

Tsunami



Malajsie 2004, 2005
a teorie



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

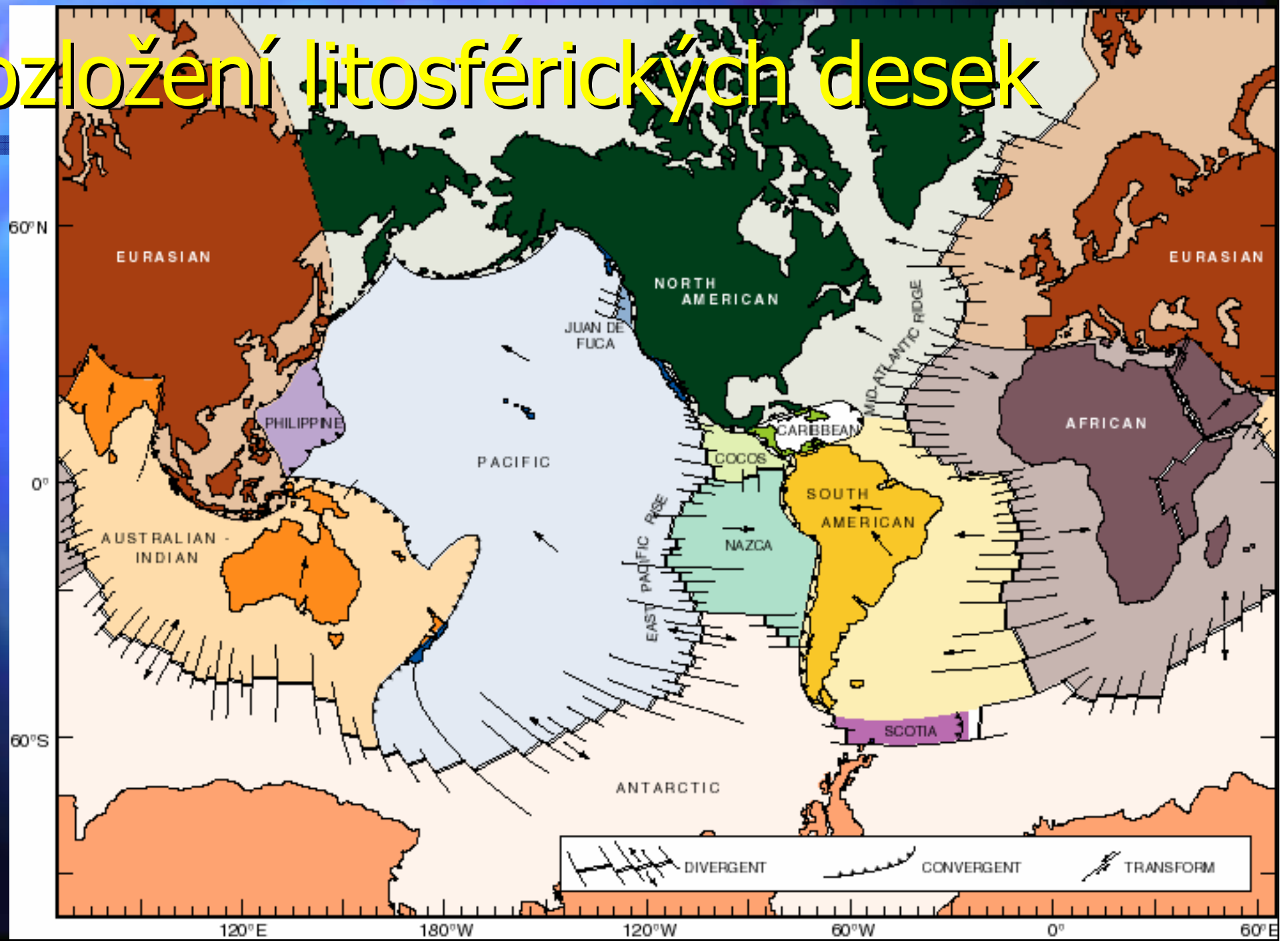
Výstup na pláž



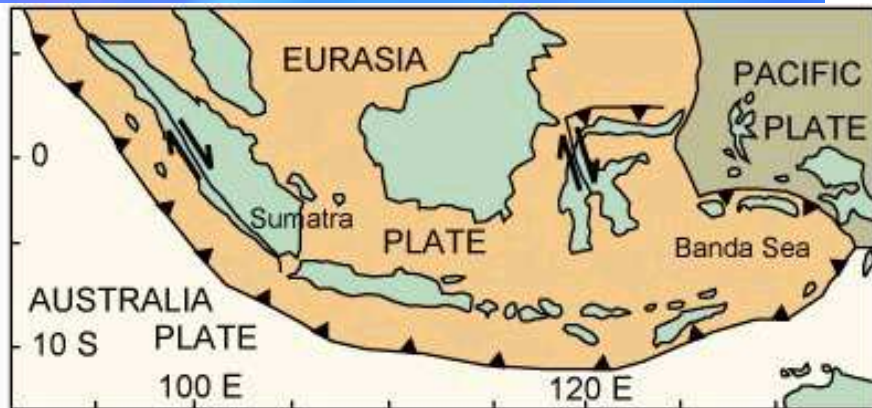
a dále



Rozložení litosférických desek

