Tsunami Inundation modelling and vulnerability mapping from Indian perspectives

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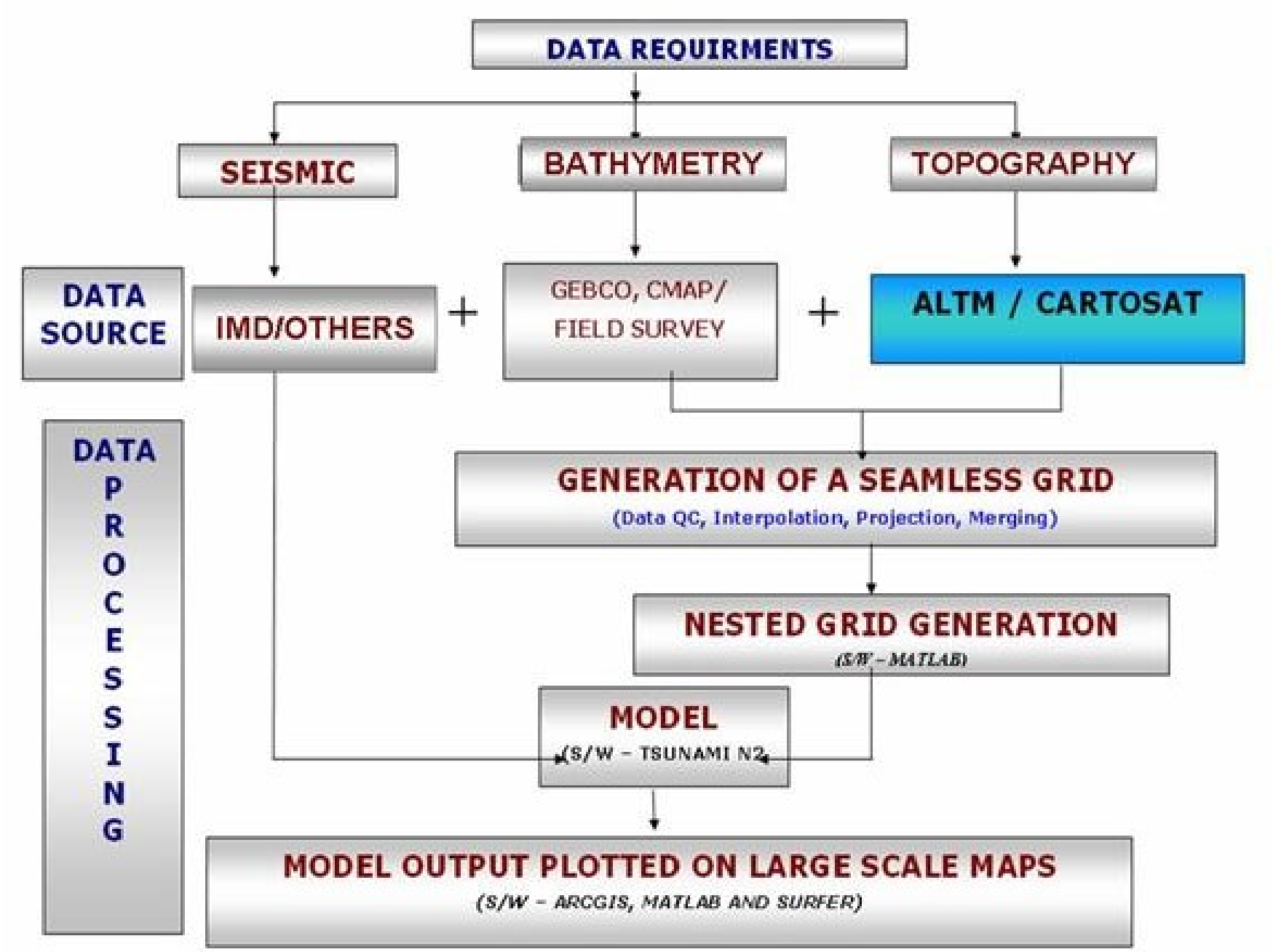
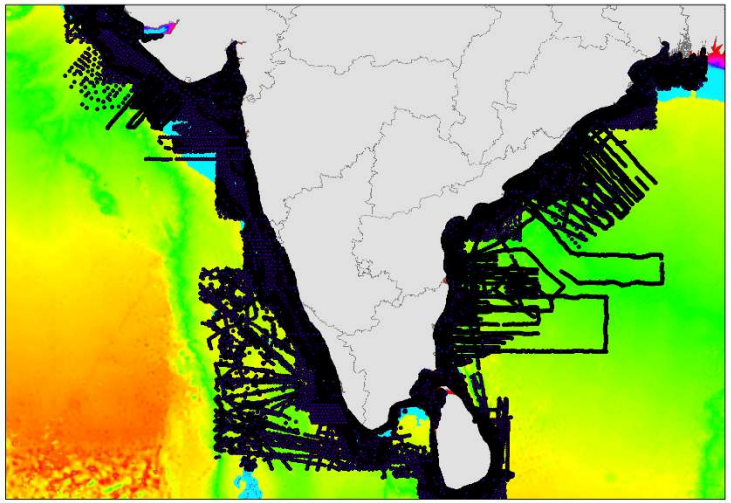
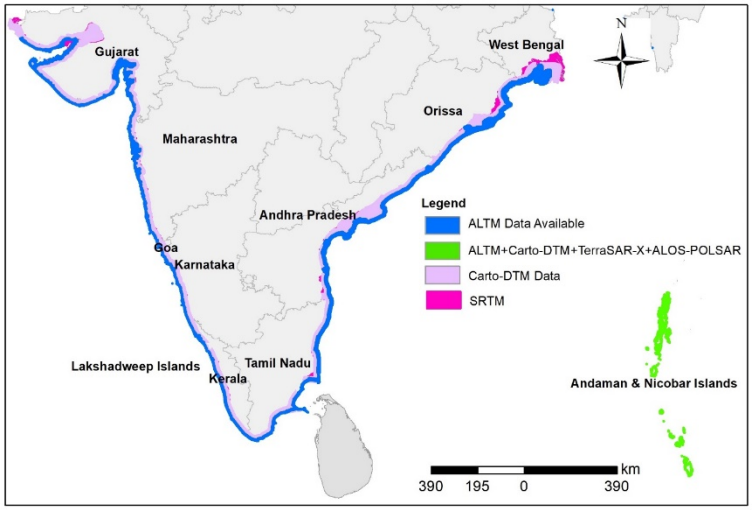
Tsunami Modelling and Mapping

