

Tsunami



Malajsie 2004, 2005
a teorie



<http://walrus.wr.usgs.gov/tsunami/> aj.

Fakta dvou událostí

datum	28.3.2005	26.12.2004
čas (SEČ)	17:09:36	01:58:53
hloubka epicentra	30 km	10 km
stupňů Richtera	8,7	9,0
dosah otřesů	6827 km	9213 km
budovy pobořeny do	544 km	735 km
počet mrtvých	více než 1000	přes 320 000

Výstup na pláž



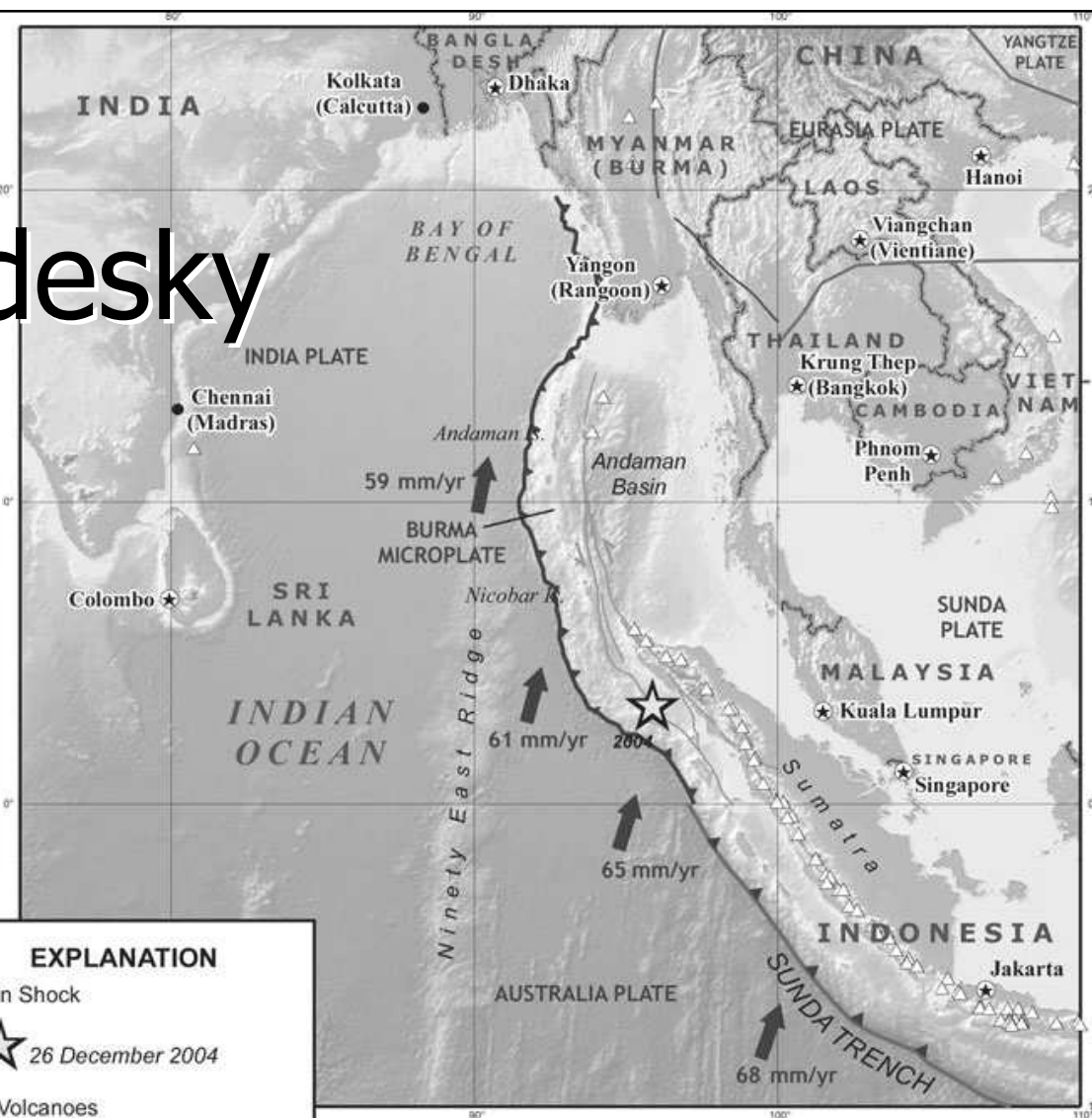
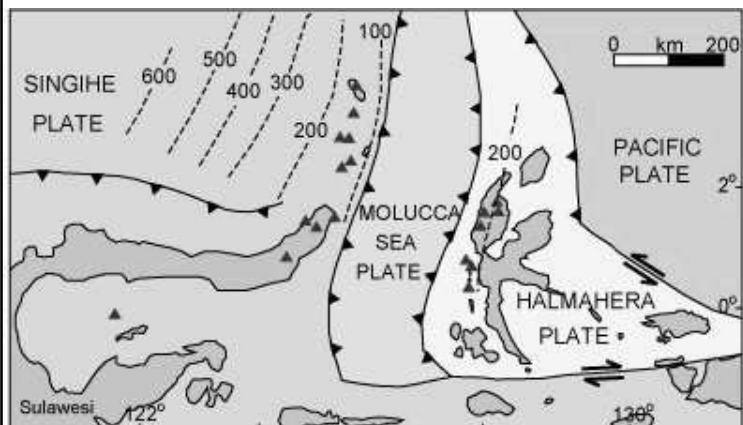
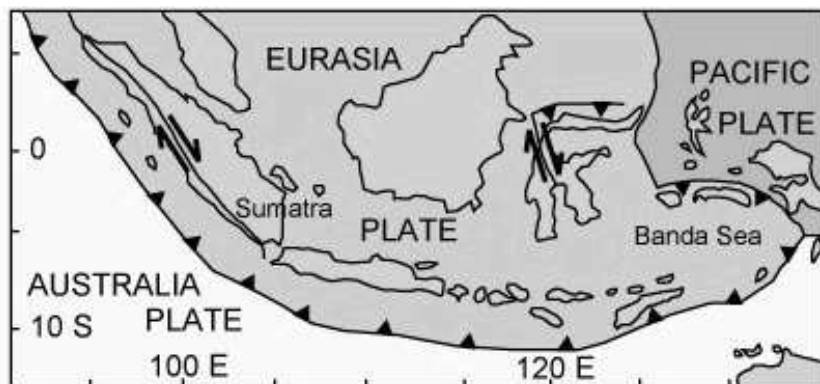
a dále



