ABSTRACT Wave in the water of western Bay of Bengal was hindcasted using nesting SWAN system for the first time for the cyclone Thane during 25-30 December, 2011. The model results were validated by measured buoy data of Pondicherry and BD11. Simulation results showed reasonable agreement with the measured data. The distance between cyclone center locations and buoys influences the significant wave height (Hs) variation. The Hs on the right side of the cyclone track is higher due to the effect of cyclone properties, and the Hs variation depend on the wind intensity and translation speed of cyclone.

KEY WORDS: Western Bay of Bangle; nesting SWAN system; cyclone Thane; significant wave height; wind intensity; translation speed.

INTRODUCTION

The oceans and the atmosphere strongly connect in forming the ocean surface dynamic. Extreme wind waves generated by tropical cyclones cause storm surges and coastal flooding depend on cyclone intensity and the center speed of the cyclone during landfall, and they devastate human life, property, ecosystem, and infrastructure. The sustainable development of economic activities in coastal and offshore region is associated with capability of monitoring and predicting long-term data about the marine environment condition such as wind-generated waves. The information of wave and wave climate at a location is great importance to estimate the action of waves on constructions of coastal and offshore engineering projects, tourism, fishery and shipping (Amrutha et al., 2016). Wave climate prediction can generally be conducted by hindcasting and forecasting because hindcasting helps to realize the wave characteristics of an area, whereas forecasting helps to forewarn the sea situation in the near future (Kazeminezhad and Ghavamin, 2015). The cyclone induced waves are high and complex ocean waves due to the rapidly varying in intense wind speed and wind direction and can propagate thousands of kilometers away from the center of the storm (Sirisha et al., 2015). Waves generated by cyclones typically comprise combined wind-seas and swells (Panigrahi et al., 2012).

The domain selected for the study is the water region off the east coast of India, western Bay of Bengal of North Indian Ocean. Bay of Bengal is a potentially active region for the formations of tropical cyclone and its formations are more than Arabian Sea with a frequency ratio of about 4:1 (Dubé et al., 1997). The cyclone formation mainly occurs during the pre-monsoon and the post-monsoon season with wind speed greater than 17.5 m/s (Balaguru et al., 2014; Krishnamohan et al., 2014). The coastal districts of West Bengal, Odisha, Andhra Pradesh, and Tamil Nadu have quite high potential to suffer from Tropical cyclones (Bahinipati, 2014). The width of continental shelf of the western Bay of Bangile is narrow and shallow causes the waves to create surges and severe coastal flooding during extreme cyclone events. It is very difficult in estimating the wave characteristics and extreme sea states because the longtime series data of in-situ observations for the Indian Ocean are mostly unavailable compare to Atlantic and Pacific (Remya et al., 2012). Swells generated by south Indian Ocean cyclone occur over the south western Bay of Bengal during the pre-monsoon season (Glejin et al., 2013). Besides, swells propagates from the Southern Hemisphere to the North India Ocean during the pre-monsoon and post-monsoon periods (Anoop et al., 2015).

Several wave studies have been carried out in the Bay of Bengal on different numerical, empirical and soft computing approach. Hendri et al. (2013) and Panigrahi et al. (2012) used SWAN couple with Princeton Ocean Model (POM) to simulate cyclone induced storm surge in the Bay of Bangile. Moreover, Xu et al. (2015) conducted a research on wave analysis for west coast of south Myanmar by adopting SWAN model to simulate the waves that were transformed from offshore to nearshore Myanmar based on the meteorological data from ECMWF. Sandhya et al. (2014) studied the evolution of wave at a coastal location off Puducherry in the east coast of India by using SWAN nested in WW3 by forcing with IFREMER/CERSAT blended surface wind for four prominent seasons viz; northeast monsoon, southwest monsoon, pre- and post-monsoon. Bhowmick et al. (2015) performed SWAN model simulation using different physics options over the Indian Ocean. From their study they indicated that the Janssen option performed much better for the Indian Ocean region with high variability of the wind. Remya et al. (2012) also revealed that the Southern ocean swells impacted on model simulation in the Bay of Bengal basin.

Many numerical simulation studies mostly focused on storm surge in the Bay of Bangile and wind wave simulation study by applying SWAN model in this area are less. Cyclone Thane was chosen as the subject storm for the present study because it made landfall between the Cuddalore and Pondicherry of the east cost of India in the early hours of