GEOSPATIAL WATER TECHNOLOGY CONFERENCE SPECIAL SESSION DESCRIPTIONS

CODE: SP1

TITLE: Challenges and Opportunities in Modeling, Monitoring, and Forecasting of Floods

Increasing frequency and intensity of hydrometeorological extremes, particularly under changing climate, are driving a recent increase in the natural hazards such as floods. Climatic changes together with land-use dynamics (e.g., rapid urbanization) contribute to the changing flood dynamics. Such interaction of human and climate present significant challenges and opportunities to scientific communities to accurately monitor, predict, and forecast floods across spatial scales. Understanding spatial dynamics of floods, particularly in urbanized landscapes, warrant robust understanding of the genesis of flood mechanisms, its propagation, communication, and human feedback.

This session seeks unique contributions exploring various aspects of floods from the vantage point of multiscale hydrologic modeling, instrumentation, and forecasting. Specifically, we encourage submissions from the academia, the industry, and governmental agencies that focus on, but not limited to novel approaches to flood predictions (e.g., assimilation techniques, application of remote sensing observations), monitoring technologies (e.g., sensors), communication (e.g., web applications), citizen science, uncertainty quantification, flood risk (as an aggregation of hazard, exposure, and vulnerability), watershed approach to flood management, and implementation of high-performance computing to high-resolution inundation forecasting.

CODE: SP2
TITLE: Mapping and modelling water use from national to local scales.

Over 140 million people (2010) rely on publicly-supplied or self-supplied drinking water sourced from groundwater. Modeling and mapping these populations is important for planning and management, including identifying the number people potentially impacted by water quality issues in a particular aquifer. [For example, self-supplied population maps and well locations have been used to help assess the impact drought has on the number of people potentially exposed to arsenic in their drinking water (Lombard et al, 2021), the impact of road salts and infrastructure on water quality (Pieper et al. 2018), the vulnerability of private wells to contamination from oil and gas development sites (Soriano et al. 2020), and the potential for salmonellosis in private wells in Georgia (Lee et al. 2019), to name a few.] New methods to map these populations and the aquifers sourced are presented in this session.

CODE: SP3
TITLE: Remediation of Urban Stormwater Using Best Management Practices and Low Impact Development Technologies

Discuss the effects of stormwater runoff on the urban and natural environment with particular focus on the Chesapeake Bay watershed. The Chesapeake Bay has experienced the negative affects of lack of pollution, nutrient, and sediment controls. Urban stormwater runoff contributes significantly to the degradation of the Chesapeake Bay and local watershed. In recent years, new urban development practices have been implemented to reduce or reverse the effects of stormwater pollution. Two of these recent technologies are best management practices and low-impact development.

CODE: SP4
TITLE: USGS National Hydrography Datasets - What's Happening Now?

The U.S. Geological Survey (USGS) manages surface water mapping of United States via the National Hydrography Dataset (NHD), Watershed Boundary Dataset (WBD), and NHDPlus High Resolution (NHDPlus HR). USGS is continuously improving these datasets, including improving stream network features by deriving hydrography from elevation data, undertaking a complete revision of hydrography for Alaska, and working to complete NHDPlus HR for the entire Nation. The presentations in this session will highlight these and other current products, services, and projects.

CODE: SP5
TITLE: Introducing the USGS 3D Hydrography Program

The U.S. Geological Survey (USGS) has developed a vision for the 3D National Topography Model (3DNTM), which will integrate USGS elevation and hydrography datasets to model the Nation's topography in 3D. The 3D Hydrography Program (3DHP) is the hydrography component of the 3DNTM and the next generation of national hydrography mapping that will include deriving a stream network from elevation data and building an information infrastructure to share water data within the context of the stream network. 3DHP will provide critical data for applications like flooding, contaminant spills, water quality and quantity, drought, climate change, and other, emerging applications. The presentations in this session will provide an overview of 3DHP plans including scope and timelines for the emerging program.

CODE: SP6
TITLE: USGS 3D Hydrography Program – Deep Dive into Data

The 3D Hydrography Program (3DHP) is the hydrography component of the 3D National Topography Model (3DNTM), which will integrate USGS elevation and hydrography datasets to model the Nation's topography in 3D. The 3DHP Datasets are the next generation of national hydrography mapping and will include a modernized data model, hydrography and hydrologic units derived from elevation data, and hydro-enforced/hydro-conditioned digital elevation models (DEMs). It will also emphasize providing a more complete picture of the hydrologic cycle by connecting to groundwater data, increasing the inclusion of engineered hydrologic systems, and improving coordination of mapped features with the National Wetlands Inventory. The presentations in this session will provide a technical review of 3DHP Datasets, plus a look at upcoming research.