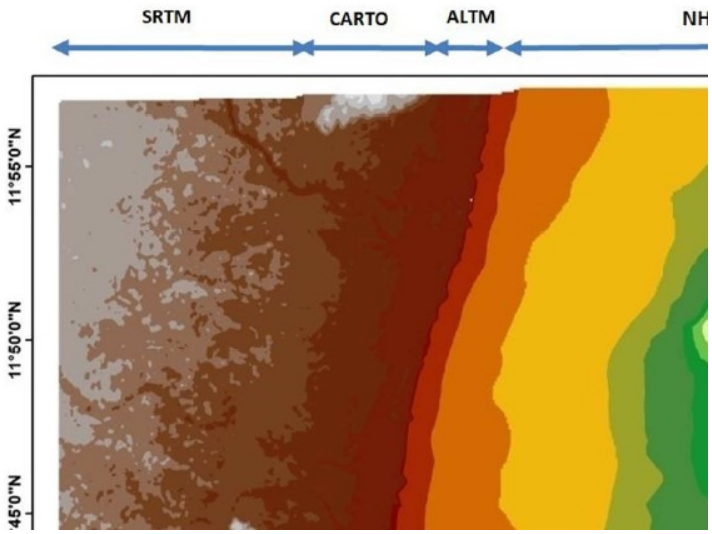


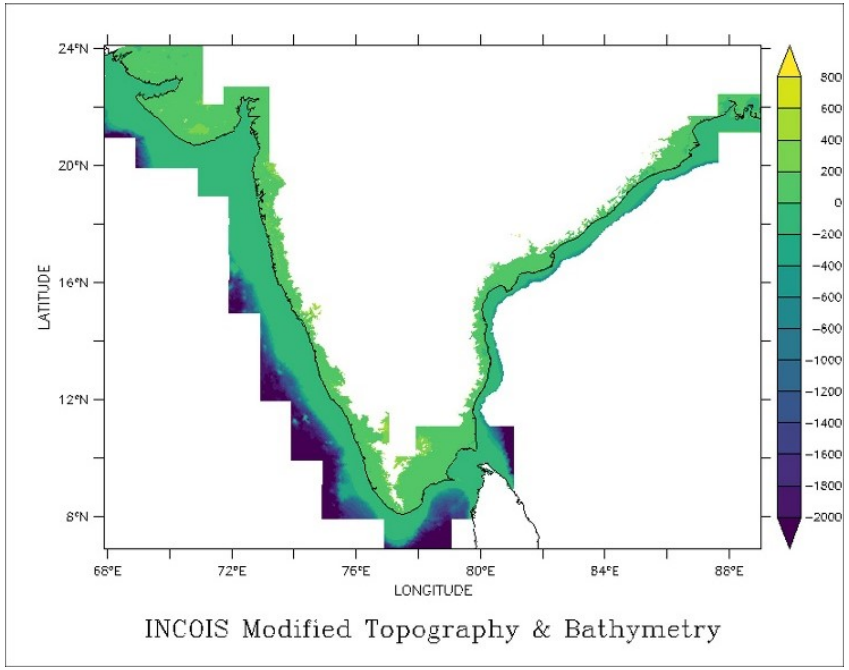
High resolution Topographic and Bathymetric data Merging



