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Development of long-term hazard planning and vulnerability assessment of storm surges using numerical models

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Abstract

Management of disasters is a complex process with multi-dimensional ramifications. A case study of disaster management plan for coastal stretch of Andhra Pradesh and Orissa, India is described using more than 100 years cyclone and associated storm surge data. Return periods for various cyclone events are determined. The maximum probable surge amplitudes are simulated using numerical storm surge models. The maximum probable total water levels are also calculated by superimposing the tidal amplitudes and wind wave setup on the surge amplitudes. The 50-year return period event is considered for computation of total water levels and based on this, protection measures are suggested for prevention of flooding along the coasts.

Using the advanced two-dimensional depth integrated (ADCIRC) circulation model based on finite-element formulation is applied for the simulation of surges and associated landward inundation generated by a cyclonic storm crossing the east coast of India. High resolution precise land topography data is an essential ingredient for the computation of accurate extent of inundation and local water levels. The data sets which we use for our experiments include course resolution (1.8km) data of GEBCO, high resolution (90m) data of Shuttle Radar Topography Mission(SRTM) and very high resolution (10m) data of CARTOSAT-1 (IRS-P5). It is demonstrated through the model that the need of high resolution ground truth data for better prediction of inundation levels using specific cyclonic events. The surges are validated with the sea level anomaly data. Similarly, significant wave heights generated by some extreme events are compared with altimeter data for validation.

Biography

A D Rao was awarded Ph.D. at the age of 25 years for his work on 'Numerical modeling of storm surges in India' from Indian Institute of Technology Delhi and postdoctoral studies from University of Reading, UK. He also visited Florida State University as a visiting faculty for one year. His research interests include development of numerical models for storm surges, ocean state forecast, internal waves. His work in this field is very well recognized through his publications and to his credit; he has published about 175 refereed papers in various reputed international and national journals.