IMPACT OF SEWAGE TREATMENT PLANT EFFLUENT ON THE BIOGEOCHEMISTRY OF THE ENOREE RIVER NEAR GREENVILLE, SOUTH CAROLINA

ANDERSEN, C. Brannon, HART, Marylea, SARGENT, Kenneth A., Dept. of Earth and Environmental Sciences, Furman University, Greenville, SC 29613

Studies of fluvial geochemistry are beginning to focus on quantifying the impact of humans on water quality. First order control over the chemical composition of river water is determined by the weathering of the underlying rock type in the river basin. This is modified by input from agricultural runoff, precipitation during rain events, and communal effluent. In urban areas, communal input from industry and sewage treatment plants can substantially modify the chemical composition of river water. Most importantly, sewage treatment plants can discharge nutrients that stimulate biological activity, further modifying the chemical composition of river water.

We examined the discharge and chemical composition of the Enoree River near Greenville, SC at two USGS gaging stations to quantify the impact of sewage treatment discharge on the biogeochemistry of the river. The first gaging station is located prior to a reach of industrial development. The second gaging station is located downstream of the industrial development, which includes two sewage treatment plants. Mixing models were used to determine the impact of sewage treatment plant effluent on discharge and chemistry. This information was then used to determine the impact of sewage treatment effluent on calculations of carbon dioxide uptake by weathering, as constrained by strontium isotopic compositions.

The results indicate that as much as forty percent of the flow at the second gaging station is from the discharge of sewage treatment effluent. This is associated with a nine-fold increase in the nitrate load, a fifteen-fold increase in the phosphate load, and a depletion of dissolved silica. Calculations suggest that most of the nutrient load is associated with effluent discharge. We interpret the decrease in silica to represent diatom production as a result of nutrient loading. Furthermore, the total dissolved load increases by over four-fold and net carbon dioxide flux increases by over two-fold. These results suggest that sewage treatment effluent has a major biogeochemical impact on river water nutrient budgets and also affects the calculation of weathering rates and carbon dioxide uptake to a significant degree.