Chemical weathering and erosion in New Zealand monitored by bedload and suspended sediments

CHRISTOPER Q. KAUTZ AND CANDACE E. MARTIN

Department of Geology, University of Otago, Dunedin, New Zealand (ckautz@fulbrightweb.org, candace.martin@stonebow.otago.ac.nz)

Chemical and physical erosion processes have been investigated in a wide range of high sediment yielding rivers from New Zealand using major and trace element data from suspended sediments and fluvial bedload grain size fractions. Average fluvial particulate compositions from New Zealand are similar to estimates of average upper continental crust (UCC) composition. Recalculation of global fluvial elemental fluxes using average New Zealand suspended and bedload sediment compositions as a proxy for sediment derived from all high standing islands (HSIs, 30% of total) results in world average compositions that more closely resemble the UCC than previous estimates using major world rivers alone.

Weathering of the Southern Alps is strongly partitioned(?) between the chemical weathering of carbonates and physical weathering of silicates. The similarity of sediments from rivers draining both sides of the drainage divide indicates minimal climatic control on weathering intensity of fluvial sediments. Rather, bedload geochemistry is controlled primarily by mechanical attrition and hydrodynamic fractionation, both of which depend on sediment residence time within the fluvial system. Combined with suspended sediment data from rivers throughout New Zealand, these findings suggest that HSI fluvial sedimentary evolution is dominated by physical weathering processes and that several cycles of sedimentary recycling may occur without production of a silicate chemical weathering signature.

Impact of storm runoff from subtropical watersheds on coastal water quality and productivity

C.W. YOUNG, D.J. HOOVER, E.H. DECARLO, F.T. MACKENZIE AND M.A. MCMANUS

Department of Oceanography, University of Hawaii, Honolulu, HI 96822, USA (edecarlo@soest.hawaii.edu)

Runoff from storms occurring in subtropical watersheds in Hawaii leads to sediment and freshwater pulses to coastal waters that rapidly affect water quality. This is particularly true in semi-enclosed embayments with relatively long residence times. The response of coastal waters to such inputs has often been evaluated by synoptic sampling that only provides snapshots of the evolution of these highly dynamic environments. In contrast, continuous in-situ measurements, when combined with synoptic sampling, are better able to-reflect the short-term biogeochemical response of these systems. Our approach facilitates the characterization of impacts of storm runoff from watersheds on coastal waters and is better suited to evaluating overall ecosystem responses over extended periods of time following storm events.

In this presentation we discuss data from several extreme rain events during the winter seasons of 2003-2004 and 2004-2005 acquired by our Coral Reef Instrumented Monitoring Platform (CRIMP). We discuss the response of Kaneohe Bay to storm sediment and nutrient inputs, the relationships between physical, biological, and chemical processes in the watershed and the bay, and the evolution of the aquatic community structure during and following phytoplankton blooms.

Elevated DIN:DIP (25) in storm runoff changes significantly the proportion of dissolved nutrients available for biological uptake. Increases in Chl-a in the bay shortly after storms and changes in the plankton community structure reflect an evolving biological response stimulated by the inputs of excess nutrients.