MODELING POINT SOURCE DISCHARGES IN TIDAL WATERS

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Abstract. Discharges into highly unsteady flows, such as tidal waters, create special problems for assessing their environmental impact and compliance with mixing zone regulations. Exposures to toxic materials at the edges of the mixing zone are highly intermittent, and time series of contaminant concentrations would be expected to contain extended periods of zeros. The time-average value of such a time series is likely to have little ecological significance, despite the use of time-averaged values in regulatory requirements.

At the same time that environmental regulations have become increasingly strict, the capability and instrumentation for measurement of physical parameters in coastal and estuarine waters has increased dramatically. This has placed new demands on the abilities of mathematical models to use these data to predict the behavior of discharged substances.

In this paper, we present the results of detailed modeling of the behavior of sewage discharged into coastal waters. The models use data measured from Acoustic Doppler Current Profilers (ADCPs) and thermistor strings directly. The ADCPs measure water velocity over the whole water column, and the thermistor strings measure temperature, and hence density, over the water column. These instruments provide vastly more data than has been previously possible. The data are used to compute environmental exposures around the outfall, including the "visitation frequency" of the plume at any location.