On recent developments in storm surge inundation modelling

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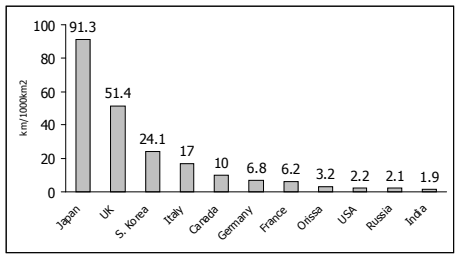
Coastal Hazards in India

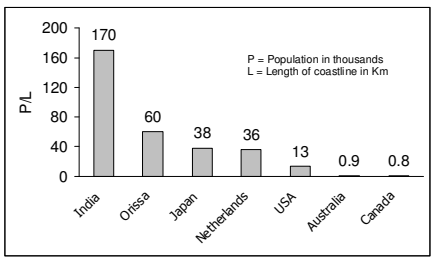
- Cyclones
- Storm Surges
- Tsunamis
- River Floods
- Drought
- Coastal Erosion
- Submarine Landslides
- Flash Floods
- Tides
- Wind Waves
- Volcanic Eruption Global Warming
- Sea level Rise
- Coastal Subsidence
- Freak Waves
- Algal Blooms
- Siltation in Navigational Channels
- Dangerous Coastal currents

Coastal Protection in India

- Generally two criteria are used in deciding whether coastal protection is economically feasible in any country.
- It will be shown in next two slides that India meets both criteria extremely well and hence it is within the economic realm of India to start developing schemes to protect its coast lines.



Comparison of coastal length per land area



Population (thousands protected) per km of coastal defence

Return periods for all the maritime states along the east coast of India

Return period (Years)	ΔP (hPa)			
	West Bengal	Orissa	Andhra Pradesh	TamilNadu
2	14	20	26	13
5	23	43	45	25
10	34	60	58	35
20	49	77	69	48
25	54	82	72	52
50	75	94	82	66

ADCIRC

A **ADVANCED CIRCULATION MODEL FOR OCEANIC,COASTAL AND ESTUARINE WATERS**

DEVELOPED BY:

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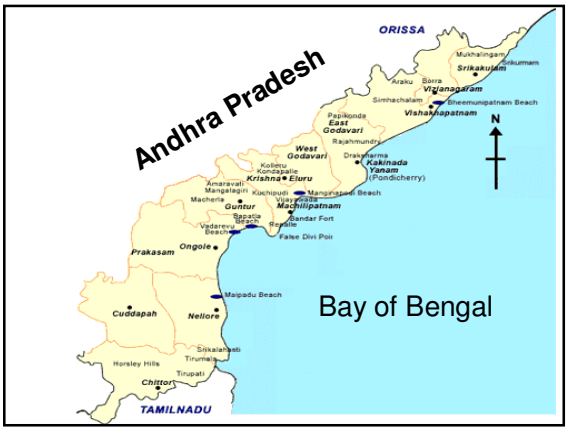
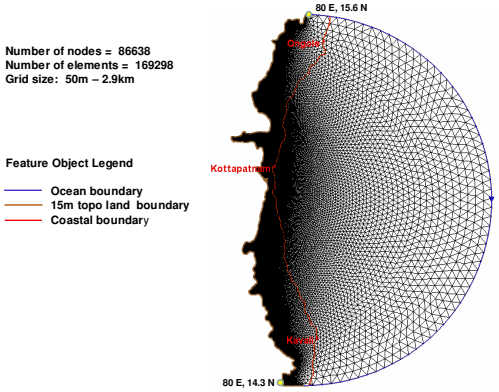


ADCIRC Capabilities

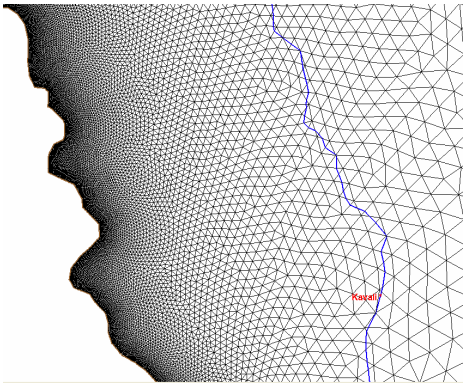
ADCIRC accommodates the following

- Tidal potential
- Wind and atmospheric pressure
- Elevation, flow and radiation boundary conditions
- Cartesian or spherical coordinates
- 2DDI or 3D
- Full wetting/drying elements (2D and 3D)
- Harmonic analysis
- Operates efficiently in single processor or parallel mode to solve large unstructured grids (linear speed up or better on 256+ processors). *Suitable for operational cent*

