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Interaction between the tropical cyclone (TC) induced waves, storm surge, and associated coastal inundation along the east coast of India investigated using a coupled atmosphere-ocean-wave model. The fully coupled Ocean-Atmosphere-Wave model (COAWST model components) was configured over the Bay of Bengal (BoB), a semi-enclosed basin in the northern Indian Ocean. To understand the impact of waves on storm surge, two numerical experiments were performed with different coupling configuration. In the experiment with wave model coupled to atmosphere and ocean models, the ocean circulation model includes depth dependent wave stress terms, Stokes drift, vertical transfer of wave-generated pressure transfer to the mean momentum equation, wave dissipation as a source term in the turbulence kinetic energy equation, mean current advection, and refraction of wave energy. Wave induced forces were considered to affect the cyclone induced storm surge. Role of storm surge on the nearshore wave-field was analysed from coupled model simulations. Model results showed that the extent of simulated inundation area increased when the effects of waves were included. The study highlights importance of inclusion of the wave effects for the hindcast of the water levels during the storm surge.

キーワード : tropical cyclone、 COAWST、 surge-wave interaction

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