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Calibration of Ba/Ca in coral as a proxy of riverine sedimentary flux in south Taiwan

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In this study, we have investigated influence of changes in riverine sedimentary fluxes on Ba/Ca ratio in coral skeleton. An 8-yr old (1994-2002) *Porites* coral was collected from coastal region about 100 km south of the Kaoping River estuary in south Taiwan. We have not only measured Sr/Ca, Mg/Ca, Ba/Ca, U/Ca and Pb/Ca ratios in the coral skeleton with HR-ICP-MS on samples collected with laser ablation (301 samples) and micro miller (58 samples), but also measured δ^{18}O and δ^{13}C on the micro-milled samples. The variations of Sr/Ca ratios are in good agreement with the measured SST record, which together with growth band counting provide a reliable chronology control on the skeleton. The most interesting feature of the measured element ratios is that the Ba/Ca ratios ranging from 0.000003 to 0.000018 show clearly seasonal cycles. The Ba/Ca ratios in the summer months are about 2-3 times higher than these in the winter months during eight years except 1997-98. The large fluctuations in the Ba/Ca cycles must reflect changes in Ba concentrations from source water.

Variations of chemical compositions in coral skeleton reflect sensitively changes in chemical compositions of ambient seawater. Dissolved barium released from riverine sediments which are carried by freshwater plumes near estuary is the main source of Ba in coastal water and can be faithfully recorded in coral skeleton. As the largest river in south Taiwan, Kaoping River provides $\sim$2.8*10^6 MT/y of terrestrial sediments into South China Sea, and 81% of this discharge occurs during the summer rainy season. Comparing the record of sedimentary fluxes calculated from the historic discharge of Kaoping River during 1991-2004 with the coral Ba/Ca record, we have found that the

seasonal cycles of the two records are in excellent match except the El Nino year of 1997-98. During the summer, higher river discharge caused by heavy monsoonal rains brings more sediments that release Ba into the coastal ocean, resulting higher Ba/Ca ratio in coral skeleton. The exception during El Nino year 1997-98 may be due to changes in direction and strength of the ocean currents (e.g., Kuroshio Current) near the coast region. Our study demonstrates that coral Ba/Ca ratio can be an effective proxy of riverine sedimentary flux in coastal region.