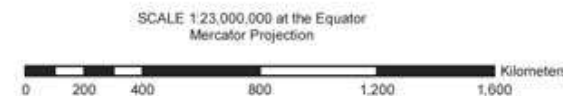
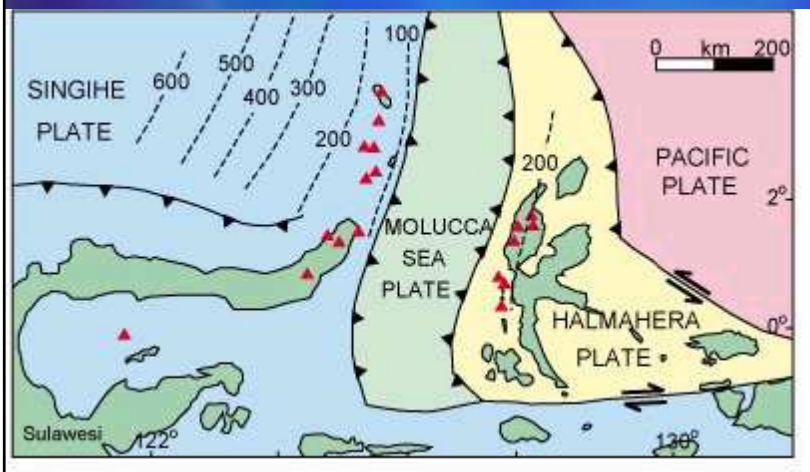


Malajsie a její desky