Rozložení litosférických desek



Malajsie a její desky



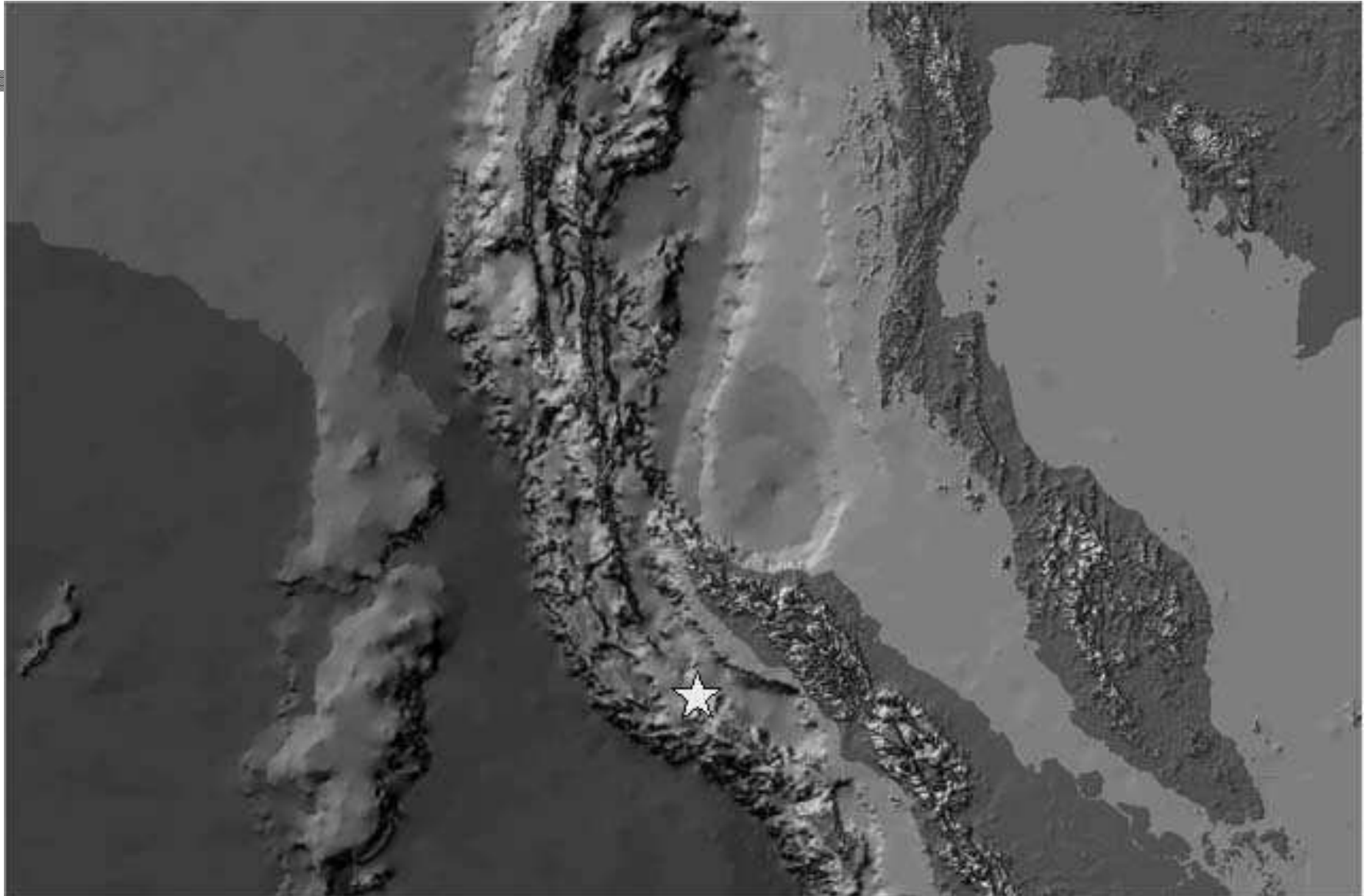
EXPLANATION

- Main Shock
- ★ 26 December 2004
- △ Volcanoes
- Generalized Plate Boundaries
- Faults (after Pubellier et al., 2004)
- ▲ Thrust
- ≡ Strike-Slip

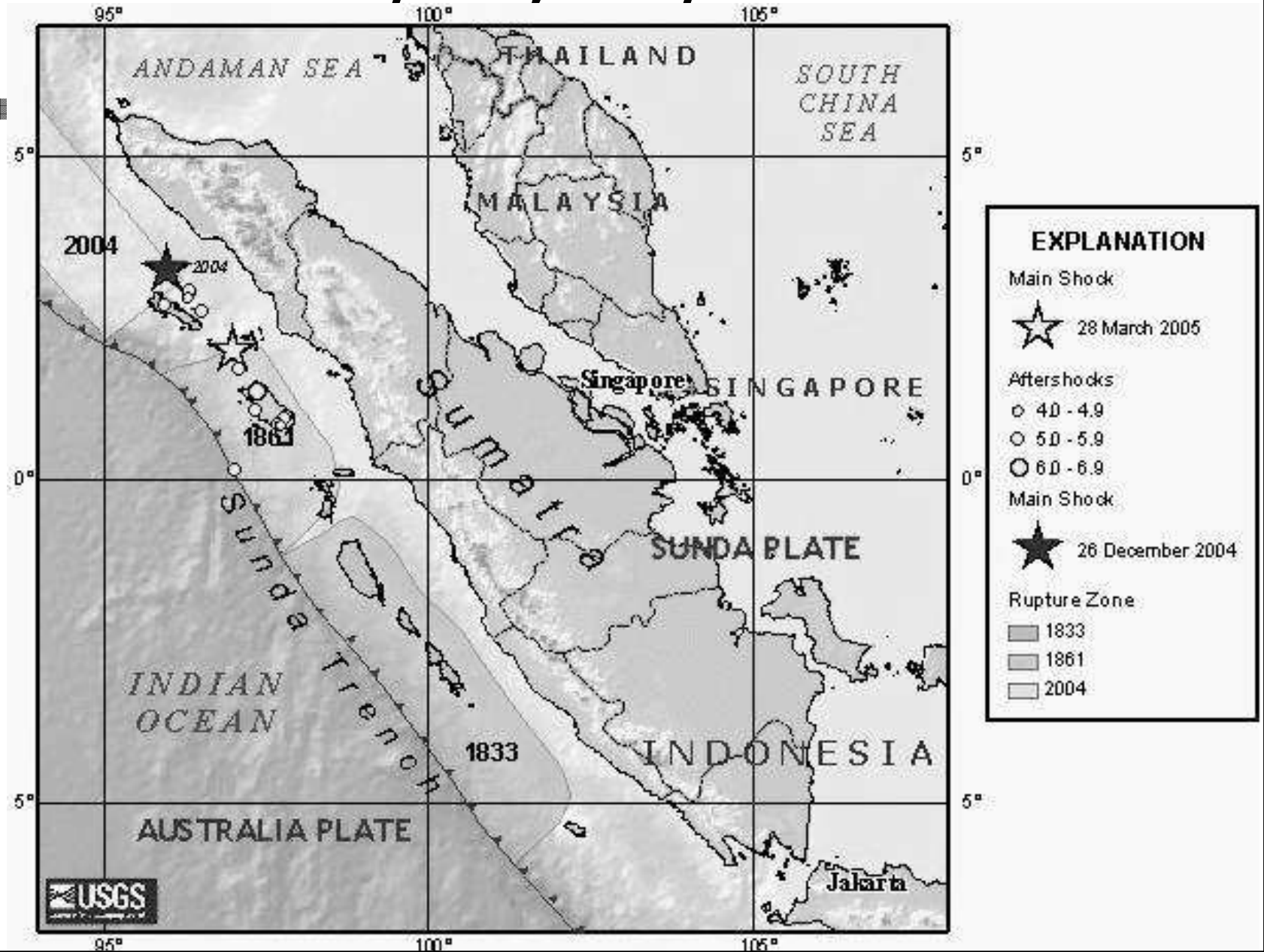
SCALE 1:23,000,000 at the Equator
Mercator Projection



