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Role of south Indian Ocean swells in modulating the north Indian Ocean wave climate through modelling and remote sensing

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Implementation and validation of a third generation wave model, Wavewatch III was used to study the characteristics of the south Indian ocean swells and their propagation in the north Indian Ocean. The NCEP reanalysis wind data (2.5° x 2.5°) has been used to generate the wind waves for the entire Indian Ocean during 2006 – 2007. The modelled wave parameters have been compared with measured buoy data and with merged altimeter data. The model results show good agreement with the buoy and altimeter data. A case study is carried out to study the propagation of the swells generated at the roaring 40°S in the Indian Ocean during May 2007. The "southern swell" occurred during May 2007 has been successfully reproduced in the wave model, which confirmed by the comparison of modelled significant wave heights with the merged altimeter significant wave heights. These swells were generated in the Atlantic ocean near the southern tip of South Africa and propagated towards the north Indian Ocean. These waves touches the Madagascar region and further hits the La Reunion islands after three days thus creating numerous damages near the islands. The magnitude of the swell is around 15m near the generation area and it reduces to around 6m near the La Reunion islands while propagating towards the north Indian Ocean. Further the swell energy is spataially distributed in the northern and southern Indian Ocean. The study reveals that the swells generated in the roaring forties and propagating in the SW/SSW direction influences more to Bay of Bengal than Arabian Sea. This occurs during pre-monsoon season primarily because large scale winds are weak in the north Indian Ocean during this period and hence swells from south Indian Ocean dominates at this time. The case of "southern swell" also happened to be at the same season. Further wave parameters were extracted at few locations in the northern Indian Ocean to study the impact of May 2007 swells on the wave climate. An average of around 1m wave height was noted at these locations during the normal period (in the absence of swells) whereas during the swell propagation, an increment of 1 to 2m was observed in the wave height. A constant wave height of 2m was observed at a point extracted in mid Bay of Bengal during the swell propagation. After the swells are completely dissipated, the wave heights are reduced back to 1m. The results presented in this paper prove that the propagation of the swells in the Indian Ocean coming from oceans other than Indian Ocean can be very well studied using the wind wave model.

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