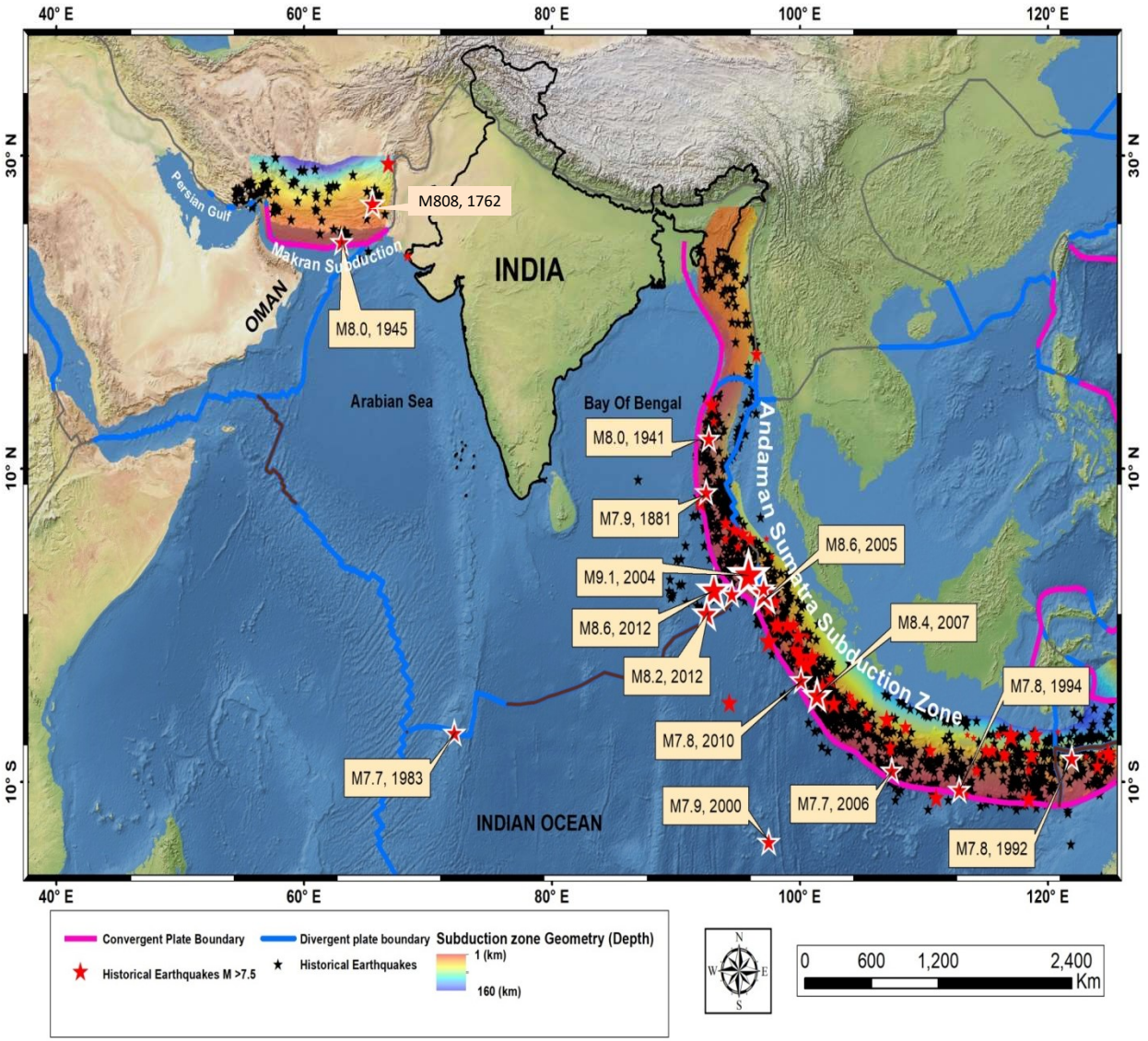


lent of near-real-time forecasts (Musa et al., 2018). SRTM data





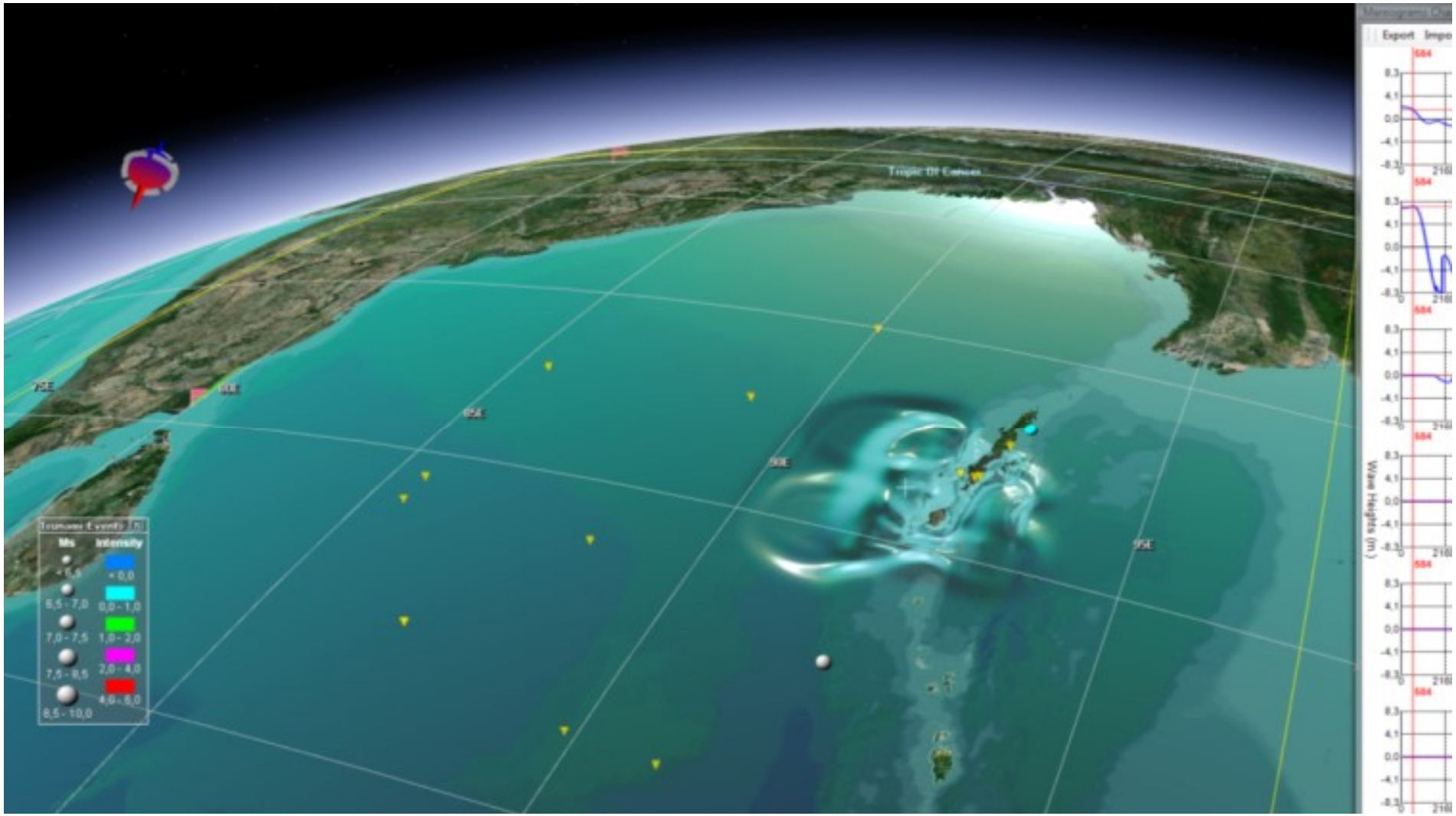