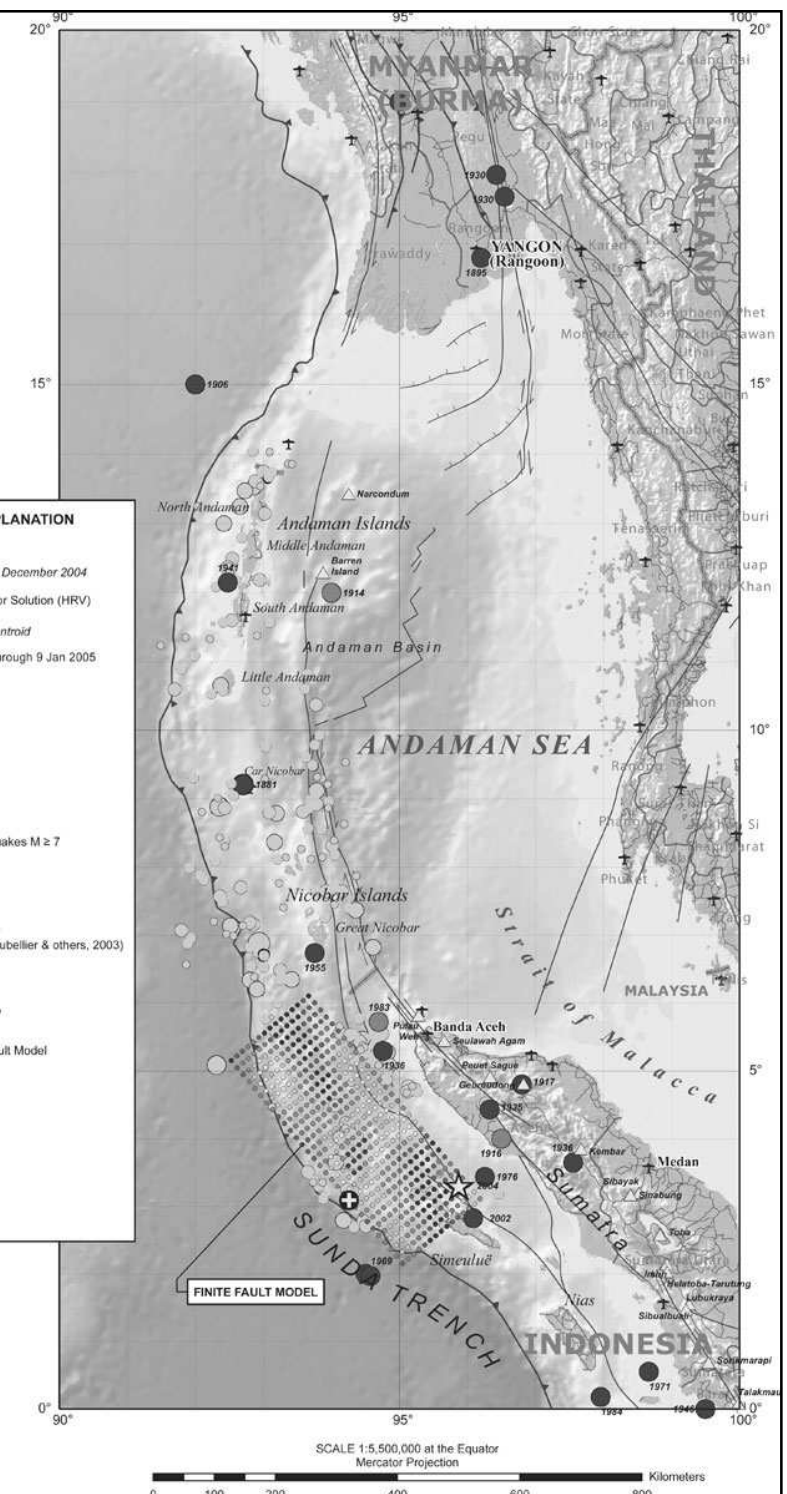
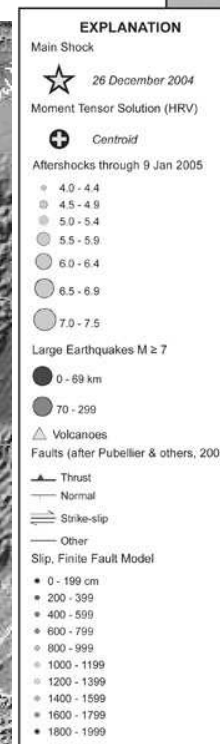
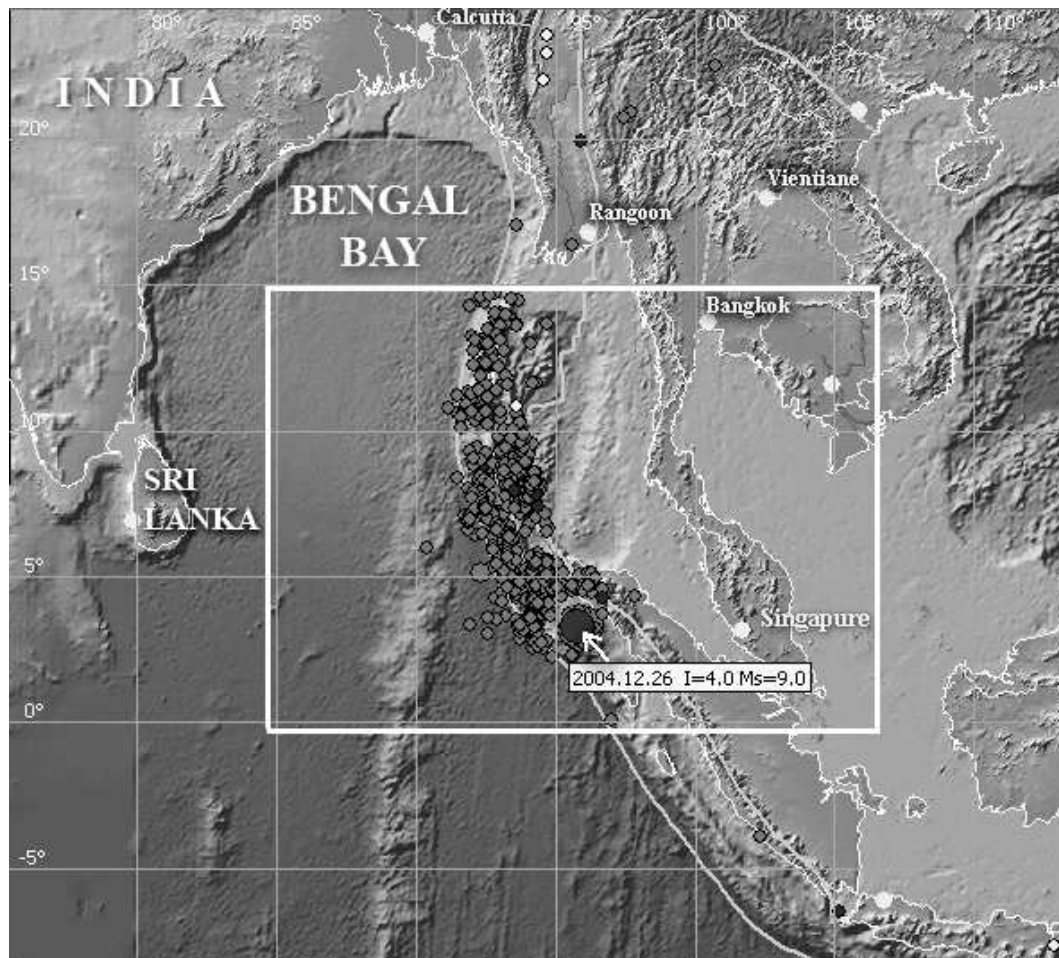
Morfologie



Epicentra – 12/04, 03/05

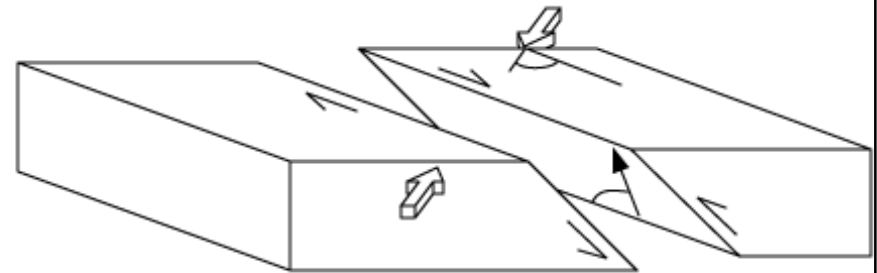


Geofyzikální indikace



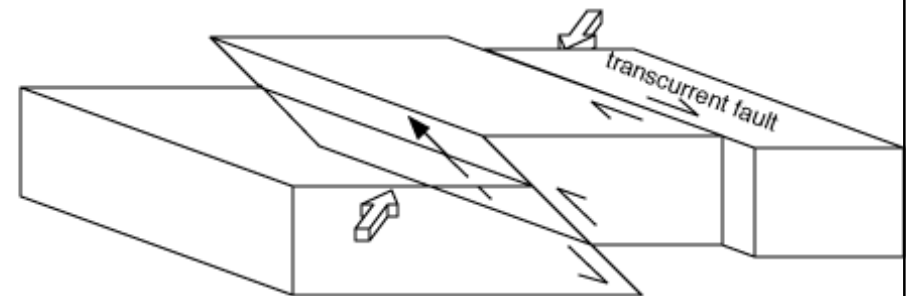
Desky a zlomy

(a)

