Deciphering Records of Chemical Weathering in the South China Sea

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Deep-water continental margins are potentially the best place where sedimentary sequences might preserve the long-term history of erosion and weathering in the adajcent continent being relatively free of long hiatsus or erosion linked to sealevel changes. Nonetheless, it is questionable whether the alteration state of sediment deposited at any one given time is truly representative of conditions in the drainage basin at the time of sedimentation or whether reworking can buffering the signal to the point where it cannot be deconvolved. Sediment spanning the last glacial cycle on the slope show correlation between monsoon intensity and alteration as tracked by K/Al, CIA, $^{87}Sr/^{86}Sr$, or various clay mineral ratios but the increased weathering seen during the Early Holocene falls to lower values prior to the end of strong monsoon conditions. However, flooding of the continental shelf at around the same time suggests that it is modern shelf rather than the continental interior which is the primary source and that the sediment delivered to the slope is largely the product of reworking by stronger monsoon rainfall rather than representing faster weathering under the influence of warmer wetter conditions. Likewise, in the Pearl River delta a similar trend of more altered sediment being deposited during periods of stronger monsoon was observed. In this case we still favor reworking as the primary cause of the geochemical trend, this time driven by stronger reworking of older, altered material from fluvial terraces either by stronger rainfall, or more recently by anthropogenic activities. Thus weathering records in marine settings are at best useful for reconstructing erosional efficiency at millennial timescales, but maybe better track environmental conditions on longer, million year scales where such buffering is less important. In some settings where long shore transport or bottom currents along the margin are more important then deconvolving the record is even more difficult. This work further emphasizes the danger of using modern river sediments as fixed end members when compared to ancient marine clastic sediments, as these are quite variable, depending on environment/climatic conditions.