ElbeXtreme: Effects of Extreme Events on Ecosystem Services in the Elbe Coastal-Estuarine System – Risks and Adaptation Strategies

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We introduce "ElbeXtreme", a project funded through the Deutsche Allianz Meeresforschung (German Marine Research Alliance, DAM) that recently started and present first insights from our work. Our scientific focus lies on better understanding the impacts of (compound) extreme events on estuarine and coastal ecosystems and ecosystem services. We are specifically interested in the interaction of freshwater and coastal systems during extreme events, such as fluvial floods and droughts, heatwaves and storm surges. The project's regional orientation lies on the Elbe estuary and the adjoining coastal system of the German Bight. We will use this area as "Living Lab" to test our new approaches in practice and derive specific risk assessments and adaption options. The ElbeXtreme consortium includes several German research centers, universities and government agencies.

ElbeXtreme will leverage several approaches to gain insights into the impacts of extreme events on estuarine and coastal ecosystems such as mining existing data and harmonizing it for use across partner institutions, as well as developing new observational approaches to capture extreme events and their time-delayed cascading effects. Analyses of the combined existing and new data, in part through Machine Learning, will result in new data products, which in turn can be integrated into coupled models for a Digital Twin of the Elbe. Aside from these new data products for the physical, chemical and biological states of the Elbe, its estuary and outflow into the North Sea, and the Digital Twin, ElbeXtreme will also develop a web-based toolbox. It will provide our partners with fast and reliable data when extreme events occur and inform stakeholders through data products and interactive software.

Our main goal in ElbeXtreme is to improve the risk assessment and early warning system regarding extreme events in estuarine and coastal systems and facilitate the creation of sustainable adaption options for the Elbe system. We expect this work to serve as a blue print for the development of monitoring and hazard warning systems for other coastal regions.