Storm & Tsunami Technologies

Storm Surge and Tsunami Analysis Model (NK-STAM)

Storm Surge Risk Analysis

Tsunami Risk Analysis

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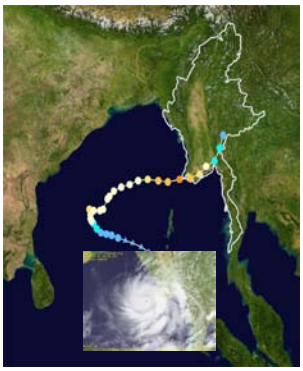
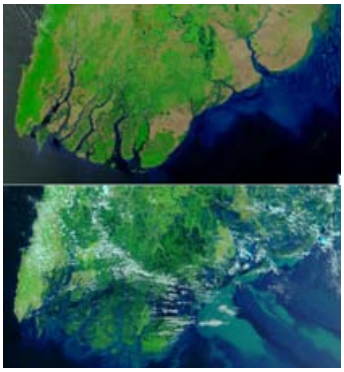
Storm Surge and Tsunami Analysis Model (NK-STAM)

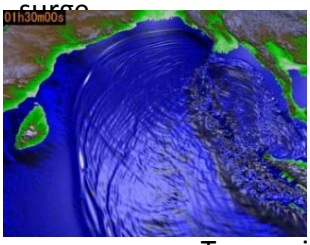


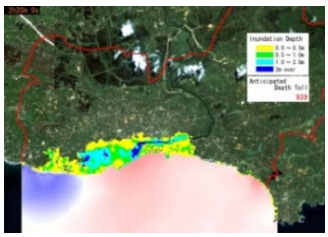


Cyclone's track and topographic changes before and after the devastation due to storm surge

Storm surges, tidal waves and tsunamis often cause devastating disasters on coastal areas. Tsunamis are large volumes of sea water shifts from one place to another triggered by earthquake. Storm surges and tidal waves are unusual rises in the water level along sea coasts, produced by an atmospheric depression, typhoon or a combination of wind and tide.

To assess the tsunami hazard and vulnerability (tsunami risk), we developed a storm surge and tsunami analysis model (NK-STAM).



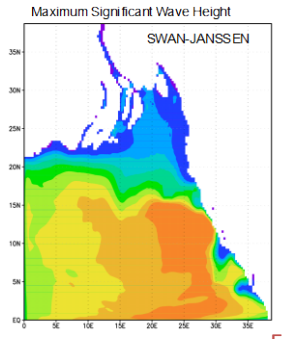


Tsunami simulation

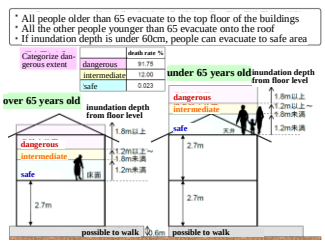
Country	Project
Myanmar	Tidal wave risk analysis/evaluation
Japan Indonesia	Tsunami risk analysis/evaluation

Storm Surge Risk Analysis

Sorm surge risk analysis



Simulated waves heights



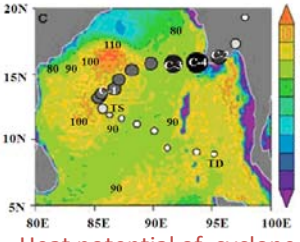
Estimating human damage of inundation

Quoted: Central Disaster Prevention Counc

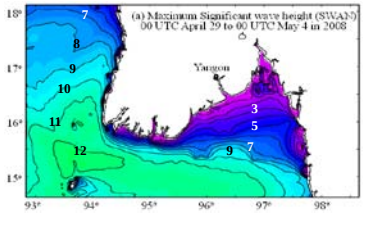
Storm surges cause a lot of devastation. The 2008 Cyclone Nargis caused the worst disaster in Myanmar, and the 2013 Typhoon Yoland was one of the strongest tropical cyclones which caused catastrophic destruction to the center of the Philippines.

High accuracy prediction of storm surge can be realized by integrating atmosphere and ocean wave in storm surge modeling.

Integration of atmosphere and ocean wave in storm surge modeling

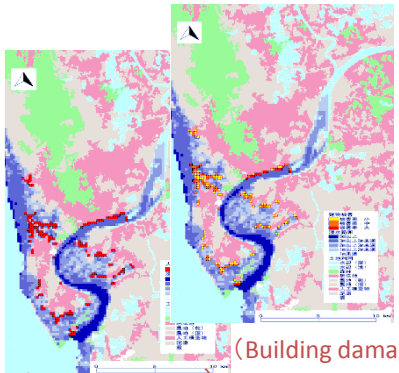


Heat potential of cyclone



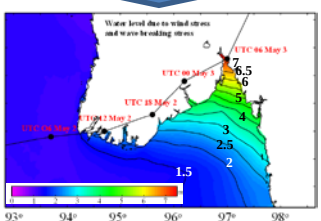
Maximum height of ocean wave

Investigating unit value of houses and schools



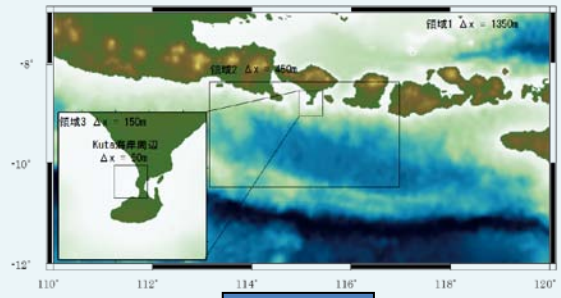
(Human damage) (Building damage)

