BIOGEOCHEMICAL IMPACTS OF STORM RUNOFF ON WATER QUALITY IN SOUTHERN KANEOHE BAY, HAWAI'I

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ABSTRACT

Fluvial impacts on water quality and ecosystem structure were evaluated in southern Kaneohe Bay, Oahu, Hawaii. Fluvial inputs occurred as small, steady baseflow interrupted by intense pulses of storm runoff. Baseflow impacted only restricted areas around stream mouths, but the five storm events sampled during this study produced transient runoff plumes of much greater spatial extent. Nutrient loading via runoff generally led to an increase of the phytoplankton biomass and gross productivity in southern Kaneohe Bay, but the rapid depletion of nutrients resulted in a fast decline of the algal population for all storm events considered in this study. Because of variability in export and mixing rates of runoff nutrients, the magnitude of the phytoplankton response was not proportional to nutrient loading. Under baseline conditions, water-column productivity in southern Kaneohe Bay is normally nitrogen-limited. However, following storm events, the high dissolved inorganic nitrogen to dissolved inorganic phosphorus (DIN:DIP) of runoff nutrients drive South Bay waters towards phosphorus-limitation. A depletion of phosphate (PO_4^{3-}) relative to nitrate (NO_3^-) in surface waters was observed following all storm events. Due to high flushing rates, recovery times of bay waters from storm perturbations ranged from three to eight days and appeared to be correlated with tidal range. Storm inputs can thus have significant impacts on the water column ecosystem and biogeochemistry in southern Kaneohe Bay, but the perturbations are only transient events.