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Assessing the inundation risk resulting from extreme water levels under sea-level rise: A case study of Rongcheng, China

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Extreme water level created when a storm surge meet an astronomical high tide always lead to the occurrence of coastal disasters. Driven by global climate change, sea-level rise will exacerbate the hazard of extreme water level as a disaster-inducing factor. Rongcheng was taken as a case study considering its physical geographic conditions and socio-economic characteristics. Based on Representative Concentration Pathways (RCP 2.6, 4.5 and 8.5), this study explored the inundation risk of extreme water levels under climate change. Pearson Type III (P-III) distribution was used for refitting recurrence periods of extreme water level, which aimed to characterize the disaster-inducing factors. Expected losses exposed to extreme water levels were assessed through inundated area and depth, per-unit loss values and vulnerability curves of land-use types. Results indicated that sea-level rise significantly shortened recurrence period in 2050 and 2100, which suggested higher frequency of extreme water level. Large increase in expected direct losses would reach an average of 60% with a 0.82 m sea-level rise (under RCP 8.5) in 2100. Moreover, affected population and Gross Domestic Product would grow 4.95% to 13.87% and 3.66% to 10.95% in 2050, respectively, while the increment in 2100 would be twice. Residential land and farmland were demonstrated as greater inundation risk because of higher exposure and losses than other land-use types. Consequently, the intensifying hazard and increase in possible losses suggested that sea-level rise would exacerbate future inundation risk of coastal region.