Geophysical Research Abstracts, Vol. 8, 05290, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05290

Trace metals in the Potomac (U.S.) watershed: spatial and temporal processes for particle distribution, loading and basin yield

T. Church (1) and K. Conko (2)

(1) College of Marine Studies, University of Delaware, Newark, DE 19716-3501, USA, (2) US Geological Survey, 430 National Center, Reston, VA 21092, USA

(tchurch@udel.edu / Phone: + 01 302 831-2558)

The Potomac basin is the largest sub-estuarine tributary of Chesapeake Bay, the largest estuary on the U.S. east coast. With headwaters in the eastern Appalachian Mountains, the Potomac basin includes the Piedmont agricultural plain, the Washington, DC urban/suburban corridor, and an extensive sub-estuary. The Potomac was sampled for trace metals (Al, As, Cd, Cr, Cu, Fe, Ni, Pb, Se, and Zn) from October 1996 - August 1997 in both its fluvial and estuarine reaches. The river was sampled approximately monthly and intensively during two storm events just above its fall line, 5 km upstream of Washington DC. The headwaters were sampled in the spring and summer at nine stations within the basin, and the estuary sampled twice in winter and summer. The sampling was for dissolved/particulate trace metal distribution, from which the loading and basin yields are calculated, and compared to similar results from another Potomac sub-basin and other Chesapeake Bay tributaries.

The concentrations and corresponding loads of trace metals at the fall line of the Potomac are dominated by the particulate fraction. This particulate dominant loading at the fall line is unlike other tributaries either within the upper Potomac or Chesapeake basins, including the larger Susquehanna River tributary. The dominant particulate burden shows considerable spatial and temporal variation. There is significant seasonal variability for some metals such as Mn and Zn, which correspond to growing seasons in the watershed. There are also considerable increases in the As and dissolved Se downstream and during the summer that may be related to seasonal pollution activities within the basin. The dissolved concentrations are rather uniform in the upper

basin, higher at the suburban fall line, yet lower than those reported for the urban subtributary (Anacostia River). At the lowest base flow, some metals (As, Cd, Cu, Ni and Zn) have a significant dissolved loading. On an annual basis even when dominated by storm flow, only these metals show appreciable dissolved loading.

As a function of high discharge flow, the concentrations of most metals show a peak early in the discharge limb (characteristic clockwise hysteresis), followed by dissolved peaks either later in the limb, or even at other seasonal times unrelated to discharge. Such trace metal discharge characteristics may be related to source storage in the watershed soils. These could include chronic anthropogenic sources accumulated historically over periods of atmospheric deposition, or agricultural and municipal land use. In the estuarine portion of the Potomac, some of the excess metal loads from upstream appear to be accommodated by deposition in the inter-tidal marshes.