CODE: SP7
TITLE: Urban Flooding Open Knowledge Network: An All-In-One Platform for Disseminating Flood Information

The Urban Flooding Open Knowledge Network (UFOKN) is a platform to integrate, generate, and disseminate actionable information for flood prediction, response, mitigation, and prevention. The UFOKN simulates how flood water propagates across the urban systems in a way that provides clear insights about existing and potential flooding problems to homeowners, utility operators, first responders and other consumers of various urban information during flooding. This system is developed by connecting data and information among multiple urban system components through ontologies and knowledge graphs to answer questions related to flooding. It is envisioned that the UFOKN will help increase urban resilience and minimize damage from future urban floods due to changing climate and land use patterns. This session will feature talks demonstrating the human-centered design, technical and conceptual framework, national-scale implementation, and multiple applications of the UFOKN.

CODE: SP8
TITLE: Lidar Applications in Hydrologic and Hydraulic Modeling

Airborne topographic and bathymetric Lidar (Light Detection and Ranging) technology can be used to collect geospatial data for application in hydrologic and hydraulic (H & H) analysis. Unmanned aerial systems (drones) has further expanded the potential for airborne Lidar. This topic could encompass the availability of existing and future planned Lidar datasets, processes for collection of new data, recent advances in Lidar technology and Lidar carrying airborne vehicles, and case studies for water applications.

CODE: SP9
TITLE: Scientific Web App Development with Tethys Platform

Tethys Platform is an open-source, Python-based toolkit that lowers the barrier to developing geospatial web applications. Using Tethys Platform, you can create interactive web applications to better engage decision makers, stakeholders, and the public on important water resources issues. Tethys Platform brings together the best tools for web visualization and computation that Python and JavaScript have to offer. Tethys apps can leverage Open Layers or Cesium Globe for visualizing spatial datasets; Plotly, Bokeh, or Highcharts for graphing; and Dask or HTCondor for distributed computing. Backed by the Django web framework, all backend logic in Tethys apps is written in Python with the full suite of scientific Python libraries at your disposal. In this tutorial workshop participants will learn how to transform their geospatial water-resources Python workflows into full-fledged web applications using Tethys Platform. The tutorial will also demonstrate to participants how they can publish their Tethys apps to the cloud.

CODE: SP10
TITLE: 3DHP Infostructure and the Internet of Water – How to Share Your Data

The Nation lacks a common data architecture for managing and easily accessing water information. Water data, valuable to a host of applications, are often difficult to access from the multitude of agencies and information systems involved. The USGS is developing a program plan to develop the 3D Hydrography Program (3DHP), with a key component being the 3DHP Infostructure, an information infrastructure to support the sharing and discovery of water data within the context of the stream network. The 3DHP Infostructure will provide the geospatial underpinning for the Internet of Water (IoW; https://internetofwater.org/). The IoW seeks to advance the transformation and modernization of water data infrastructure in the U.S. by developing affordable, open-source technologies for sharing and integrating water data, and to demonstrate, through a national network of partners, the power of those technologies to improve equitable and resilient water outcomes.

The workshop will walk user through the processes necessary to share water data as a part of the Internet of Water using various tools and applications. It will begin with how to provide correct locations for data on the stream network using hydrographic addressing, as well as how to create a web mapping service to hold the hydrographically addressed data. The workshop will also review how to create a reference to the web mapping service in a centralized data catalog. It will then introduce best practices to publish hydro-addressed data on the web, allowing them to enrich and be enriched by other hydro-addressed data.

CODE: SP11
TITLE: Using the NHDPlus High Resolution

The NHDPlus High Resolution (NHDPlus HR) provides a modern geospatial hydrologic modeling framework for the United States that will support many applications. The NHDPlus HR has been released for the conterminous United States, Hawaii, several U.S. Territories, and parts of Alaska. NHDPlus HR includes a set of Value-Added Attributes (VAAs) which greatly improve the capabilities for upstream and downstream navigation, analysis, and modeling. Examples of these enhanced capabilities include using structured queries for rapid retrieval of all NHDFlowline features and catchments upstream of a selected NHDFlowline feature; selecting stream segments (sorted in hydrologic order) for stream profile mapping, analysis, and plotting; and calculating cumulative catchment attributes.

This workshop will provide a comprehensive introduction to the concepts behind the NHDPlus HR Value Added Attributes, and show how the VAAs may be used in hydrologic analyses. The workshop will include in-depth examples and demonstrations. Attendees are welcome to follow along on their own laptop, but this is not a hands-on workshop.