Stream chemical signatures of rock weathering and contribution of organic acids to charge balance in the perhumid coastal temperate rainforest of Alaska

D'AMORE, D.* AND TRAINOR, T

*ddamore@fs.fed.us

The landscape of the perhumid coastal temperate rainforest (PCTR) of Alaska is chronologically young due to relatively recent ice advances that covered nearly the entire extent of terrestrial area. However, the terrestrial landscape has experienced rapid change during the Holocene due to a humid climate that promotes intense soil weathering and rapid accumulation of soil organic carbon. Therefore, the region represents a paradox where the temporal intensity of ecosystem succession is low, but the intensity of climate driven rock weathering and soil development is very high. The contrasting temporal and spatial intensity of landscape change in the PCTR makes it particularly valuable for testing theories of ecosystem development. We investigated the relationship between rock weathering and soil development through measurements of stream element concentrations and stream charge balance in several catchments of the PCTR. All observed catchments had evidence of weathering indicated by cation export relative to sea-salt aerosol input. The magnitude of the weathering signature was inversely related to the accumulation of organic carbon in the catchment. There was clear evidence of rock-water interaction in all mainstem streams and non-wetland catchments. However, organic matter accumulation in wetland watersheds diminished the weathering signature and export of inorganic carbon. Organic acid export was a notable contributor to alkalinity in watersheds with wetlands. Organic acids balanced the residual net negative charge as streamwater pH decreased bicarbonate alkalinity. We conclude that biological processes inhibit the weathering of lithologic materials due to organic matter accumulation and influence the stream chemical charge balance. This study provides a model for landscape evolution that integrates rock weathering, soil development, and organic matter accumulation.