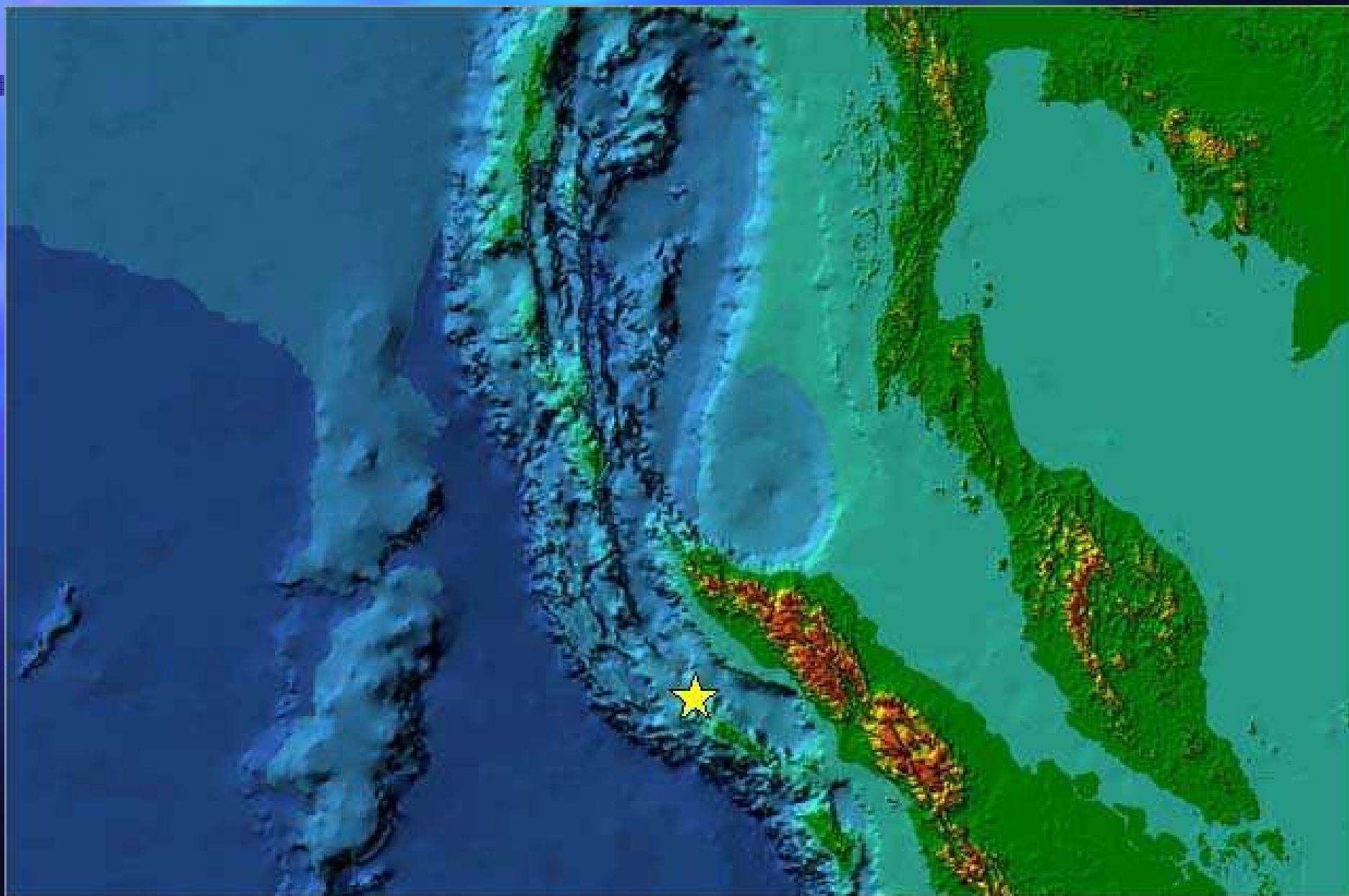


EXPLANATION

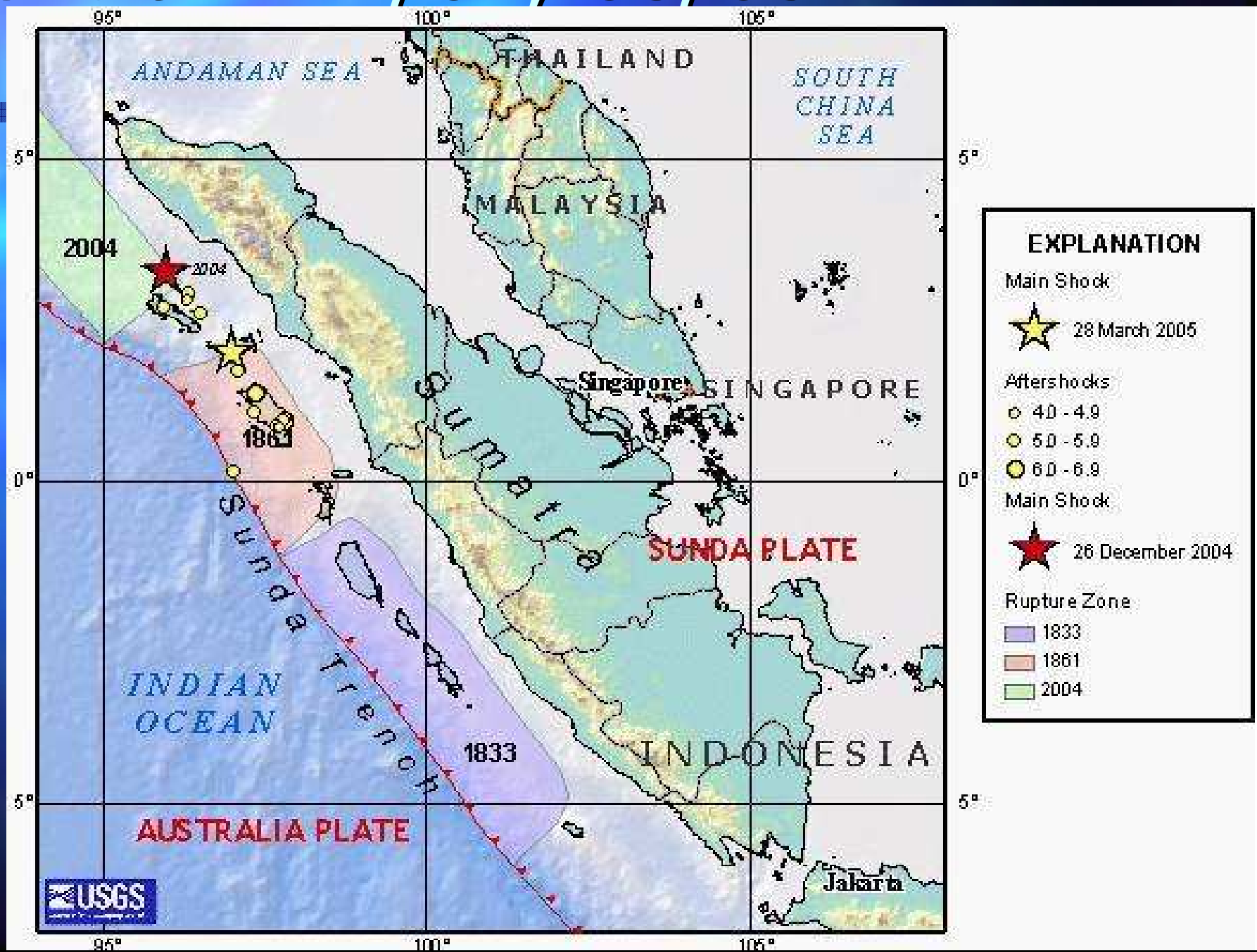
- Main Shock
 - ★ 26 December 2004