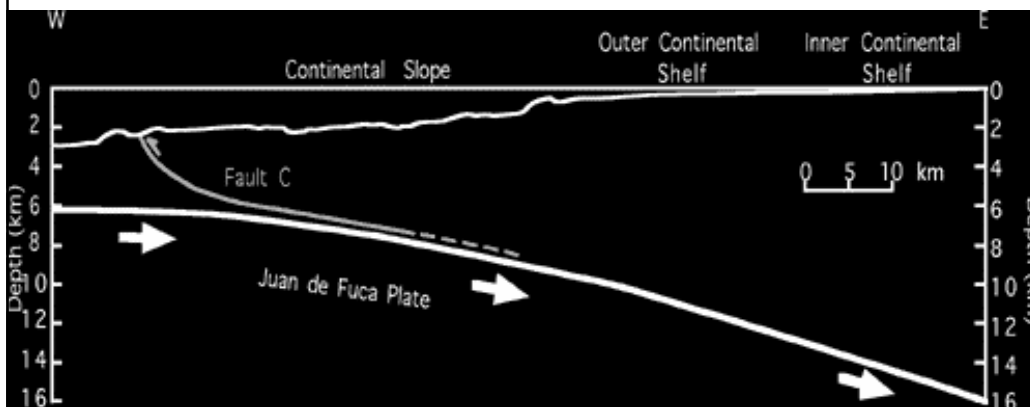
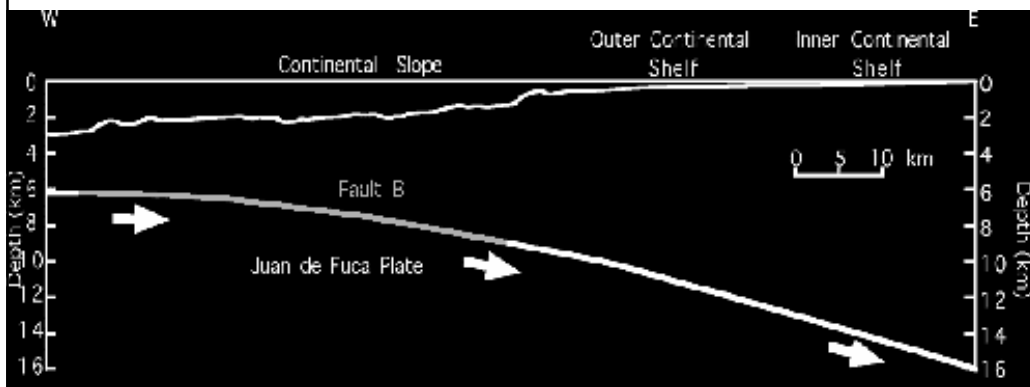


Oblique Faulting: thrust/right-lateral faulting

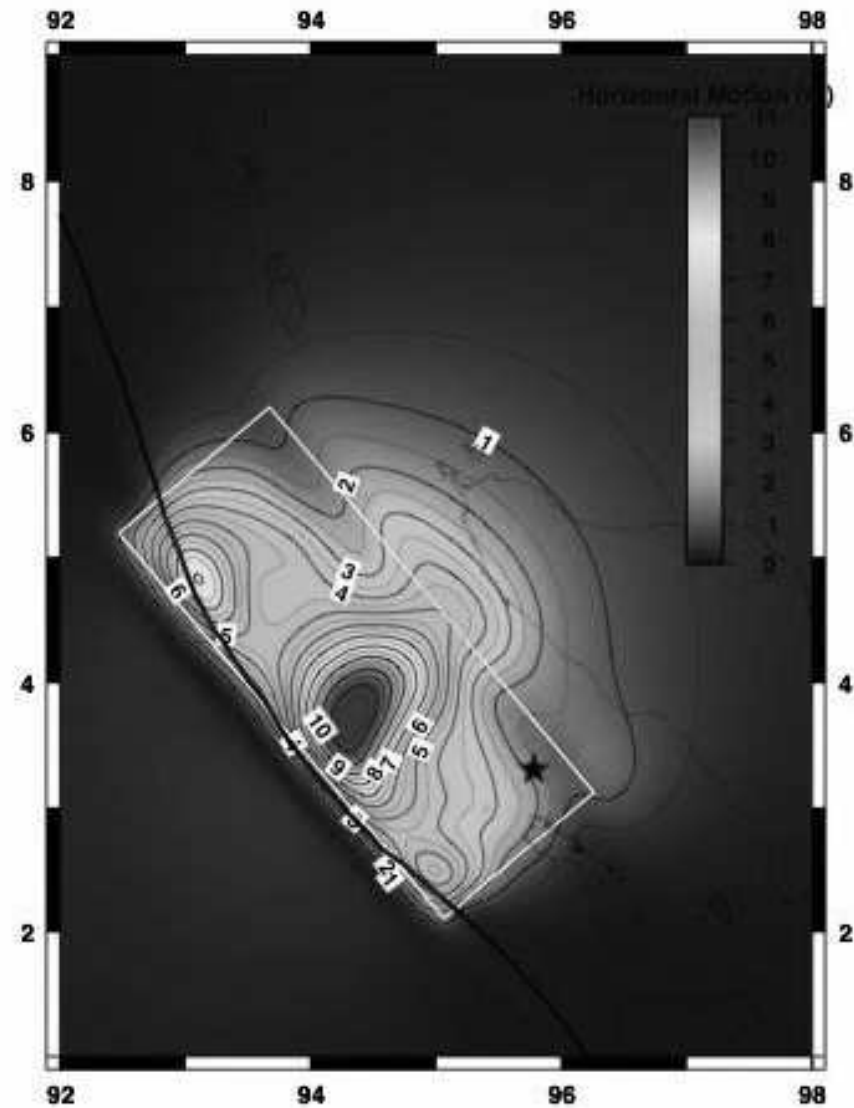
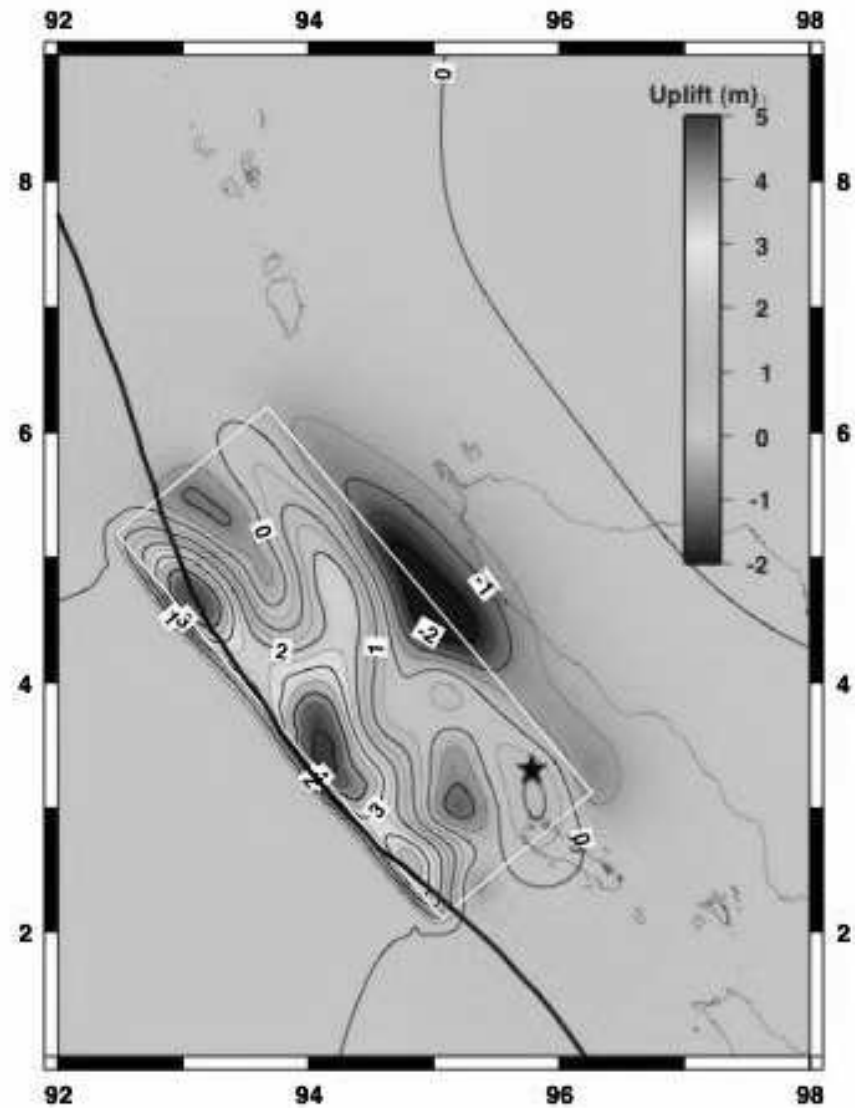
(b)



