

Development of a Meshless Storm Surge Model to Explore Urban Shoreline Amplification During Extreme Tropical Cyclones

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Extreme tropical cyclones can generate extreme storm surges and storm waves that pose a serious flood risk for many coastal communities. For example, Typhoon Jebi made landfall in Osaka Bay in 2018 and caused unprecedented flooding from storm surge despite the well-preparedness of the region. The flooding was unevenly distributed and concentrated in heavily-developed areas (with numerous artificial islands, reclaimed land, and ports), and it is currently an open question what role the complicated shorelines played in the record storm surge flooding observed. Here, we will present on efforts to develop a high-resolution storm surge model to explore how complex urban shorelines can locally amplify coastal storm flooding during intense tropical cyclones. The model uses a meshless approach (radial basis function-generated finite differences with polyharmonic splines and polynomials) and was chosen for its geometric flexibility and computational efficiency. We will discuss ongoing work and analyze storm surge heights in Osaka Bay with varying degrees of shoreline complexity during Typhoon Jebi.

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