Water Data Sharing in the United States

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The President's Office of Science and Technology Policy defines national goals for Federal science and technology investment. In 2002, the Office of Science and Technology Policy (OSTP) established a Subcommittee on Water Availability and Quality (SWAQ) to provide guidance concerning the science and technology needed to assure the availability and quality of water resources of the United States (SWAQ, 2004, 2007). The most recent task of the SWAQ is a report describing a strategy for strengthening observational data and modeling capabilities for improved understanding of climate change impacts on freshwater resources (SWAQ, 2010). The Secure Water Act (2009) that called for this report includes two data-related review elements: "to establish data management and communication protocols and standards to increase the quality and efficiency by which each agency acquires and reports relevant data; to consider options for the establishment of a data portal to enhance access to water resources data … that is collected by each Federal agency and any other private or public entity for each nationally significant freshwater watershed and aquifer located in the United States". This note provides background information relevant to those goals, based on the research of the CUAHSI Hydrologic Information System project.

The Consortium of Universities for the Advancement of Hydrologic Science, Inc, (CUAHSI) (http://www.cuahsi.org) is an organization formed in 2001, now representing 125 US universities, which is supported by the National Science Foundation to develop infrastructure and services to advance hydrologic science. Since 2004, NSF has supported a CUAHSI Hydrologic Information System (HIS) project to enhance access to hydrologic information. CUAHSI HIS has defined a language called WaterML (Water Markup Language) for conveying times series of water observations data through the internet, including data measured at point locations concerning streamflow, groundwater levels, soil moisture, evaporation, snow, precipitation, climate and water quality, which are data categories addressed by the SWAQ (2010) report. Data accessible in WaterML includes information from the USGS National Water Information System, EPA Storet, National Climatic Data Center, US Army Corps of Engineers, USDA NRCS and ARS, National Weather Service, NASA, and water observations data from 15 universities. CUAHSI has also compiled a national water metadata catalog at the San Diego Supercomputer Center and a uniform way of searching this catalog using standard terms, which provides access to 5.1 billion water observations data contained in 23 million time series describing 18,000 variables measured at 1.9 million locations in the United States.

The USGS and some other water agencies now publish some of their observations data in WaterML. EPA has developed a web services language called WQX (Water Quality Exchange) that conveys groups of water quality observations, and CUAHSI has developed a translator that converts WQX into WaterML so that time series of physical hydrology and water quality data can be acquired in a consistent way.

The Open Geospatial Consortium (OGC) (http://www.opengeospatial.org/) is an international organization, representing about 400 companies and agencies, which has developed the most widely used standards for sharing geospatial data through the internet. In 2008, CUAHSI proposed to the OGC that there should be established a Hydrology Domain Working Group to harmonize WaterML with OGC standards, and later the OGC and the World Meteorological Organization expanded this mission to included joint development of data standards for hydrology, climatology, oceanography and meteorology. International interoperability experiments in data sharing for groundwater and surface water are being carried out, and a version 2 of WaterML is being proposed that is conformal with OGC standards.

The CUAHSI Hydrologic Information System project has concluded that the best approach to enhance internet-based water data sharing in the United States is to adapt existing OGC data standards. Our research has shown that each agency or university can thus describe and maintain its own metadata and data services, and these can be linked through shared catalog services so that uniform methods of data searching can identify common water data across different agencies and institutions. We have also shown that climate and weather grid information can similarly be searched and accessed by being indexed in a consistent way with water resources time series. The ACWI/FGDC Subcommittee on Spatial Water Data supports this approach to developing water data services in the United States.

Creating a technical means to unify access to water data in the United States is one thing, actually implementing it is quite another. Leadership by the SWAQ and OSTP at the federal level is needed to develop strategies to enhance water data sharing across all levels of government, among water disciplines, and between water science and water management in the United States.

References

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