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PROCESSES AFFECTING THE BIOGEOCHEMISTRY OF SILICON IN WATERSHEDS OF THE SOUTH CAROLINA PIEDMONT

ANDERSEN, C. Brannon[1], LEWIS, Gregory P.[2], and SARGENT, Kenneth A.[1], (1) Dept. of Earth and Environmental Science, Furman Univ, Greenville, SC 29613, brannon.andersen@furman.edu, (2) Department of Biology, Furman Univ, Greenville, SC 29613

Transport of dissolved Si from terrestrial ecosystems to estuaries and coastal oceans is critical to the integrity of coastal fisheries. Therefore, it is important to understand both the terrestrial processes that affect the supply of Si to rivers and the processes within rivers that influence the downstream transport of Si. Since 1999, we have sampled over 280 stream, river, and pond localities in the Saluda and Enoree River basins to determine the effects of land transformation on fluvial geochemistry in the piedmont of South Carolina. The variety of land covers and presence of many artificial ponds both may affect the net transport of dissolved Si.

Nearly all of the stream samples are saturated with respect to quartz regardless of stream order. Some small streams in the lower piedmont can have base flow concentrations as high as 600 umol/L, more than three times the saturation limit. Because the concentration of dissolved Si remains fairly constant along the length of larger rivers in the piedmont (200-250 umol/L), discharge and drainage area are the major controls over net transport fluxes. The net dissolved transport ranges from 35 to 75 kg SiO2/ha/yr higher than northern temperate forested environments draining felsic silicate rocks. Plants and algae also can modify the biogeochemical cycle of Si. On land, phytoliths in tree leaves appear to be a significant reservoir of Si. For example, leaves of white oak, a dominant canopy species, contain over 1.5% Si by dry weight, more than Ca, Mg and K. In small ponds, diatom production can cause Si concentrations to decline as much as 84%. However, the effect of diatoms and trees on net Si transport is unclear at this time. Ground water appears to replenish stream Si to some extent downstream of the ponds.

Although weathering is by far the most important process in the biogeochemical cycle of Si, Si uptake by land plants and diatoms in artificial ponds also are important processes. Our results show that small ponds are sinks for Si, although the impact on net transport fluxes may be scale dependent. Trees appear to be a reservoir for Si in temperate climates as well as in tropical climates, although the residence time of phytoliths in the soil is unknown.

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General Information for this Meeting

Session No. 100--Booth# 6
Geochemistry (Posters)
Hynes Convention Center: Hall D
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