- △ Volcanoes
- Generalized Plate Boundaries
- Faults (after Pubellier et al., 2004)
 - ▲ Thrust
 - ▬ Strike-Slip



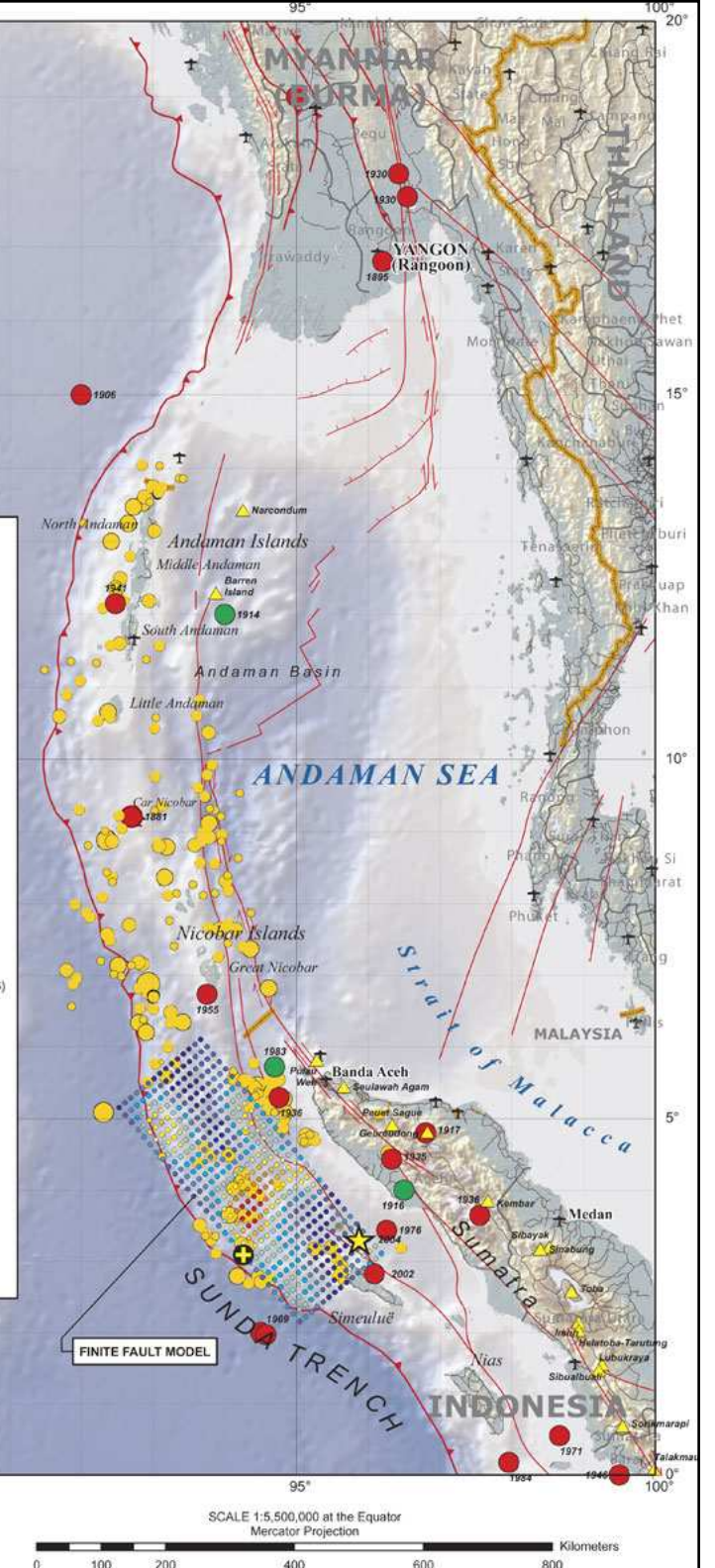
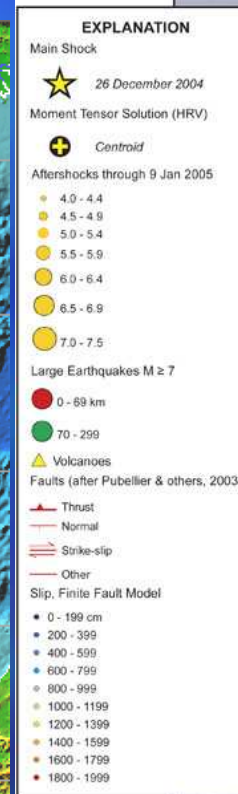
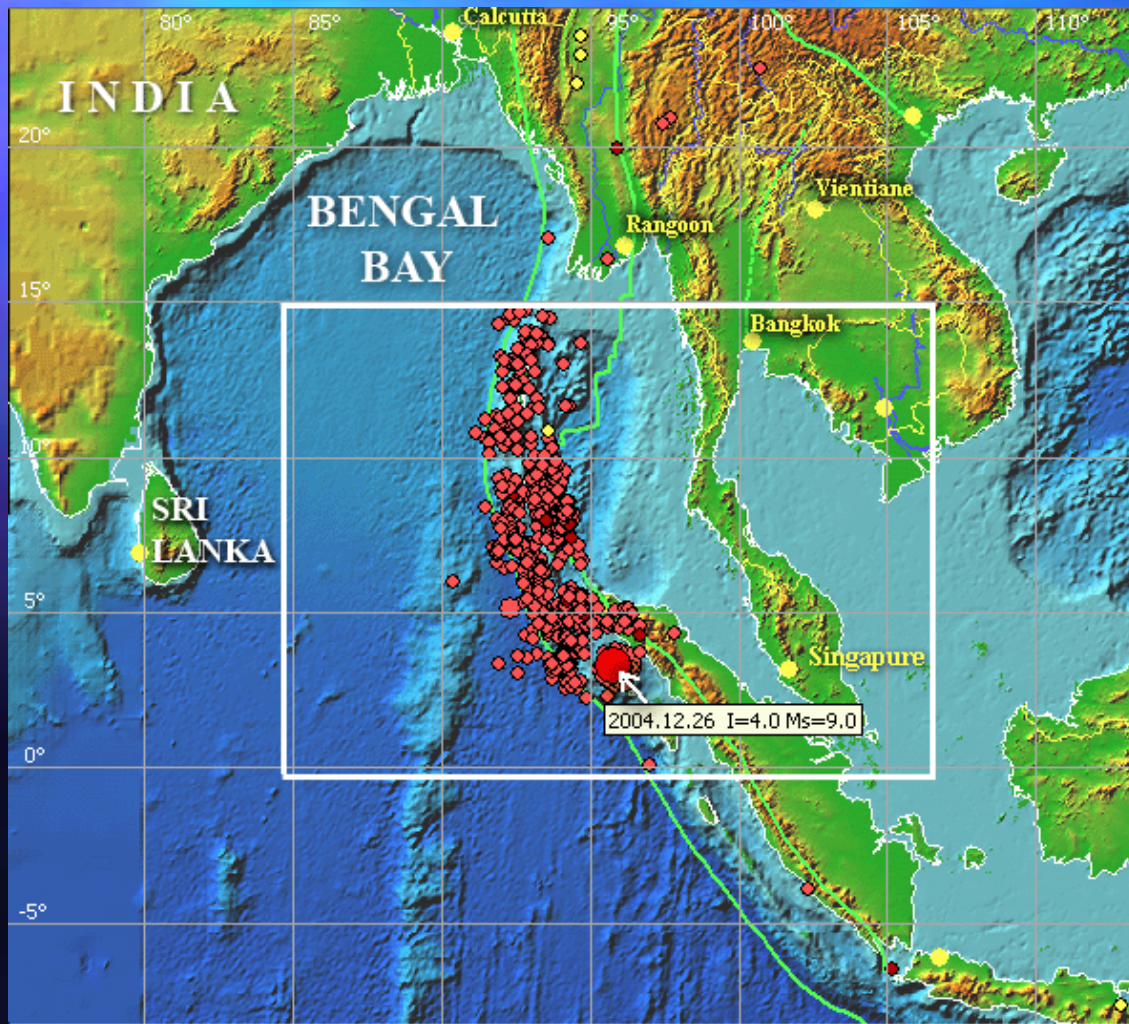
