has three stables isotopes (24Mg, 25Mg and 26Mg) and the 26Mg/24Mg ratio (expressed as δ26Mg) is accurately measured, with precision of 0.09‰ at 95% confidence level, using the standard sample bracketing technique by MC-ICP-MS. The δ26Mg of sampled water range between: -0.96‰ and -1.44 ‰ on the DSM3 scale but is poorly correlated with the relative proportion of Mg brought by each of the RSR, SSR and DG end-members ruling out a pure hydrological control on the riverine δ26Mg. The δ26Mg can also record processes since 26Mg is preferentially scavenged during precipitation of secondary clay minerals or uptake by the biomass. However, the elemental uptake of silicon (Si) versus Mg is greatly different between those two processes. To unravel the dominant process of Mg isotope fractionation, we will discuss a coupling of δ26Mg values of the end-members reflecting the incorporation of Mg during clay formation and biomass uptake, with the masse balance of elemental concentration of Si.