Potential Tsunamigenic Zones



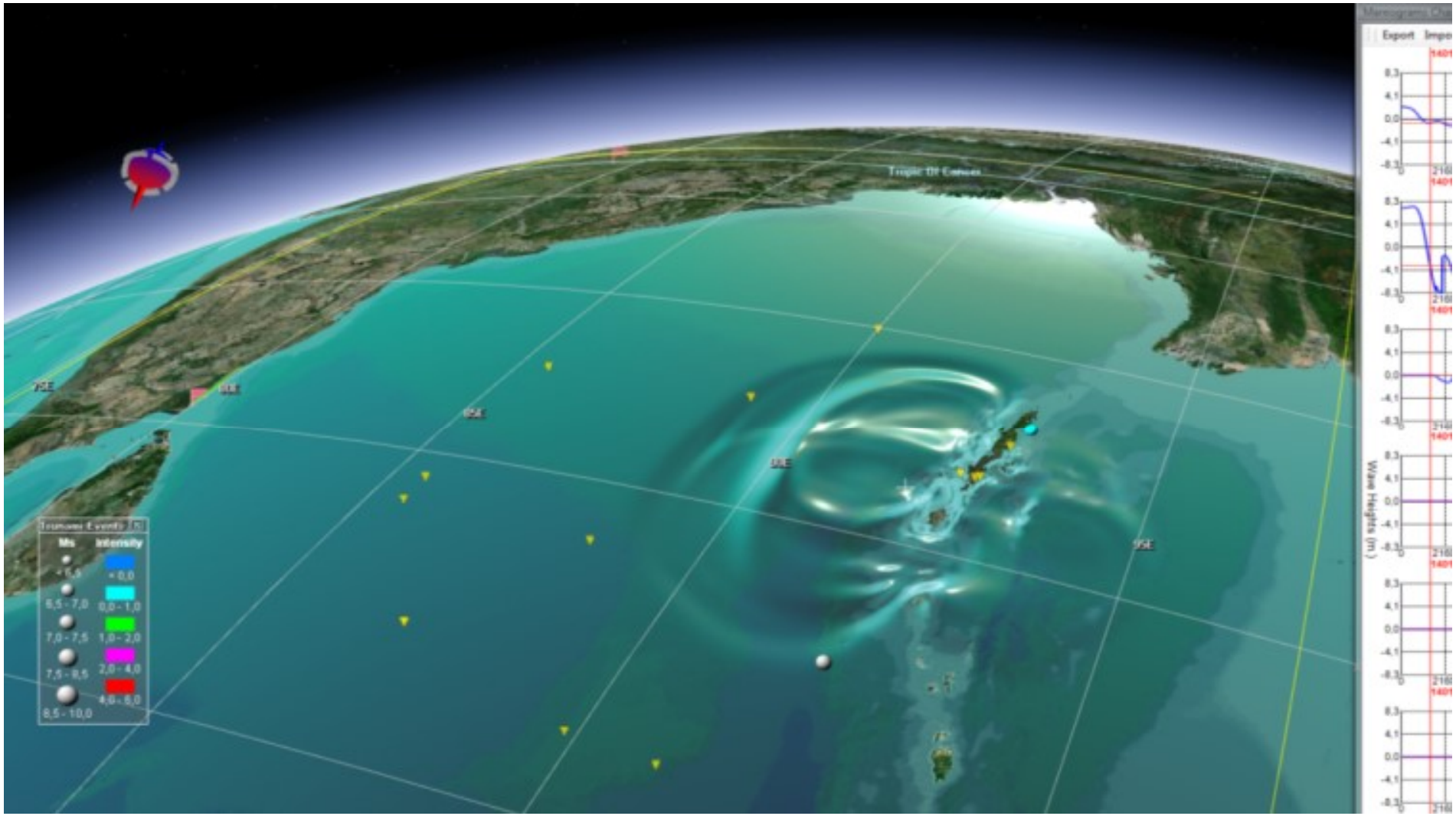
Details of Source parameters used in Maps

