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Improving risk assessments of hydrocarbon spills in harbor environments

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The growing pressure of exposure to petroleum hydrocarbons in tropical Australia calls for novel, innovative approaches for assessing risks of hydrocarbon spills. Such an approach has been developed through a close collaboration between research and industry organizations. The approach links outcomes of a semi-quantitative risk assessment methodology to results of spill weathering and trajectory numerical modeling, and then to emerging tropical toxicological data. The risk assessment was based on triple bottom line concept; it uses a multi-disciplinary expert panel to assess the probabilities and consequential impacts associated with potential risk events, such as accidental hydrocarbon spills. Typical incidents leading to hydrocarbon spills were identified based on the analysis of risk profiles for the study area. Model validations suggested that Delft3D-FLOW correctly propagated the tidal variations from the open boundary through the entire model domain, and accounted for variable in time and space winds. Spill trajectory modeling was carried out using a purpose-developed oil spill trajectory and fates model, MEDSLIK-II. The stochastic assessment approach involved 100 simulation of each modeling scenario using different samples of ambient conditions each time. Three thresholds for modeling of potential entrained hydrocarbon impacts were set to 10 ppb, typical of temperate climates, and 103 ppb and 64 ppb, which are EC10 for tropical coral without and with UV impacts. An inter-comparison of the respective probability maps demonstrated that appropriate thresholds may improve the predictive efficiency of spill impact assessments in the estuarine and open-ocean environments, leading to more coherent contingency planning and response measures.

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