Decoupled Faulting: pure thrust faulting



Uplift and slip

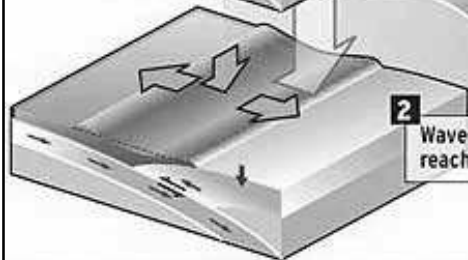
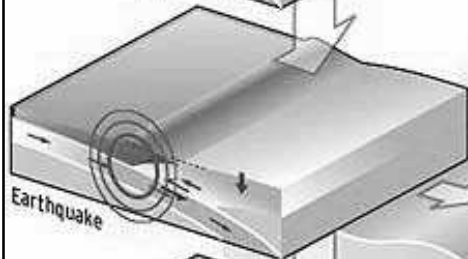


Vznik vlny



FATAL COLLISION

1 Sudden shifting of continental plates causes earthquakes, forcing sea water above to rise, forming waves



2 Waves move rapidly in deep ocean, reaching speeds of 800kmh

As they collide, the Australian plate is pushed up and over the Pacific plate. This causes buckling of the Earth's crust, building mountains and triggering earthquakes



The Australian PNG plate is moving north. The Pacific plate is moving north-west. They are colliding at a speed of 7cm a year

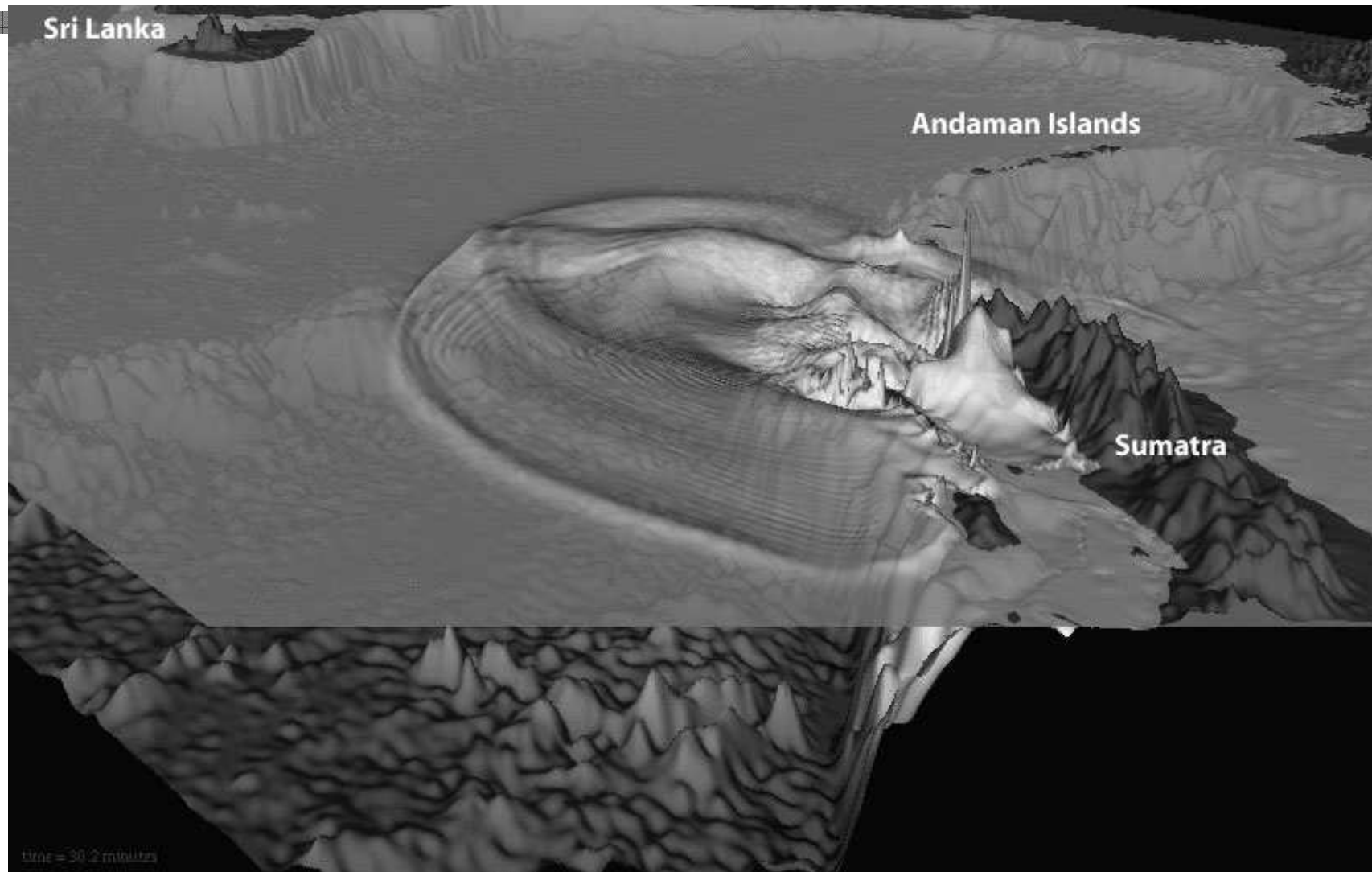
PLATE BOUNDARIES

The border of the Pacific plates is often called the "Rim of Fire" after the volcanoes that form along the boundary

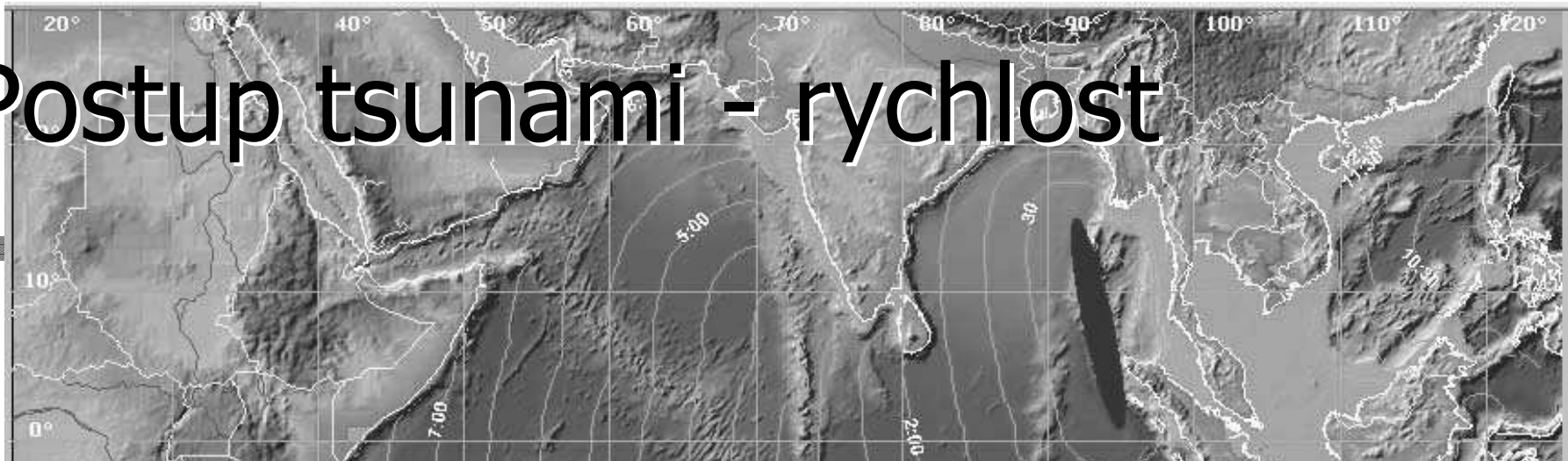
3 As waves near land, they slow to about 45kmh but are squeezed upwards, increasing in height

