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INCORPORATING THE IMPACTS OF CLIMATE CHANGE INTO COASTAL RISK ASSESSMENTS

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The coast is the one of the most dynamic environments on the planet. The combination of all too frequent coastal floods and morphological changes resulting from continuous wave impact makes it a very hazardous place for infrastructure, yet the coast remains one of the most desirable locations for property development. Coastal flooding and erosion, two of the primary hazards responsible for the devastation of coastal property, occur over a wide range of space and time scales and are influenced by many natural forces. One of the most pressing concerns for coastal researchers, coastal managers, and property owners are the uncertain effects that climate change will have on these hazards. Both accelerated sea level rise and increases in winter storm wave heights have been clearly documented in some locations, such as along the U.S. Pacific Northwest (PNW) coast, and are projected to continue into the future. Therefore, management tools incorporating the impacts of climate change on coastal hazards are crucial for both human safety and the preservation of jeopardized infrastructure.

Current methods of coastal risk assessment often rely on the Federal Emergency Management Agency (FEMA) guidelines for Flood Insurance Rate Maps (FIRMS) classifying areas as high or low risk. These maps are typically constructed based on the 1% annual chance total water level (*i.e.* one hundred year flood) – a statistical measure which does not incorporate chronic erosion, shoreline variability, or climate change. In the absence of these important considerations, many coastal communities are left overly vulnerable and a re-evaluation of these procedures is warranted.

We are developing new methodologies capable of assessing coastal risks (initially in the PNW) via a probabilistic approach that directly incorporates the effects that climate change will have on future water levels and shoreline erosion rates. By adapting the Total Water Level model (TWL) developed by Ruggiero *et al* (1996) to account for climate controls, various climate change scenarios are applied to predict possible future inundation hazards. In addition, a deterministic shoreline change model, applied in a probabilistic manner, is used to generate coastline change projections that also allow for direct assessment of the impact from climate controls. We then combine our improved flood risk methodology with probabilistic (decadal scale) shoreline change modeling to produce quantitative multi-scale coastal vulnerability assessments.

The results from this study are of importance to coastal managers who are currently making decisions in the absence of climate considerations. By adopting a methodology that specifically addresses climate change and variability in estimations of coastal flood risk and shoreline evolution, coastal managers will be equipped with the necessary tools to make sound decisions.

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