Parameters	Sumatra 2004	Car Nicobar 1881	Andaman 1941	Arakan 1762	Worst-Case	Worst-Case
Source	Sumatra	Car Nicobar	North Andaman	Arakan	Car Nicobar	North Andaman
Longitude	95.85^0 E	92.43^0	92.5^0 E	94.0^0	92.43^0	92.43^0
Latitude	3.32^0 N	8.52^0	12.1^0 N	19.0^0	8.52^0	8.52^0
Magnitude	9.3 Mw	7.9 Mw	7.7 Mw	8.8 Mw	9.3 Mw	9.3 Mw
Slip	15 m	5 m	5 m	10 m	15 m	15 m
Fault Length	1200 km	200 km	200 km	700 km	500 km	500 km
Fault Width	150 km	80 km	80 km	125 km	150 km	150 km
Strike Angle	345^0	350^0	20^0	320^0	345^0	345^0
Dip Angle	15^0	25^0	20^0	20^0	15^0	15^0
Rake Angle	90^0	90^0	90^0	90^0	90^0	90^0
Focal Depth	20 km	15 km	30 km	10 km	20 km	20 km

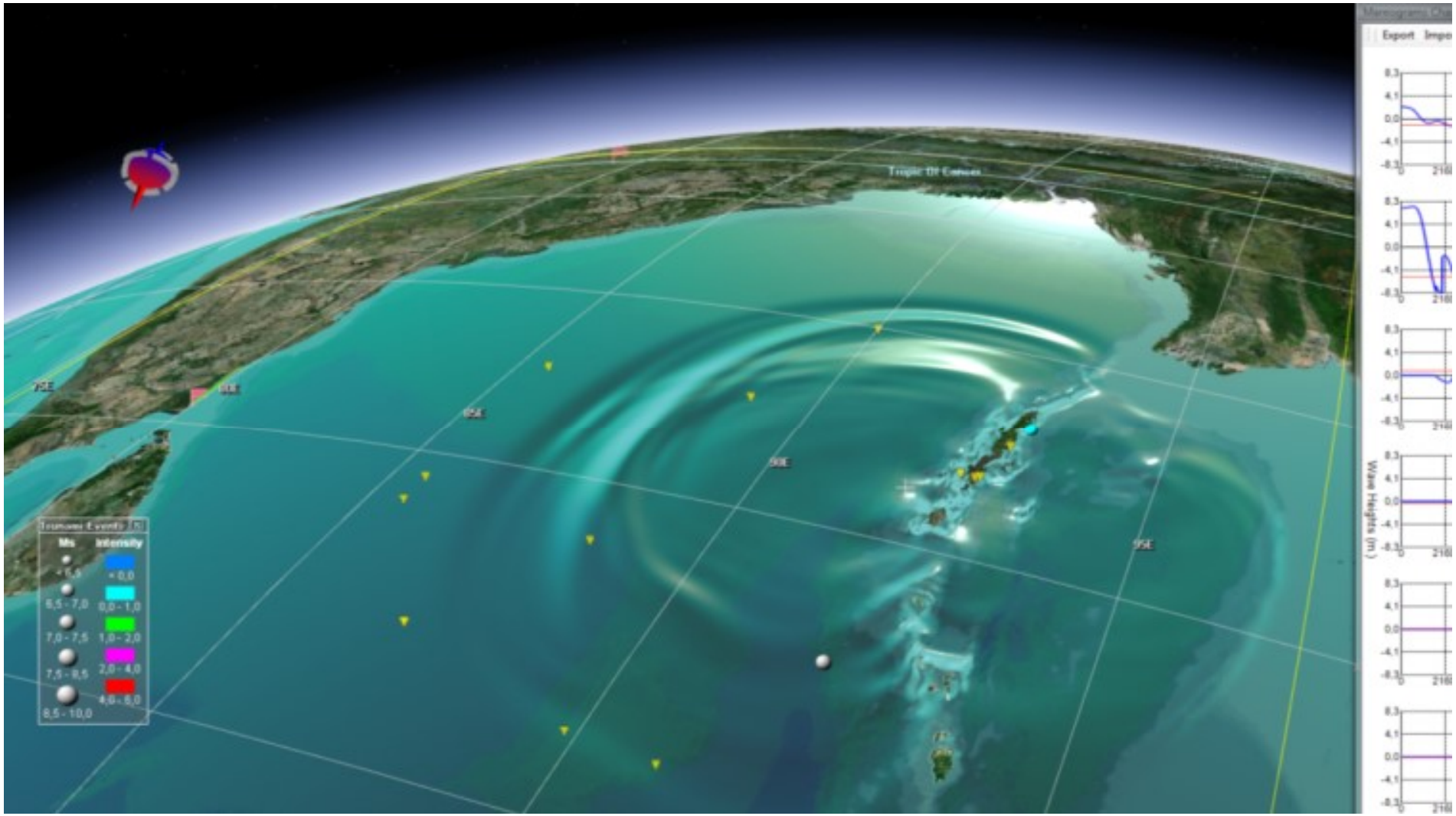
Tsunami modeling



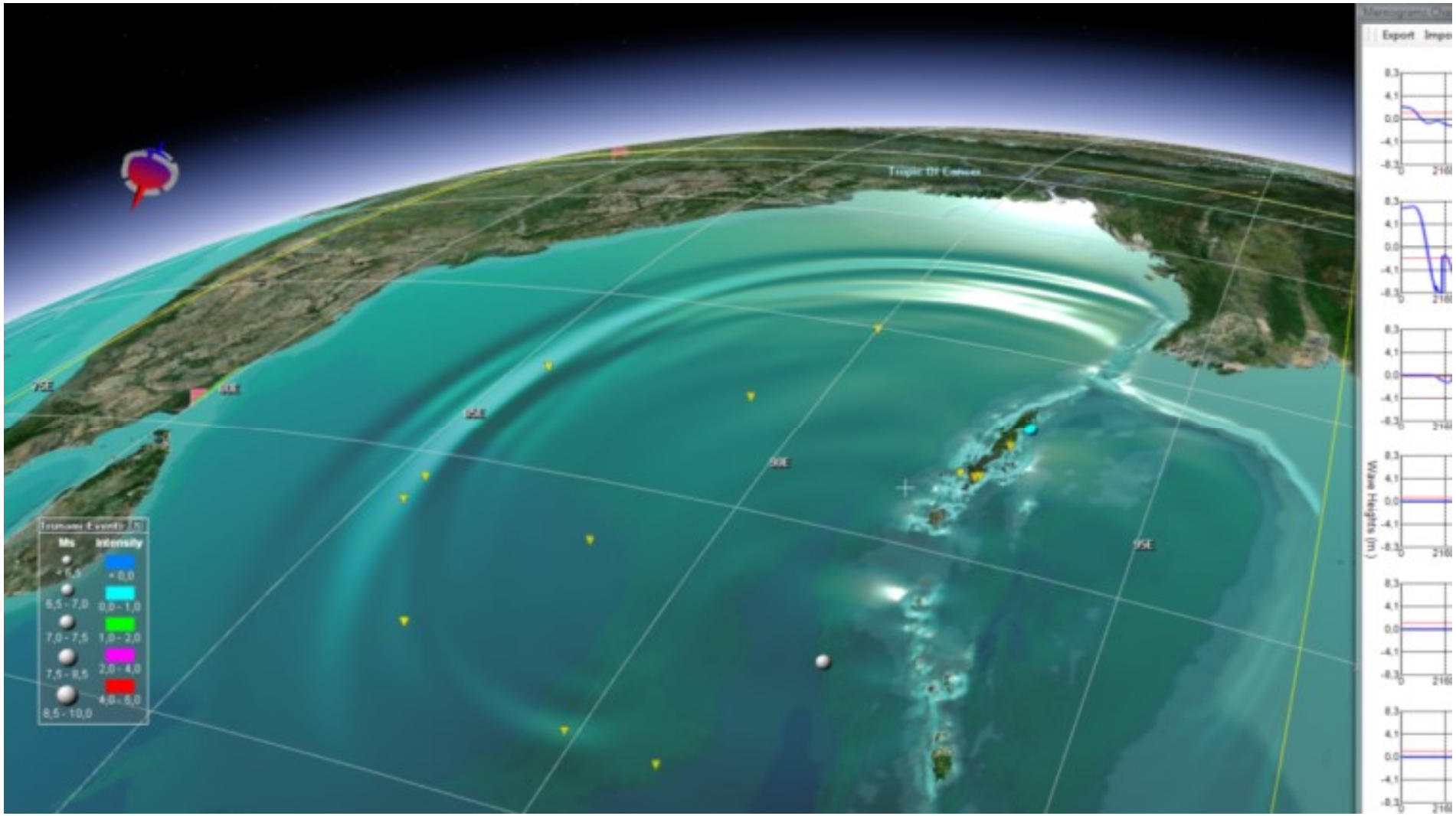
Tsunami modeling



Tsunami modeling



Tsunami modeling



Extent of coastal Inundation due to tsunami

Tsunami Inundation levels

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https://doi.org/10.1007/s12594-022-2183-y

ORIGINAL ARTICLE

Finite Element Modeling of Tsunami-induce and Associated Inundation Extent: A Case St 26th December 2004 Indian Ocean Tsunami

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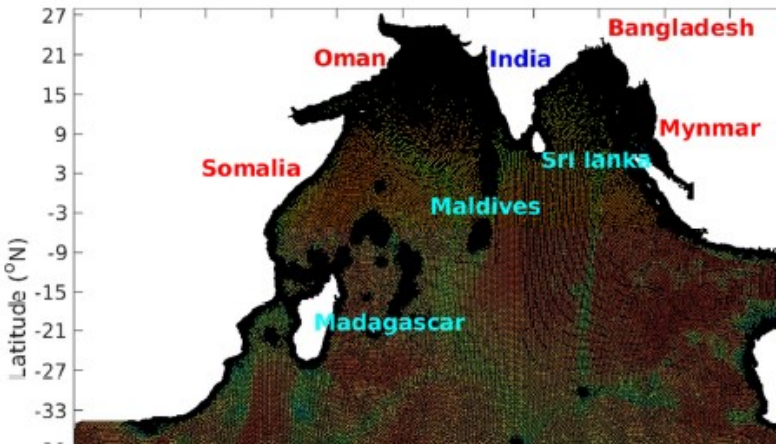
ABSTRACT

In recorded history, the tsunami due to the Great Sumatra earthquake of 26th December 2004 has been the most devastating, causing the loss of over 230,000 lives besides extensive damage to most of the coastal provinces bordering the Indian Ocean. Real-time prediction of tsunami wave heights and resultant inundation of inland coastal areas are essential to safeguard the life and property of the coastal community. In the present work, a finite-element-based ADvanced CIRCulation (ADCIRC) model (widely used for storm surge simulations) is used to compute tsunami wave with higher amplitud property of the coastal 2004 Indian Ocean ts 230,000 people and c ten countries across th Synolakis et al. 2005)

Nearly eighty per in the Sunda arc co (Rastogi et al., 2006) 2004 struck at Sumatr



