Influence of terrestrial precipitation to the variability of extreme sea levels along the coast of Bangladesh

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Increasing trend of global mean sea level under the climate change is an alarming issue to the sustainability of the world coastal communities. Bangladesh is highly vulnerable to the adverse impacts of extreme sea level because of its geographical location with low-deltaic coast. In addition, this region receives a plenty of precipitation that increases river discharge near the coastal area that may cause further increase of sea level. While the effects of the atmospheric forcings like atmospheric pressure, wind-induced wave and surges to sea level change have been investigated intensively, previous studies did not highlight the influence of precipitation to extreme sea level events along the Bangladesh coast. In this study, the influence of precipitation to the extreme sea level events was investigated for three stations with different geographical settings. The daily sea level heights at Cox's Bazar (1983–2006), Charchanga (1980–2000) and Khepupara (1987–2000) were obtained from University of Hawaii Sea Level Center observation data archives. The variations in sea level height anomaly during seven days in prior to the extreme sea levels was predicted by multivariate regression using selected climatic variables. It was revealed that the prediction of extreme sea level height considering precipitation effect outperforms the prediction without precipitation. The benefit of incorporating precipitation data was higher at Cox's Bazar than Charchanga and Khepupara, reflecting the hilly landscape at Cox's Bazar where clear response of surface runoff to precipitation is expected. At Cox's Bazar, predictions for eight extreme sea level events out of ten are significantly improved by considering precipitation effect. The findings suggest that the precipitation have important effect to the sea level change along the coast of Bangladesh. Therefore, incorporating precipitation effect is helpful to the coastal management and reduction of hazards by improving the prediction of extreme sea level events.