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HydroShare: A Platform for Collaborative Data and Model Sharing in Hydrology

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Advances in hydrology, as in many domains of science, increasingly requires integration of information from multiple sources, reuse and repurposing of data, and collaboration. The complex, multi-faceted problems faced in hydrology such as predicting floods and droughts in the face of climate and watershed changes cannot be addressed by scientists, either experimentalists or modelers, working individually. Instead, team science and collaboration is required, with data and models open, accessible and transparent to support reproducibility and enhance trust in findings. Cyberinfrastructure is needed to help scientists move into this new paradigm of collaborative research. HydroShare is a web based hydrologic information system operated by the Consortium of Universities for the Advancement of Hydrologic Science Inc. (CUAHSI) that is available for use worldwide as a service to the hydrology community. HydroShare includes a repository for users to share and publish data and models in a variety of formats, and to make this information available in a citable, shareable, and discoverable manner. HydroShare also includes tools (web apps) that can act on content in HydroShare, providing users with a gateway to high performance computing and computing in the cloud. This presentation will describe the functionality and architecture of HydroShare, highlighting its use as a virtual research environment for managing individual research contributions within collaborative groups to advance science on complex questions. We will illustrate the use of HydroShare for collecting and making accessible to the community data from the US National Water Model and 2017 Atlantic Hurricanes Harvey, Irma and Maria that had significant impacts on parts of the US and islands in the Caribbean. HydroShare has components that support: (1) resource storage, (2) resource exploration, and (3) web apps for actions on resources. The HydroShare data discovery, sharing and publishing functions as well as HydroShare web apps provide the capability to analyze data and execute models completely in the cloud, overcoming desktop platform limitations. The HydroShare Jupyter Notebook app provides flexible and documentable execution of Python code snippets for analysis and modeling in a way that results can be shared among HydroShare users and groups to support research collaboration. The Jupyter platform is embedded in high performance and data intensive cyberinfrastructure so that code blocks may include preparation and execution of advanced and data intensive models on the host infrastructure. We will discuss how these developments can be used to support collaborative research in hydrology, where being web based is of value as collaborators can all have access to the same functionality regardless of their computer or location. The architecture of HydroShare is built for extensibility and robustness with system components loosely coupled and configured to interact through application programming interfaces (APIs). Web apps are hosted on separate servers, which may be set up by different teams. They are registered in HydroShare using a web app resource that configures the connectivity for them to be discovered and launched directly from resource types they are associated with.