
Abstract:
While the spatial heterogeneity of many aquatic ecosystems is acknowledged, rivers are often mistakenly described as homogenous and well-mixed. The collection and visualization of attributes like water quality is key to our perception and management of these ecosystems. The assumption of homogeneity can lead to the conclusion that data collection from discrete, discontinuous points in space or time provide a comprehensive estimate of condition. To counter this perception, we combined high-density data collection with spatial interpolation techniques to created two-dimensional maps of water quality. Maps of four riverine transitions and habitats – wetland to urban, river to reservoir, river to estuary and a groundwater intrusion – were constructed from the continuous data. The examples provided show that the most basic water quality parameters - temperature, conductivity, salinity, turbidity, and chlorophyll florescence - are heterogeneous at spatial scales smaller than those captured by common point sampling statistical strategies. The 2-dimensional, interpolation-based maps of the Hillsborough River (Tampa, FL) show significant influences of a variety of geographic features including tributary confluences, submarine groundwater inflow, and riparian interfaces. We conclude that many sampling strategies do not account for the type of patchy heterogeneity observed. The integration of existing in-situ sensors, inexpensive autonomous sampling platforms, and geospatial mapping techniques provides high resolution visualization that can adds a more comprehensive geographic perspective needed for environmental monitoring and assessment programs.

Keywords: GIS; Water quality; Sampling; Groundwater; Riverine; ROV; Spatial heterogeneity