4 Waves head inland, destroying all in path

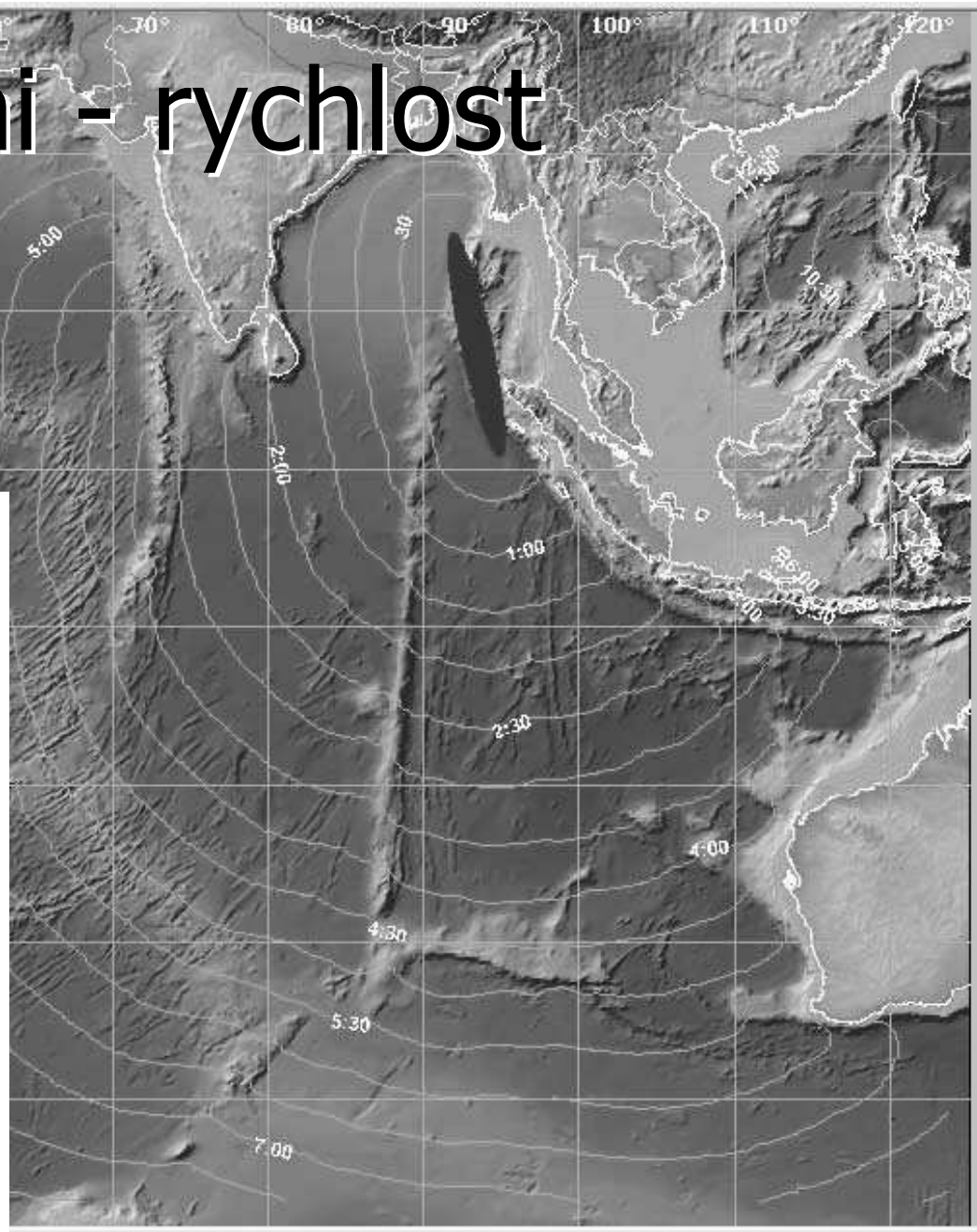
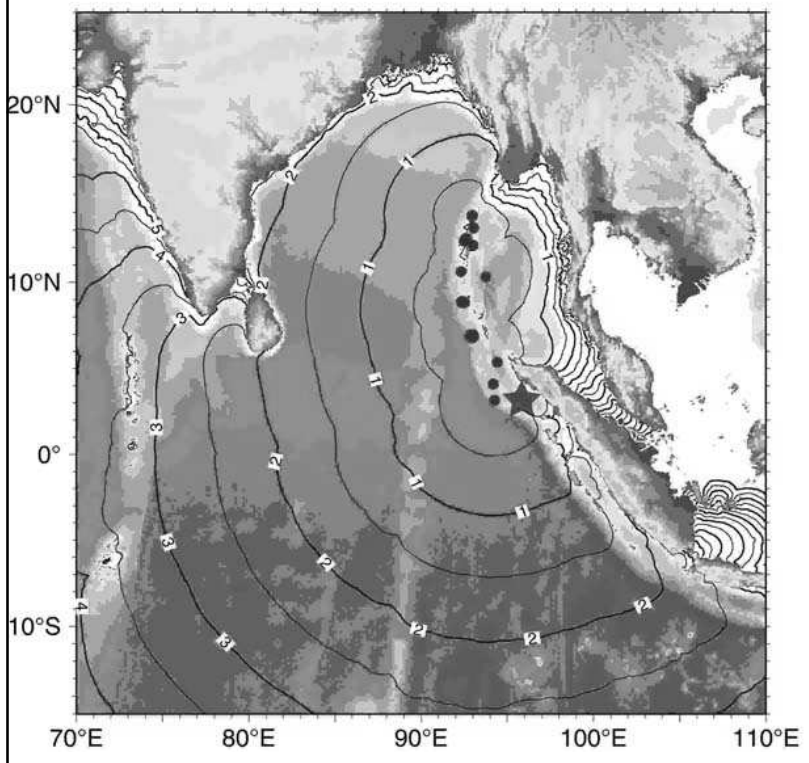
Postup tsunami



