

**Roth, D. A. 1994. Ultratrace analysis of mercury and its distribution in some natural waters in the United States. Ph.D. dissertation. Colorado State University. Fort Collins, Colorado. 326 pp.**

A method is described for the determination of ultratrace concentration levels of total dissolved mercury in natural water samples. This method is specifically designed for the analysis of samples preserved with a potassium dichromate and nitric acid solution. Mercury is measured by cold vapor atomic fluorescence spectrometry using a method based on the acid reduction of mercury to the elemental state by a chemical procedure using stannous chloride. Mercury is shown to be determined in an automated fashion to a detection limit of 0.0004 micrograms per liter. Variations of this method were used to accurately determine mercury in bed sediments and suspended sediments, and total mercury (dissolved mercury plus mercury associated with suspended sediment). The analytical methods described above were applied to a large number of natural surface water, suspended sediment, and bed sediment samples from several large scale projects in the United States. These study areas encompassed the entire Mississippi River, the Colorado River in the Grand Canyon, Lake Powell, and the Firehole, Gibbon, Madison, and Gallatin Rivers in Yellowstone National Park. On the basis of data from this work, past dissolved mercury concentrations reported for many natural surface waters have been too high. Additional work indicates that suspended sediment is the primary mode of transportation of mercury in alkaline river systems which, until recently, has largely been ignored by many water quality surveys. Finally, the concentration levels of mercury found in bed sediments are enriched compared to those in the overlying water but is less than levels found in the suspended sediment indicating possible remobilization of the mercury.