Morfologie



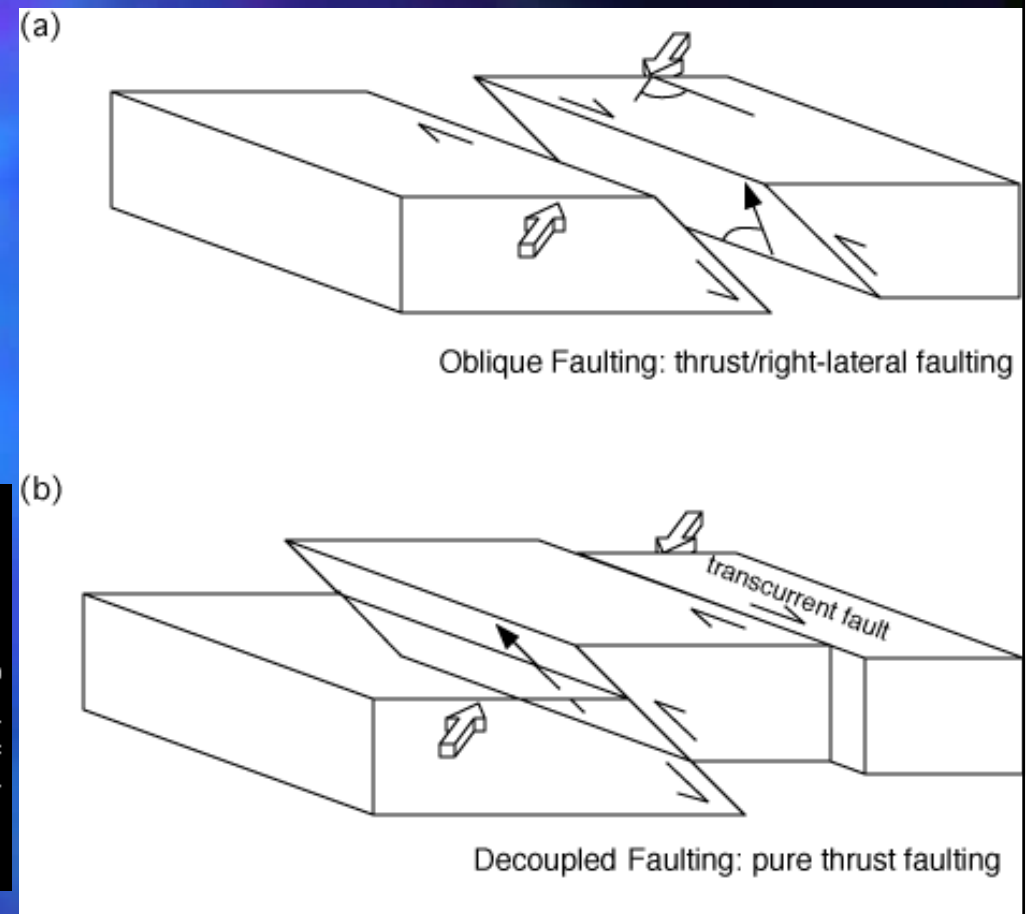
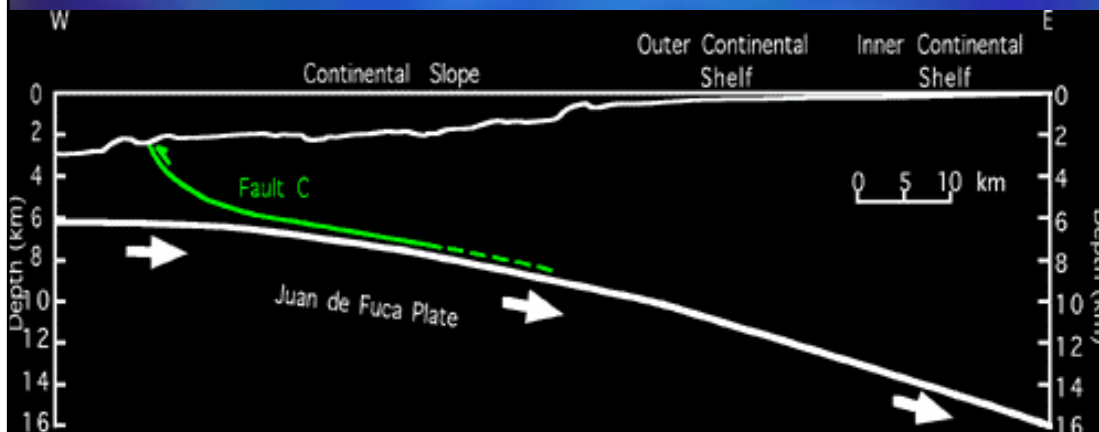
