Abstracts

Thursday, May 1

Session J3: Continuous Monitoring: Tools and Tricks for Data Management

8:00 – 9:30 am | Room 261

Database Design for In Situ Water Quality Data

Amy Russell and Jennifer Hill
Illinois State Water Survey, Champaign, Ill.

Abstract
The Water Quality Section at the Illinois State Water Survey (ISWS) has collected large amounts of in situ water quality data from locations across the state of Illinois. The data are of three types: continuous monitoring (CM) data from sondes collecting on 1-30 minute intervals, stream profile data collected using spot meters, and singular spot meter measurements collected during site visits, typically on a weekly basis.

The volume of data collected is very large and the data are currently archived separately based on project and data type. We propose a database schema where all in situ data collected for varying purposes can be combined and stored for easy analysis and retrieval by ISWS researchers, with the potential of publishing the data set online for public access. The proposed structure favors efficiency of storing CM data over other considerations because with more than 7 million existing CM observations, these measurements will constitute the bulk of the content and this type of data collection is expected to continue.

The proposed database was developed by incorporating favored elements from CUAHSI's ODM Database and EPA's WQX database, then restructuring tables and fields to reduce duplication of continuous monitoring data.

This presentation will compare the resulting database with both ODM and WQX schemas using metrics such as number of records, file size, complexity of database structure, and resulting complexity of data import and querying.

Combining Monitoring Data Spanning Multiple Temporal and Spatial Scales To Evaluate Water Quality Affecting Seagrass Habitat Extent In Northwest Florida Estuaries

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[1]US Environmental Protection Agency, Gulf Breeze, Fla., [2]ORISE Research Participation Program, Gulf Breeze, Fla.

Abstract
The ability to understand and manage ecological changes caused by anthropogenic stressors is often impeded by a lack of sufficient information to resolve pattern and change with sufficient resolution and extent. Increasingly, different types of environmental data are available that describe temporal and spatial patterns in great detail, opening the door to better relating changes to their causes. However, information from different sources is often difficult to utilize due to constraints imposed by mismatches in scales, technological and data processing hurdles, and a lack of data analysis methods and examples applied to environmental decision-making. In this presentation, part of a study seeking to demonstrate application of satellite remote sensing data in environmental decision making, we address the task of understanding causes of changes in seagrass habitats in northwest Florida estuaries, which have been declining in spatial extent and depth of colonization since at least 1960 and continuing through 2010. Based on global patterns and trends related to seagrass loss, changes in optical properties are likely important. The data that were considered included: (1) digitized aerial surveys of seagrass extent, (2) water quality indicators from satellite remote sensing, (3) boat-based surveys, and (4) high-frequency continuous monitoring of optical properties. We evaluate the relative strengths and weaknesses of each in the context of a conceptual

model of ecological processes affecting seagrass. We also examine how each type of data could be used to better inform interpretation of the other types, with the final purpose of using them together to improve our conceptual and quantitative understanding of factors affecting the seagrass habitats. The approach includes the use of coupled hydrodynamic-water quality models to facilitate synthesis and extrapolation of information across scales. Finally, we discuss how these different kinds of information can inform development of numeric nutrient criteria and other aspects of nutrient management in estuaries.

ODM Tools Python: Open Source Software for Managing Hydrologic and Water Quality Time Series Data

Jeffery Horsburgh, Stephanie Reeder, James Patton and Amber Jones
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Abstract
Hydrologic and water quality data is being collected at high frequencies, for extended durations, and with spatial distributions that require infrastructure for data storage and management. The Observations Data Model (ODM), which is part of the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) Hydrologic Information System (HIS), was developed as a framework in which to organize, store, and describe point observations data. This presentation will describe ODM Tools Python, which is an open source software application that allows ODM users to query and export, visualize, and edit data stored in an ODM database. Previous versions of ODM Tools have included the functionality to export data series and associated metadata, plot and summarize single data series, generate derivative data series, and edit data series using a set of simple tools. We have developed a new version of ODM Tools in Python that adds a modernized graphical user interface, multiple platform support (Windows, Linux, and Mac), multiple database support (Microsoft SQL Server and MySQL), and support for automated scripting of quality control edits performed on data series through an integrated Python script editor and console. Scripting records the corrections and adjustments made to data series in the quality control process, ensuring that the steps are traceable and reproducible. Additional improvements to ODM Tools Python include customizable queries for data selection and export, the ability to plot multiple data series simultaneously with various plot types, and user-defined functions for data series editing and derivation.

Temporally Dynamic Representations of Continuous Monitor Data through Animated Graphing

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Abstract
The proliferation of continuous real-time monitors across diverse monitoring organizations and web hosting platforms is making high frequency data widely available to water resource managers. The defining feature of the resultant data sets is a nearly continuous stream of observations at all times of day and under conditions that would be inaccessible to manned vessels. Traditional static representations seem incomplete and limiting when applied to these high density data streams.

The author has developed a method of cycling data sets in standard graphing applications, to exploit the temporal nature of continuous data. The resulting animated graphs provide an intuitive, information rich experience of the data, and allow for integration and synchronization of data sets from different sources to better understand estuary and watershed processes being measured.

This presentation will highlight several applications including progression of the storm surge from hurricane Sandy into the Delaware estuary, development of terrestrial flooding in the non-tidal Delaware River, and dissolved oxygen fluctuations as a function of time-of-day and tidal cycle.