Storm surge risk map

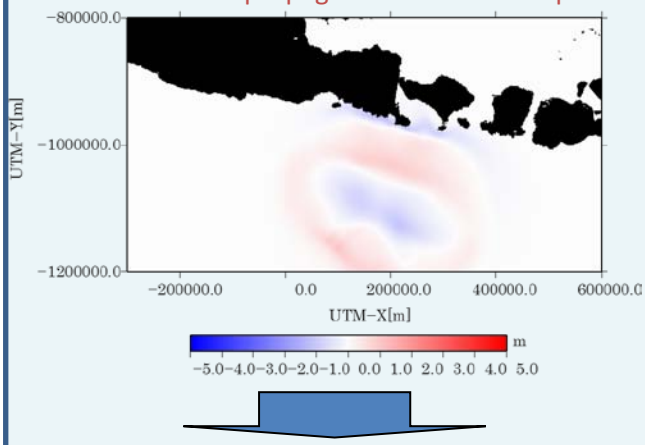


Maximum deviation of storm surge

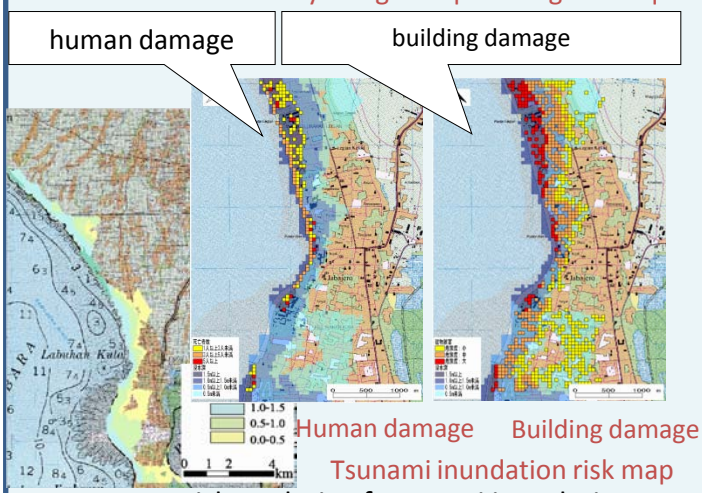
Tsunami Risk Analysis



Calculate tsunami propagation from fault displacements



Simulate inundation by using 4 step nesting technique



Risk analysis of tsunami inundation

The 2004 Sumatra earthquake and tsunami and the 2011 Great East Japan earthquake and tsunami devastated their coastal areas.

In these tsunami disasters, damage to human life and property was not only caused by inundation but also by driftage.

The behavior of driftage is numerically modeled and embedded in NK-STAM.

Driftage damage in the 2004 Sumatra earthquake and tsunami

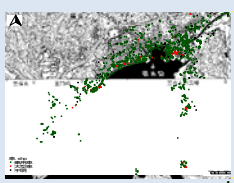
Risk analysis of tsunami inundation

- Risk analysis of tsunami Inundation is made in the following way.
  - Compute a series of the events such as fault displacement, tsunami propagation and inundation on a coast area
  - Estimate damages to humans and buildings
  - Make the tsunami risk maps

Risk analysis of tsunami driftage

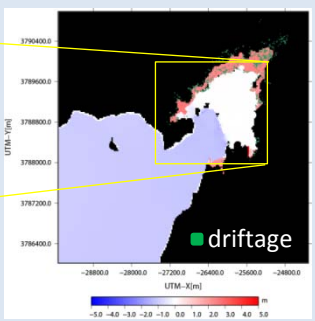
- Risk analysis of tsunami driftage is made in the following ways.
  - Select target objects drifting in tsunami
  - Develop scenarios
  - Make a tsunami propagation and inundation simulation
  - Estimate and predict the damages by driftage in tsunami

Cars



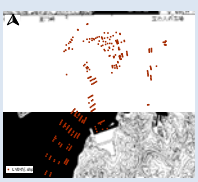
Initial locations

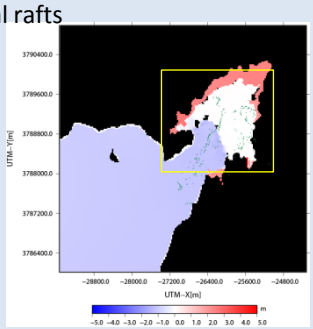
driftage



After Tsunami

Aquacultural rafts





Driftage simulation in future tsunami