Advanced Topics in Hazard Prediction

System for Hazard Assessment of Released Chemicals (SHARC) Model Validation and Verification Studies: Improvement of Model Predictions for Chemical Releases in Dynamic Estuarine Systems

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The System for Hazard Assessment of Released Chemicals (SHARC) is an advanced waterborne hazard fate and transport modeling and analysis tool developed by Maritime Planning Associates, Inc. (MPA). Validation and verification (V&V) studies performed in the tidal-fresh Potomac River near Washington, DC USA from 2011-2017 under different forcing conditions revealed areas for SHARC model improvement, such as better integration of high-resolution hydrographic & meteorological model data into SHARC and refinement of SHARC chemical fate algorithms to better quantify how variability in key water column parameters such as particle concentration and size, organic matter concentrations, alkalinity, and pH impact the partitioning and fate of specific reactive, non-conservative constituents. Additional V&V studies are needed in more dynamic estuarine systems with a wider range of variability in physiochemical conditions to improve the capabilities of SHARC for predicting the transport, dispersion, and fate of conservative and semi-conservative chemical releases in estuarine. In 2019, follow-on data collection efforts and SHARC V&V studies were performed in the Severn River, MD and the Chesapeake Bay to investigate the potential for improving SHARC model predictions. This included the integration of high-resolution hydrographic and meteorological model data and near-real-time and probabilistic physiochemical water-quality data into SHARC. Results demonstrate the utility of using a custom, local-scale hydrographic model (DELFT-3D) to improve SHARC model predictions in estuaries and show how better characterization of variability of key physiochemical water quality parameters can improve SHARC model predictions. Results provide additional V&V of SHARC's current capabilities and limitations and will contribute to improvements to SHARC as a decision support tool. These improvements will be implemented in follow-on V&V studies to advance the utility of SHARC as a waterborne hazard fate and transport modeling and analysis tool in dynamic estuarine systems. The overall goal of this work was to advance the utility of SHARC to support DTRA Reachback.