

Use of Flux Chambers for the Quantification of Dissolved Mercury and Methylmercury Flux from South River Sediments

Introduction:

Flux chambers allow direct measurement of chemical flux from discrete areas of sediment. Flux chamber measurements in the South River System can facilitate determination of which sediments are the most important contributors to methylmercury (meHg) in the South River system. The resulting data can be used to help our understanding of mercury cycling in the South River System.

There are two main objectives for the flux chamber work:

- 1) Direct measurement of the flux of dissolved Hg and meHg from several locations representing the range of total sediment Hg concentrations and environments in the South River System and reference sites.
- 2) Simultaneous comparisons of dissolved Hg and meHg measurements of flux from the sediment with surface water and pore water.

Accurate measurements of the flux of mercury species from the sediments will allow conclusions to be drawn regarding the relative contribution of sediments to the overall mercury budget of South River System.

Materials and Methods:

The flux chambers are designed as dual systems allowing for either replicate measurements or testing the effect of variable conditions. The chambers are constructed of Polycarbonate and Teflon, and go through an extensive cleaning process to remove any potential trace amounts of mercury that may be present in the chamber construction materials.

The collaboration between Dr. Gill with TAMU and DuPont has produced several improvements to Dr. Gill's original flux chamber design. The improved chambers have additional support plates and adjustable stilts to assist their deployment in soft sediments. Based upon some recent efforts by the USGS (Groundwater: January – February 2004: "Use of Electromagnetic Seepage Meter to Investigate Temporal Variability in Lake Seepage"; D.O. Rosenberry, R.H. Morin), the capability to measure very low water flow from the sediments has been added.

The deployment of the flux chambers consists of a one-hour equalization period followed by a five-hour sampling period. During the sampling period, samples are drawn at regular intervals until the oxygen content of the sample is 50% of the baseline measurement. The samples are analyzed for mercury species and possibly additional ancillary parameters relevant to mercury cycling.