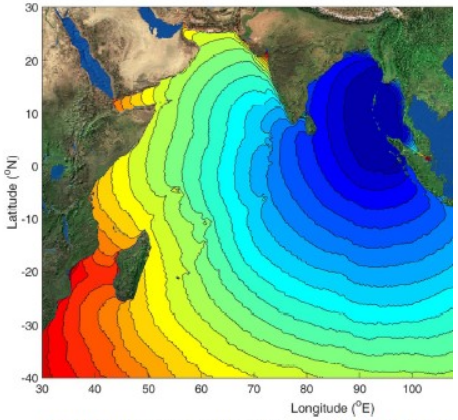
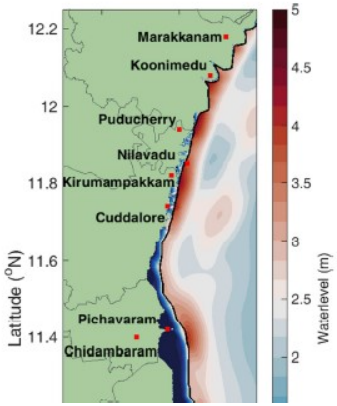
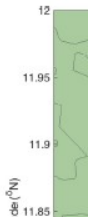


Fig.8. Travel time contours of tsunami wave associated with 26th Dec

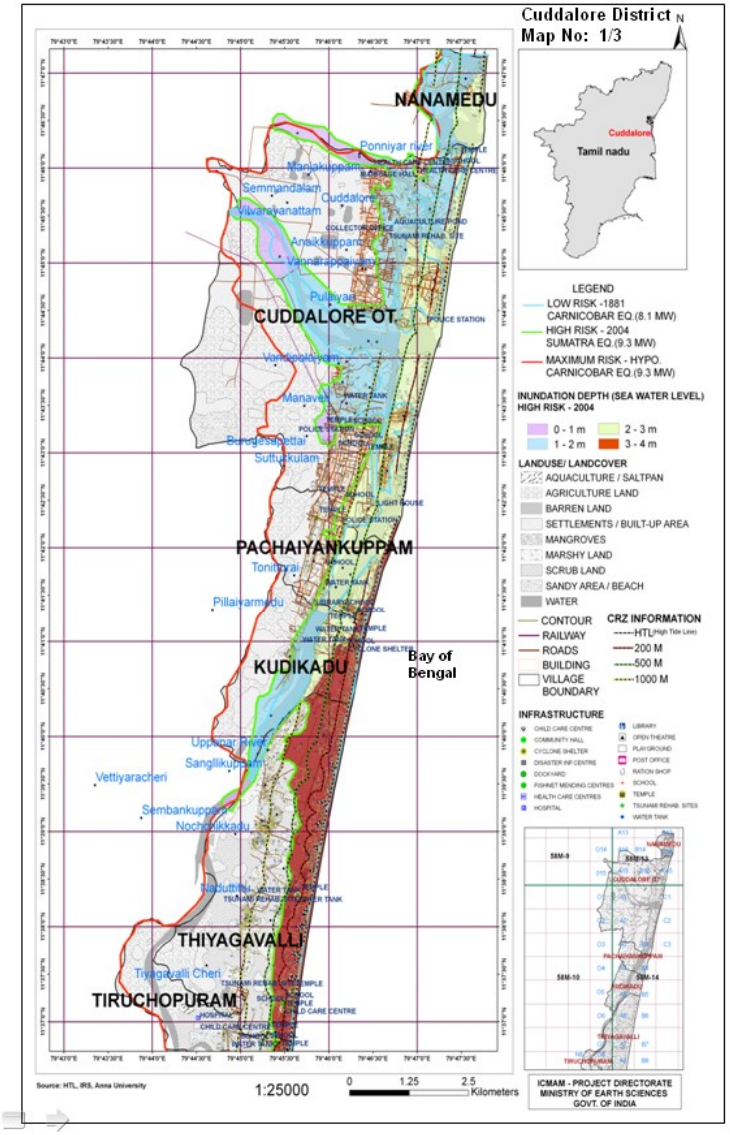


have been prop inland flooding features, which al., 2005). Such bathymetry data been resolved w these extreme r Banda Aceh, to topography c.f.



Tsunami Vulnerability Map of Cuddalore, Tamil Nadu

FOR OFFICIAL USE ONLY



- High Tide Line and CRZ buffer (200m, 500m, 1km)
- Roads and Rails, Elevation contours – 1m
- Landuse from IRS-LISS III

