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A methodology for identify impact zones of potential hydrocarbons spills during floods

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The contamination from sparse sources in case of flood events is difficult to characterize and to analyze. Sources are difficult to be detected and impact area highly depends on both the water flow during inundation and on contaminant accumulation and spreading in different environmental phases such as water, sediment, soil, biota and atmosphere. The final distribution of contaminants is influenced by the whole dynamic of the floods, form the inundation to the drying phases of the territory. In this research, we propose a coupled dynamic model for water flood and for multiphase contaminant transport in order to assess the potential environmental implications of the floods.
Distribution of organic pollutant in the natural environment is here simulated by a two-dimensional fugacity based models; fugacity based models can simulate the distribution of contaminants in a multimedia environment. The 2D fugacity based model is a rapid method for predicting the environmental fate processes for specific chemical compounds. We have taken an hypothetical example for the release of fuel such as diesel and gasoline (cars, fuel storage, industrial machine ecc.) from urban area. Fuel products are composed by hundreds of different compounds with different chemical and physical properties influencing their environmental behavior. To overcome the difficult of simulating the spreading of hundreds compounds we used a methodology for grouping the chemicals in a limited number of homogenous classes in terms of chemical-physical properties.
In impact zones are finally identify by introducing an hazard index proportional to the concentration in an environmental phase and the toxicity of the contaminants in that phases. In the same time, the approach allows to identify the environmental phases where accumulation can occurs, and hence drive the sampling design after emergency.
The methodology has been applied to the two-dimensional model in the Shkodra case study (Albania, January & December 2010).
Starting from analysis of hydrocarbons(TPH), the model can prevent the transport and the fate of TPH during the Shkodra flood. Using this results we can characterize the risk in terms of hazard index for the population and the environment.
The results obtained from the 2D fugacity based model added a very important value for the characterization of the human health and the environmental risk, especially for the civil protection management during the first support actions, and the assistance for the population during and post flood events.