Postup tsunami - rychlost

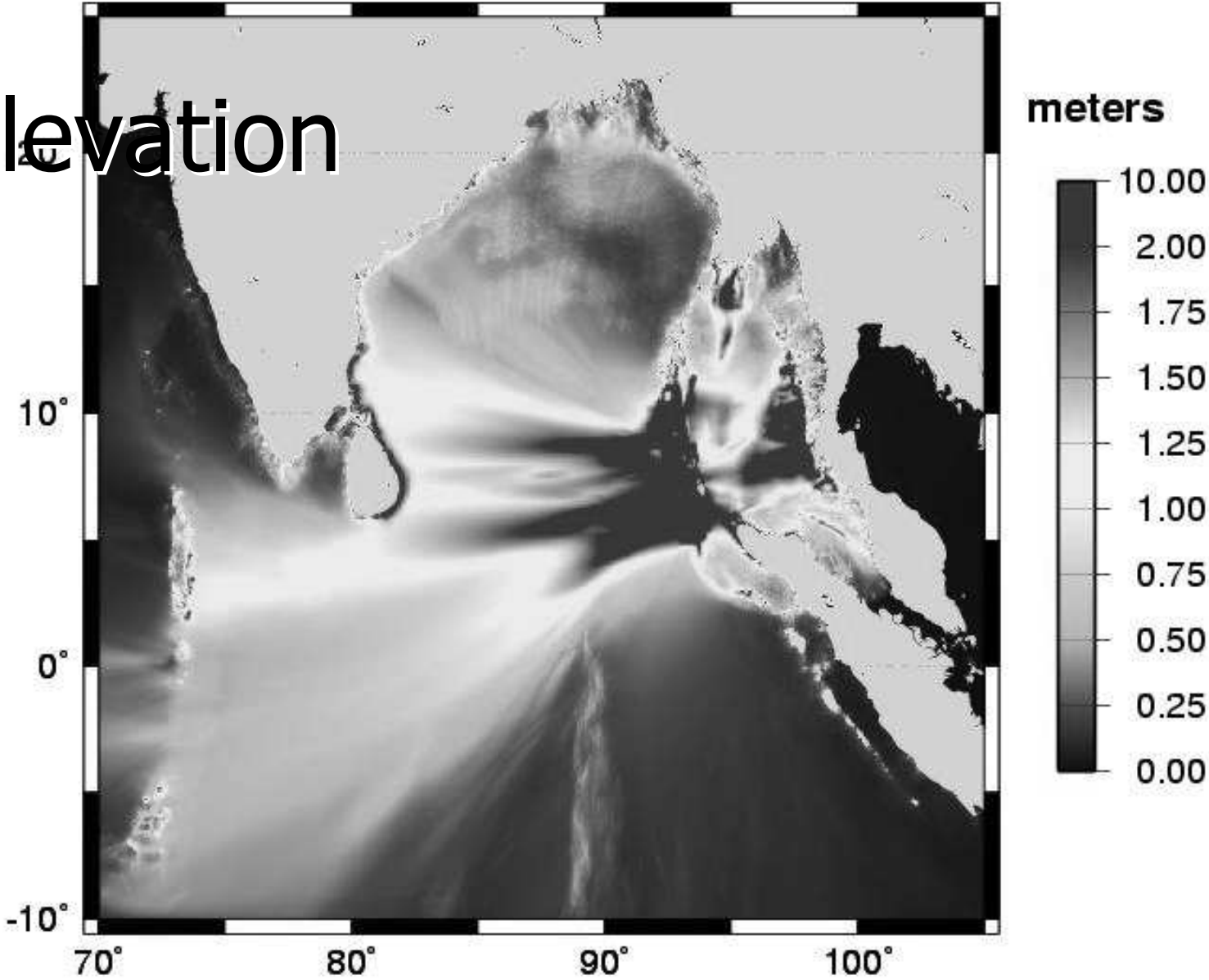


2004/12/26 Sumatra

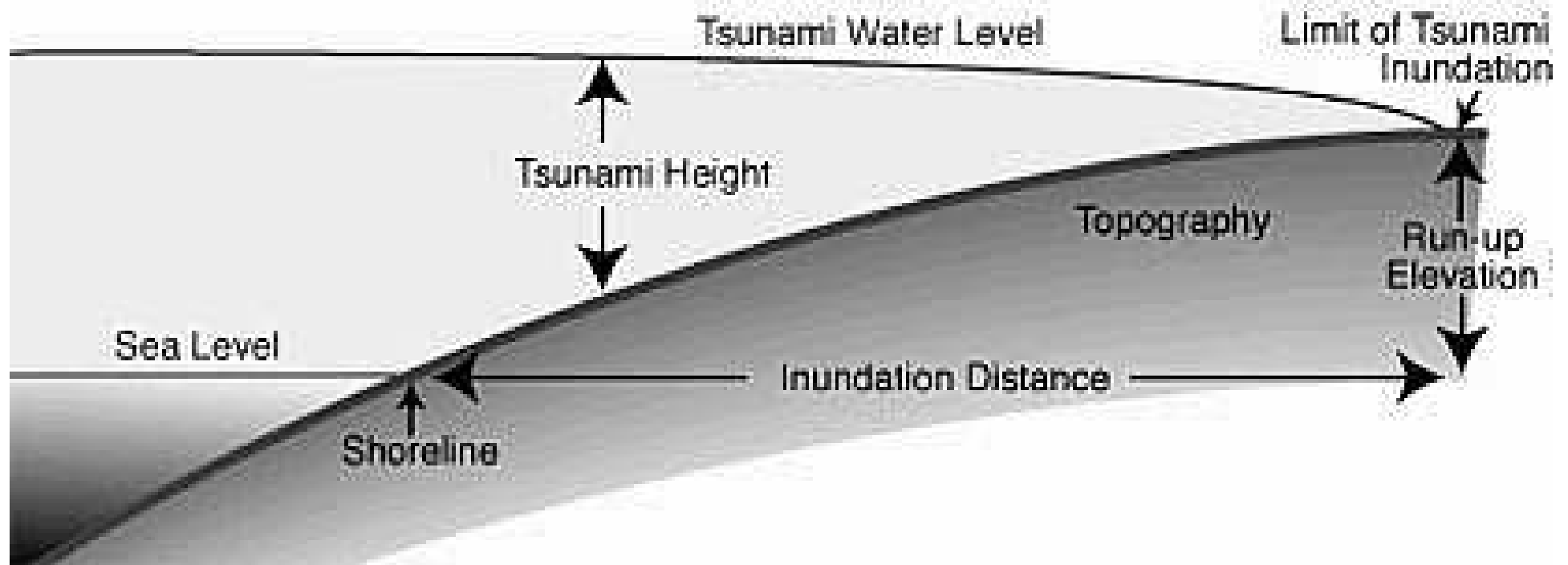


Maximum water elevation

Water elevation



Tsunami - terminologie



Následky



Maldivy

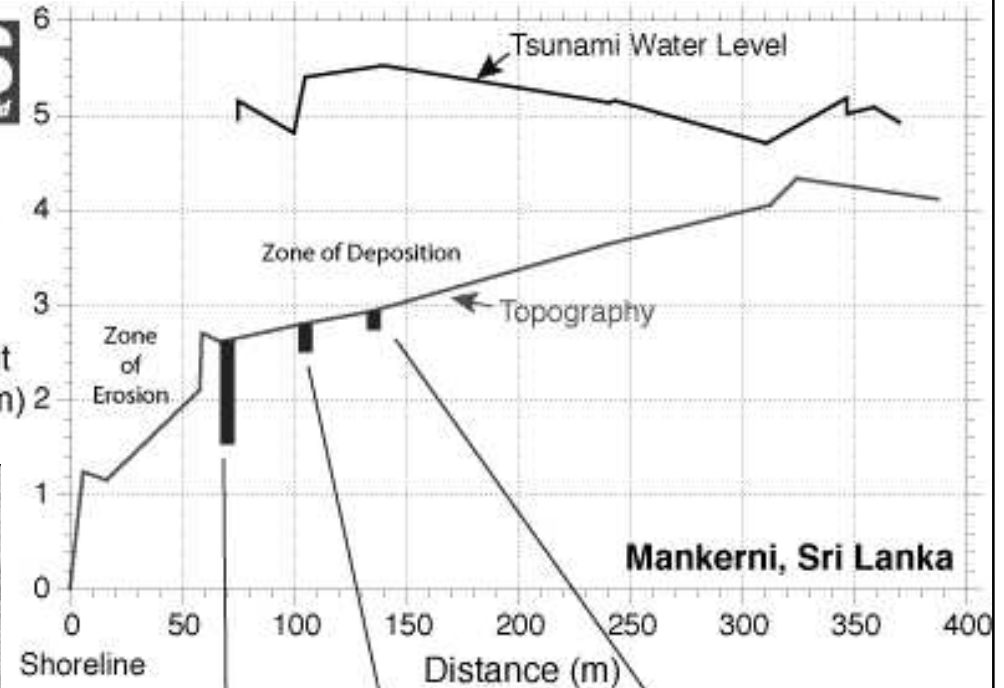


Malé, Maldivy

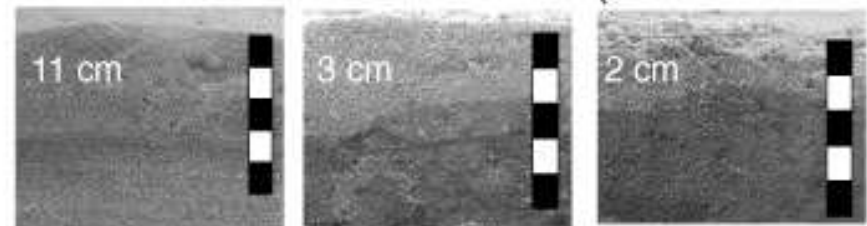
Sedimenty a jejich mocnost



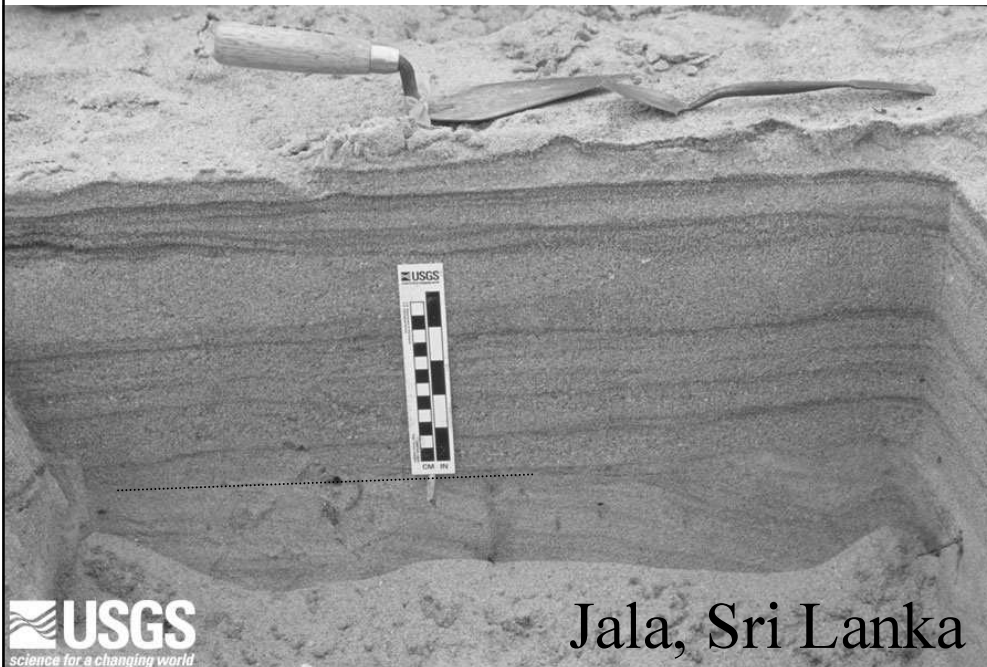
Elevation (m)
Tsunami Deposit Thickness x10 (m)



Mankerni, Sri Lanka



Tsunami Sand Deposits



Jala, Sri Lanka



34 m



Banda Aceh, 34 metru

Before - after

Indonesia - Banda Aceh Subset 4

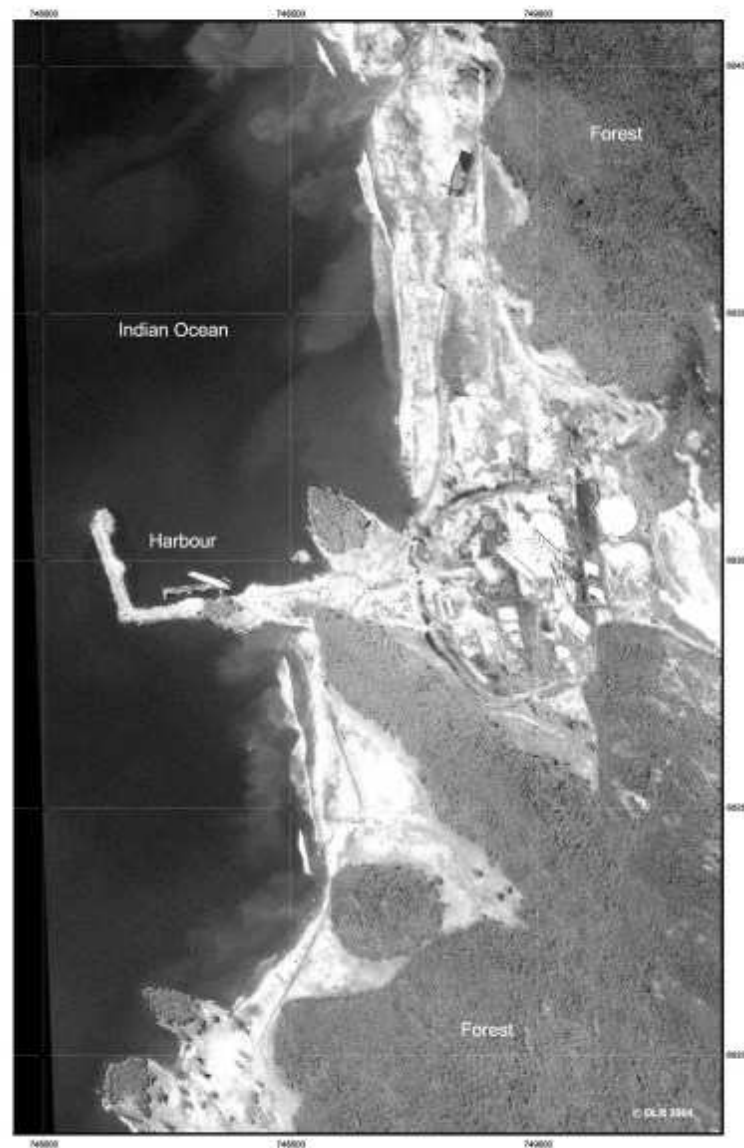
IKONOS - January 10, 2003 - PRE-DISASTER IMAGE



Indonesia, Banda Aceh

1 : 5000

IKONOS - December 29, 2004 - POST-DISASTER IMAGE



Center for Satellite based
Crisis Information
Emergency Mapping & Disaster Monitoring

German Remote Sensing Data Center
German Aerospace Center



Interpretation

The map shows a mining and processing area with a tailrace in the area of Banda Aceh on the island of Sumatra.

(Indonesian) before and after the devastating Tsunami food area, which struck many countries in the Indian Ocean on December 26, 2004.

The IKONOS images were taken on January 10, 2003 and December 29, 2004, respectively.

The map shows the destruction caused by the Tsunami. The entire mining and processing area was affected by the food area. In the harbour one can see a cargo ship that was wrecked.

Scale



1:5000

Projection: UTM Zone 48 N
Spheroid: WGS84
Datum: WGS 84



Data Source

IKONOS imagery provided through

Centre for Remote Imaging,
Sensing and Processing (CRISP)



Map created December 30, 2004 by JHGD:RJE

Indonesia - Banda Aceh Subset 3

1 : 5000

IKONOS - January 10, 2003 - PRE-DISASTER IMAGE

IKONOS - December 29, 2004 - POST-DISASTER IMAGE



Before – after II

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Cvičení s tsunami

- Co je hlavní podmínka vzniku tsunami?
- Lze předvídat riziko vzniku tsunami?
- Jaké procesy-události vedou ke vzniku tsunami? A podle tohoto, kde všude mohou vzniknout?

Faktory vzniku a pohybu tsunami

- změna polohy či objemu hornin na dně
- fakt, že voda je nestlačitelná
- volný průběh energie vlny
- omezení vlny, hmoty vody zespodu, vytlačení