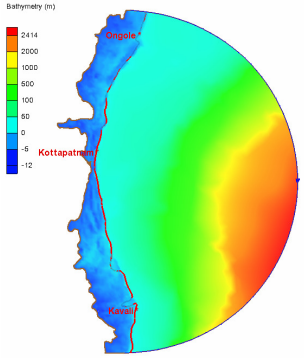
High Resolution Model Grid (Semi-circular domain)



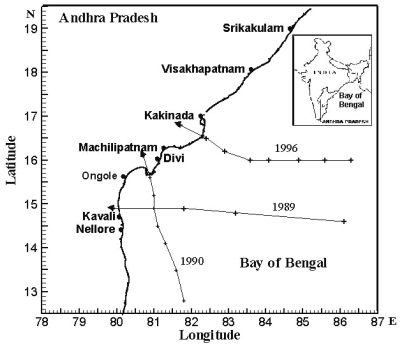
High Resolution Model Grid (Semi-circular domain)



ADCIRC finite-element grid and bathymetry (m)
General Bathymetric Chart of the Oceans (GEBCO)

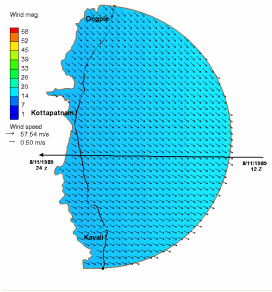


Study area along with tracks of May1990, November 1989 and 1996 cyclones

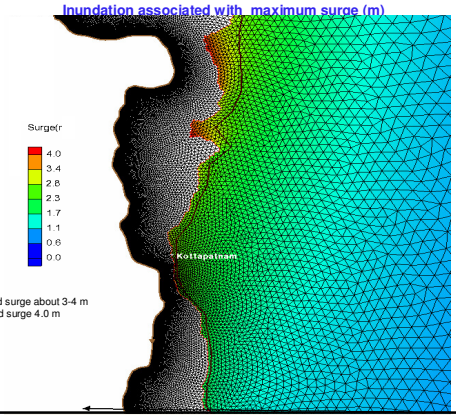


Winds (ms^{-1}) associated with Nov.1989 Kavali cyclone

Parameters for 1989 Kavali cyclone
RMAX = 40 km
Maximum sustained winds = 60 ms^{-1}

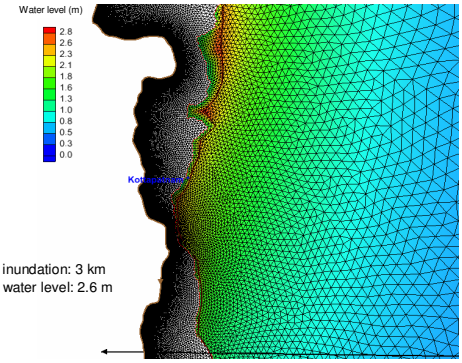


Inundation associated with maximum surge (m)



Observed surge about 3-4 m
Simulated surge 4.0 m

Water level associated with the peak surge (m)



Max inundation: 3 km
Max water level: 2.6 m

Development of Location Specific Integrated Prediction System for Assessment of Cyclonic Risk and Vulnerability

- Coupling of meso-scale atmosphere model with the storm surge model
- Storm surge calculation using coupled model (tidal effect is to be included)
- Computation of coastal Inundation
- Spatial distribution of inundation involving various GIS themes for site specification
- Identification of vulnerability

Data Requirement

- High resolution cyclonic winds
- Bathymetry, particularly in the continental shelf
- Detailed coastal geometry
- Land topography both horizontal (50m) and vertical (0.25m)

Thank You