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Luminescence patterns in tropical coral skeletons revealed using a novel technique

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Luminescence intensity changes observed in massive tropical coral skeletons are attributed to seasonal variations in river discharge. The nature and cause of luminescence still remains unresolved; however the incorporation of humic acids is widely accepted. Using a novel technique designed to measure the intensity of luminescence, we can extract the luminescent signal produced by humic acid concentrations from the luminescent aragonite skeleton using spectral ratios. Normalising the luminescence data against aragonite is comparible to geochemical proxies normalised against calcium e.g. Sr/Ca.
Spectral luminescence ratios are a far more reliable proxy to reconstruct discharge patterns than intensities as problems associated with skeletal architecture, density and luminescent aragonite are removed. Correlations with the robust sediment runoff proxy Ba/Ca, obtained by Laser-Ablation ICP-MS, improve dramatically and long term trends are now apparent, which were previously masked by the decreasing density trend observed in corals. Using NE Madagascar as a case study, long term trends in luminescene spectral ratios are increasing, indicating increasing river runoff due to changes in rainfall and/or land use associated with deforestation. Short term exreme runoff events are revealed which are caused by major cyclones that affected NE Madagascar over the past 30 years.