Tsunami Vulnerability Map of Cuddalore, Tamil Nadu

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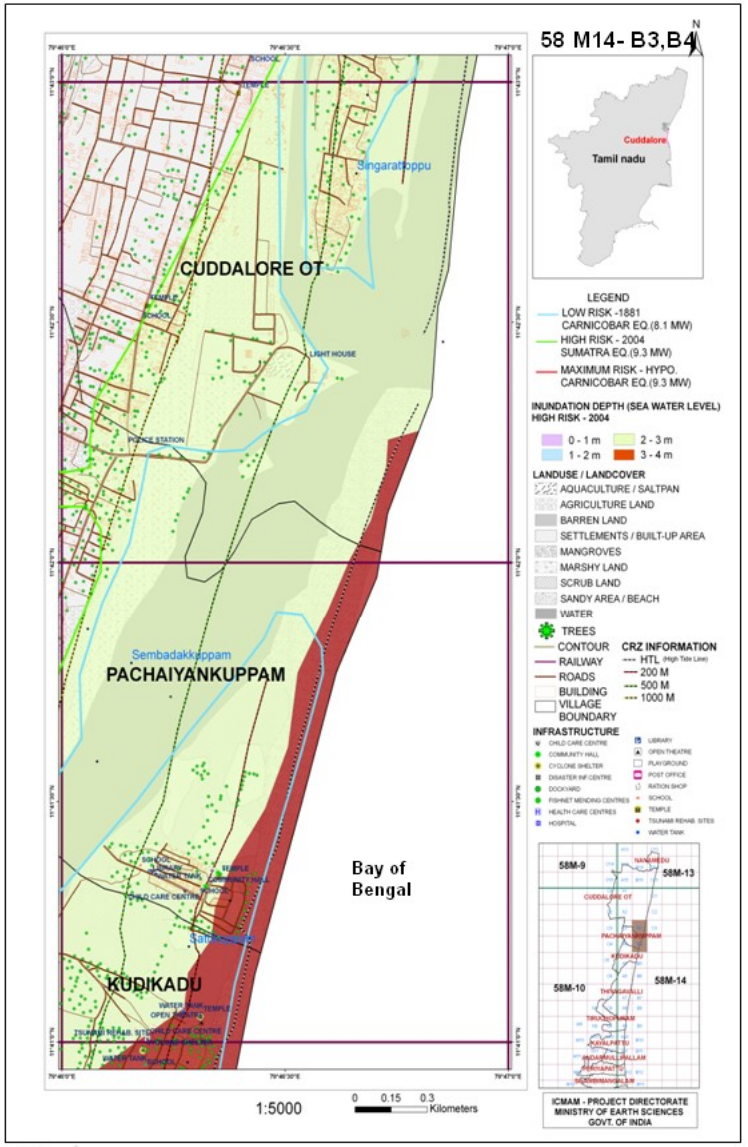
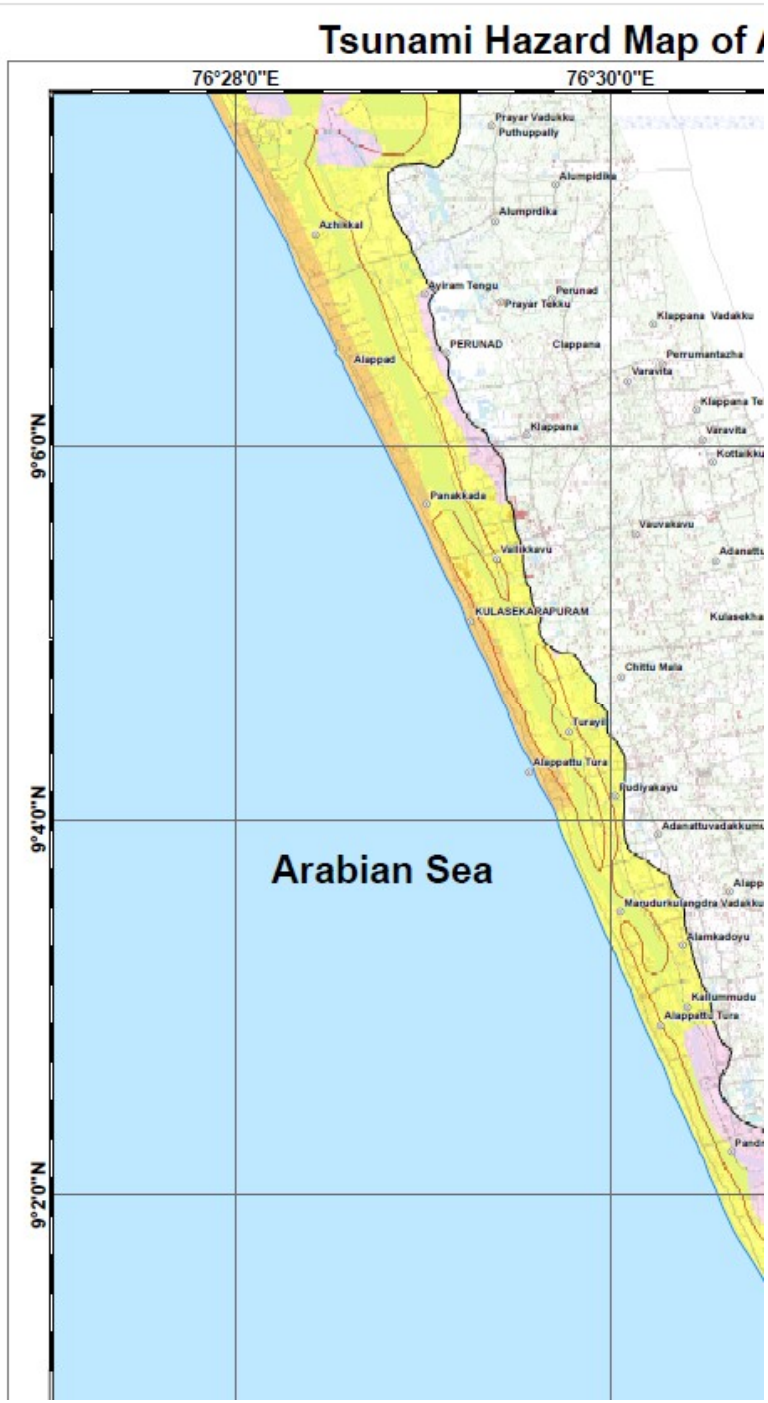


- High Tide Line and CRZ buffer (200m, 500m, 1km)
- Roads and Rails, Elevation contours – 1m
- Infrastructure details from DC images

Tsunami Hazard Map of Alappad

Overlaid on land use and transport



INFORMATION AVAILABLE IN THE MAP

I. Vulnerability classification

Low risk – Carnicobar Eq (8.1.Mw)
High risk – Sumatra Eq (9.3Mw)
Maximum risk – Hypo. Carnicobar eq (9.3 Mw)

II. Inundation Depth (sea water level due to Sumatra 2004)

III. Others details

From Satellite Imagery (entire Village)

