Geophysical Research Abstracts
Vol. 15, EGU2013-12471-1, 2013
EGU General Assembly 2013

Standards-based publication and sharing of time series information in the DRIHM project: a EU-US collaboration

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To enable a plug-and-play infrastructure, the European DRIHM (Distributed Research Infrastructure for Hydro-Meteorology) project aims to develop a comprehensive data publication and sharing system presenting uniform standards-based data discovery and access interfaces for hydrometeorological data collected by DRIHM partners in several European countries. This is a challenging task due to heterogeneity in types of data being collected and organized for modeling, and different semantic and structural conventions adopted by different data publishers. To meet this goal, the DRIHM project, and its DRIHM2US extension, collaborates with the recently funded US SCIHM (Standards-based Cyberinfrastructure for HydroMeteorology) project to develop a data sharing infrastructure for time series information.

We report initial results of the application of the data integrating technologies developed by the NSF-funded CUAHSI HIS (Consortium of Universities for the Advancement of Hydrologic Data, Inc., Hydrologic Information System) project, to information collected within DRIHM. The CUAHSI HIS system has been widely used in the US; it provides access to about a hundred water data collections that can be queried via uniform web services. The DRIHM partners initially implementing the system, include the CIMA Research Foundation (Italy), the French National Center for Scientific Research (CNRS), and the Republic Hydrometeorological Service of Serbia. The collected time series information was ingested into CUAHSI Observations Data Model databases, and water data services were created for each of the partners. At the time of writing, the water data services include SOAP and REST endpoints that provide access to the time series in WaterML 1 and WaterML 2.0 formats. The former encoding, developed by CUAHSI HIS, has been adopted by a number of federal agencies and research groups in the US, while the latter, created by an international group of experts under the aegis of the Hydrology Domain Working Group of the Open Geospatial Consortium and the World Meteorological Organization, has been recently adopted as an international standard for exchanging hydrologic data. The services are registered at the central catalog, which supports discovery of time series based on their spatio-temporal characteristics and on variable semantics. The semantics of the measurements is aligned , in the process of publication and service registration, with a set of centrally managed controlled vocabularies and a parameter vocabulary. Data from multiple collections can be discovered, accessed, visualized and analyzed using CUAHSI HydroDesktop software, or other clients that support water data service interfaces. While HydroDesktop relies on WaterML 1 format, the Delft FEWS system, maintained by a DRIHM partner Deltares, is already capable of ingesting WaterML 2.0 services, which enables interfacing WaterML 2.0-formatted streams with forecast models.

Development of a consistent data sharing system is one of the first steps in realizing DRIHM objectives. Next steps include further integration of water data services with simulation models, WRF and WRF-Hydro in particular, and integrating point time series with gridded information to be used as model input. We discuss these additional steps and associated challenges, and demonstrate the complementarity and benefits of US-EU collaboration in the development of global standards-based infrastructure for hydrometeorological data.