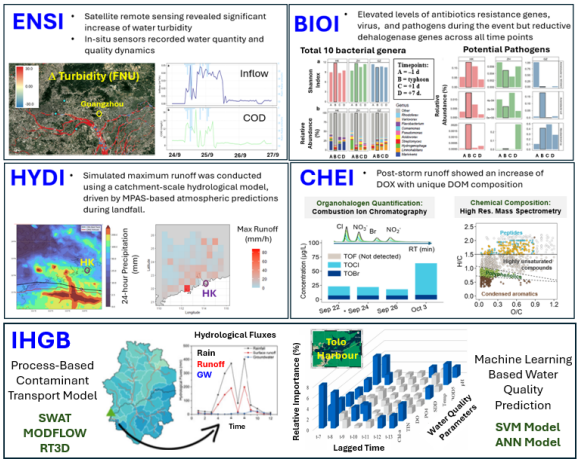
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iSTORM: Informatics for Source and Transport of Organohalogens in Runoffs under Meteorological Extremes

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The intensification of hydrometeorological extremes, such as torrential rains and typhoons, is increasing the risk of overflows and floodings in Guangdong-Hong Kong-Macau Greater Bay Area (GBA). These events flush pollutants accumulated in urban and terrestrial environments into riverine and aquatic ecosystems, posing immediate and long-term threats to environmental and public health. To safeguard water resources and support sustainable development, our team proposes a novel multidisciplinary hydro-biogeochemistry research framework, integrating Environmental Sensing and Informatics, Hydroinformatics, Chemoinformatics, and Bioinformatics to identify source, transport pathways, and fate of environmental pollutants, as well as their ecological and human health risks under diverse conditions, including extremes beyond historical norms. In addition to hydrometeorological data from in-situ and remote sensing, our team will conduct intensive water and sediment sampling from major GBA cities along hydrographs during storm events for detailed chemical and microbial analyses. While prioritizing surface water quality, the study emphasizes organohalogens as a key emerging contaminant class. Notably, these compounds can be tracked and quantified by analysing the bulk characteristics, such as per- and polyfluoroalkyl substances via total organic fluorine and disinfection byproducts via total organic chlorine, as well as by examining microbial community responses, such as dehalogenase enzymes activity. By integrating advanced sensing techniques, atmospheric and hydrological modelling, chemical markers and fingerprints, as well as microbial profiling and signatures, our goal is to develop specialized informatics pipelines that unify diverse environmental data for an alert and information system supporting emergency response and sustainable planning in the GBA.