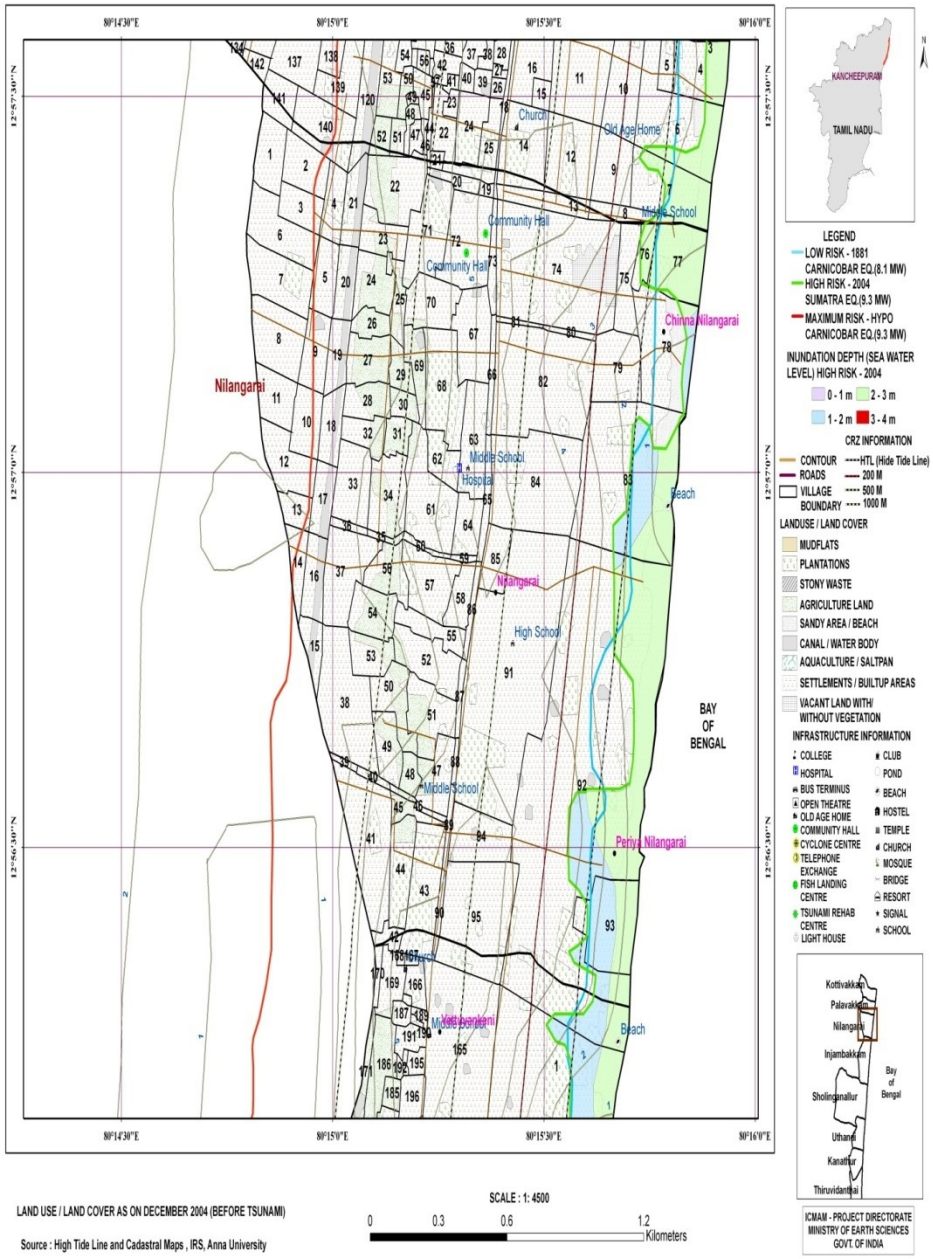
- Landuse

From DC images (upto 2Km from coast)

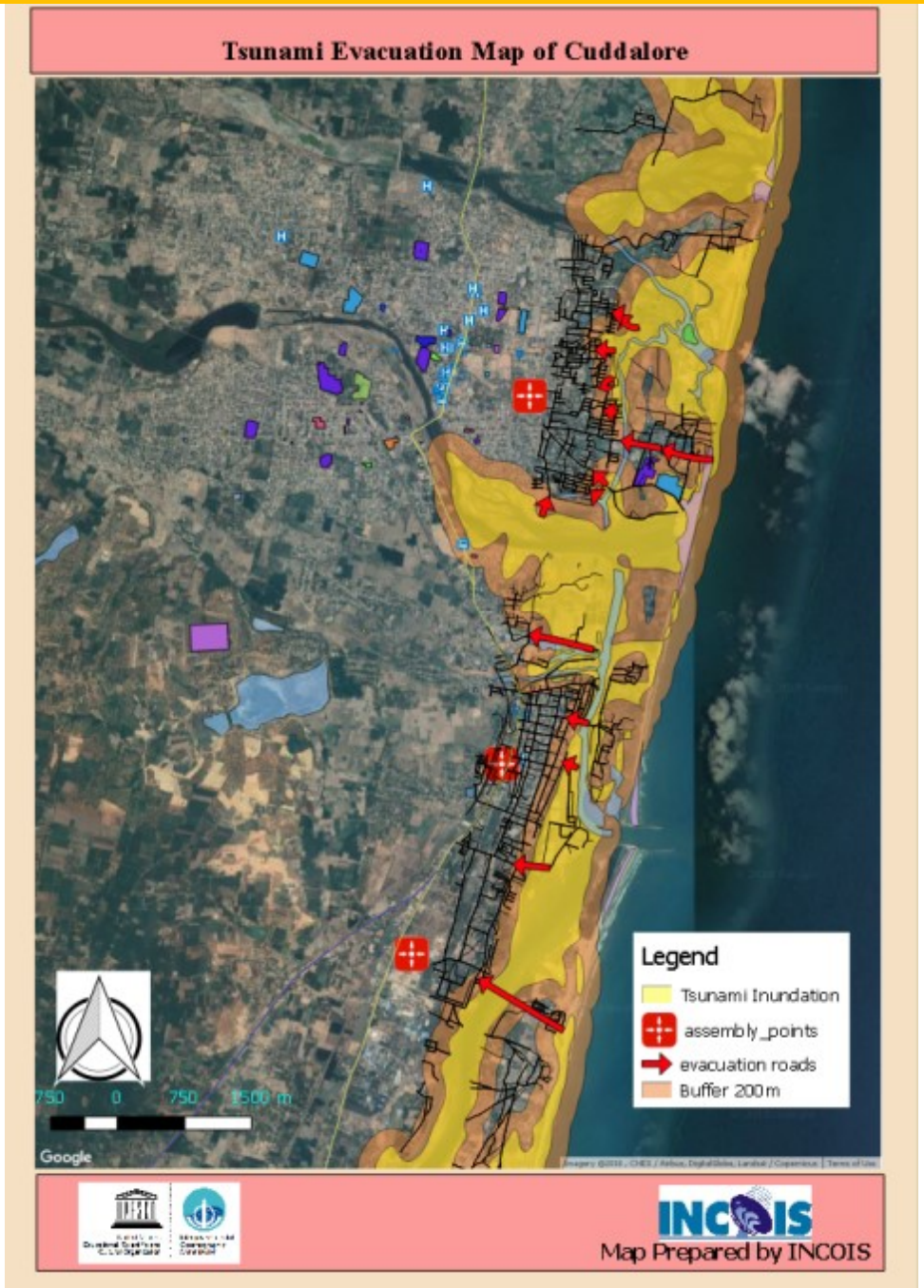
- Elevation Contours
- Infrastructure details
- Trees
- Roads
- Railways
- Buildings

Secondary data

- Cadastral boundaries and Survey Nos
- Administrative boundaries



Example: Evacuation map of Cuddalore



- Aims: to save the people at risk before tsunami
- General consideration in Tsunami Evacuation Pl
  - ✓ Direct to safe place
  - ✓ To the closest and fastest route to go to safe place
  - ✓ Consider tsunami arrival time
  - ✓ Consider number of people at risk

Thank you