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The impact of future sea level rise on extreme water levels in the Pearl River Delta.

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Starting from the 1980s, China's Pearl River Delta (PRD) has experienced a rapid population and economic growth, but it is a fast-developing economic giant in a fragile environment. The PRD is a low-lying coastal area with much of its surface area below mean sea level, which makes the PRD a flood-prone coastal environment exposed to sea-level rise and extreme water levels caused by typhoons. High population growth and urbanization are rapidly eroding the floodplain and large-scale land reclamation has taken place to satisfy the need for development, leaving the new urban areas at possibly high risk of flooding.
The changes in regional sea level are quantified in this work by using probabilistic regional sea level projections for selected scenarios of climate change, with specific focus on sea level rise in coastal areas. With respect to coastal inundation the questions to be answered in this work are: (i) how much is the contribution of tide-sea level rise interaction to the height of the highest high waters, the sum of local sea level and tidal amplitude? (ii) what are the impacts of extreme water levels under future climate conditions?
An FVCOM (Finite Volume Community Ocean Model) implementation for the South China Sea and Pearl River Delta is used to understand how the rising mean sea level and tides can interact and affect coastal inundation in the Pearl River Delta, as well as the impacts of typhoons under future climate conditions. The model extends from a coarse grid in the open ocean where tides and sea level changes are introduced, to an appropriate high resolution in the delta distributary channels, which has allowed us to explore how water levels will react to the different sea level rise projections.
Even if the sea level rise signal and extreme surge levels provide the major contributions to flooding, the interactions between rising sea level and tides is an additional factor to be considered for better planning of future protection measures. The frequency of occurrence of inundation will increase, due to sea level rise, even without any increase in storm frequency.