

TRANSPORT AND ATTENUATION OF ZN, MN, AND AL IN THE UPPER ENOREE RIVER, SC

ROBERTS, Melissa D.(1), WEINSTEIN, Kim(2), ANDERSEN, C. Brannon(1), DAVIES, Brian(3), SARGENT, Kenneth, A.1 (1)Dept. of Earth and Environmental Science, Furman University, Greenville, SC 29613 (2)Dept. of Geoscience, Hobart and William Smith Colleges, Geneva, NY 14456 (3)Dept. of Geological Sciences, Clemson University, Clemson, SC 29634

Metals in a low pH plume enter a first-order stream in the third-order Upper Enoree Watershed north of Greenville, SC. However, they are attenuated within the 7.3 km of travel before reaching the main channel of the Enoree River. To determine the modes of metal transport and removal, waters were filtered through 0.45 μm , 0.22 μm , and 0.1 μm filters prior to chemical analysis. Zn, Mn, and Al mineral saturations were determined by speciation calculations, and mixing models were generated. In addition, particulates collected on 0.1 μm filters during low flow conditions were analyzed using a SEM. Zn and Mn have approximately the same concentrations among all filtrates, indicating Zn and Mn travel as dissolved species, which is consistent with the speciation model suggesting Zn^{+2} and Mn^{+2} as dominant species. Speciation calculations indicate the possibility of ZnSiO_3 precipitating at the uppermost sites, but this has not been verified. Assuming Zn and Mn are conservative, a mixing model suggests that the observed decrease results from dilution by confluence with an unpolluted stream whose flow is approximately four times the flow of the polluted stream. In contrast, Al decreases sharply 2 km downstream of the source. The Al concentration is greatest in the 0.45 μm filtrate and least in the 0.1 μm filtrate. The dominant species predicted by the model are $\text{Al}(\text{OH})_2^{+1}$ (57.4%), AlOH^{+1} (21.5%), Al^{+2} (7.0%), and Al^{+3} (6.7%). The model also suggests that the water is oversaturated with aluminum minerals and could precipitate diaspore and perhaps allophane, gibbsite, basaluminite, and others. SEM analysis reveals sub-micron aluminum oxides and aluminum silicates, possibly precipitates. However, these particulates could be derived from the surrounding ultisols. In summary, Zn and Mn are transported as divalent cations and attenuated by dilution. In contrast, Al is transported as dissolved complexes and colloidal particulates is attenuated by precipitation and deposition.

Submitted to the 2000 Southeastern Regional Meeting of the Geological Society of America, Charleston, SC