INNOVATIONS IN NEXT GENERATION CB THREAT CHARACTERIZATION AND ASSESSMENT FOR DECISION SUPPORT

Improvement Of Model Predictions For Waterborne Hazard Fate And Transport And The Development Of Autonomous Surface Platforms For 'smart' Chemical Plume Tracking In Coastal Systems

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The U.S. Naval Academy (USNA) has been working with the U.S. Defense Threat Reduction Agency (DTRA) to conduct waterborne hazard fate and transport modeling validation and verification (V&V) studies in shallow coastal systems from 2011-present. Ongoing studies are focused on field activities that improve modeling capabilities. These studies and included the development and integration of high-resolution hydrographic and meteorological forcing models, refinement of chemical fate algorithms, and the application of machine learning techniques to better predict physiochemical conditions and water chemical parameters such as pH and particle size spectra in estuarine and coastal ocean environments using historical data. Another important, ongoing research focus is the development of custom autonomous surface vehicles (ASVs) and the demonstration of their potential for waterborne hazard plume mapping and tracking. These ASVs not only have utility in waterborne hazard fate and transport modeling V&V studies but also have the potential to be trained and programmed as 'smart' assets that could actively follow a waterborne chemical plume based on its optical or (radio-)chemical signature. Results of past and ongoing model V&V and improvement efforts will be reviewed along with initial results of smart-ASV development and testing. This includes future plans for a live, waterborne hazard fate and transport modeling V&V field experiment in a region of interest to DTRA that brings together research and development (R&D) efforts to date, demonstrates a capability to adequately predict the transport, dispersion, and fate of waterborne threat agent released in a dynamic coastal system under a range of different meteorological and hydrological forcing and environmental conditions, and informs areas for future DTRA waterborne hazard R&D priorities.

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