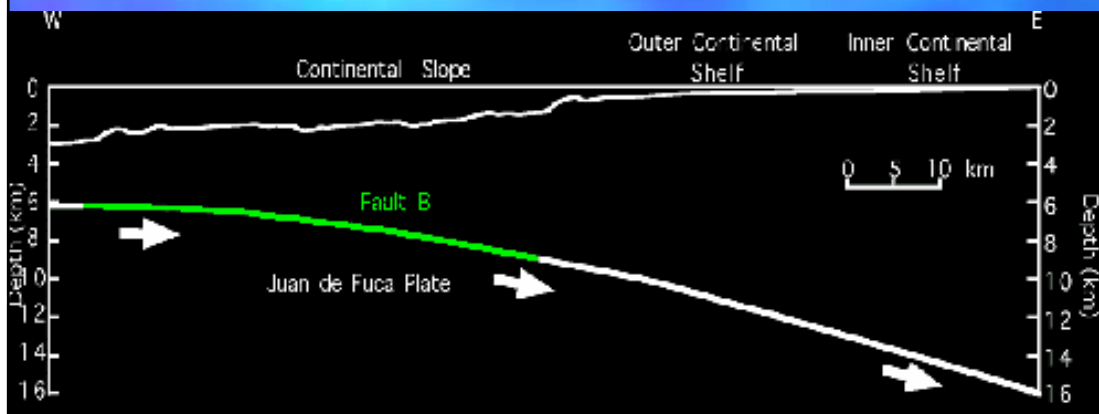
Epicentra – 12/04, 03/05



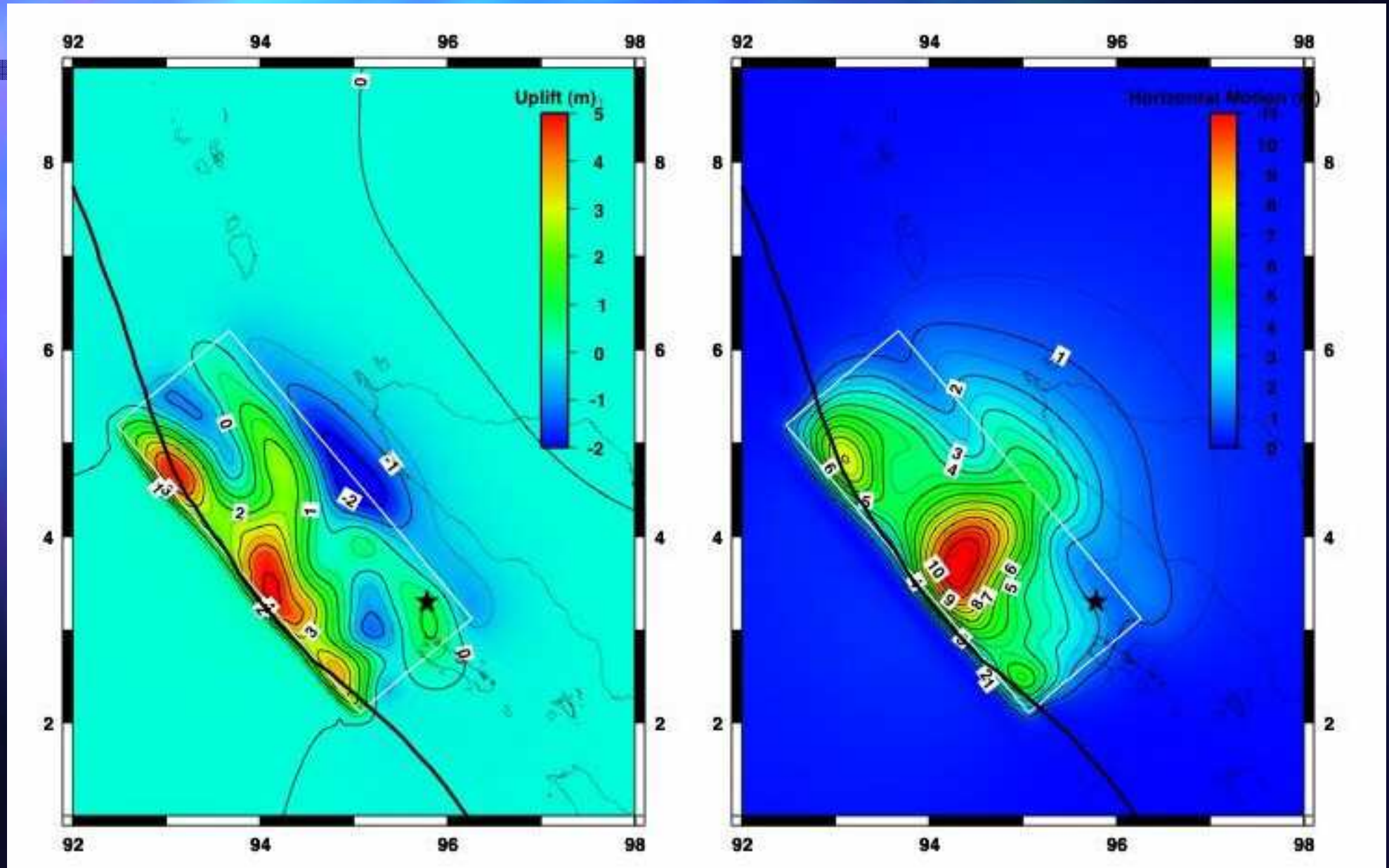
Geofyzikální indikace



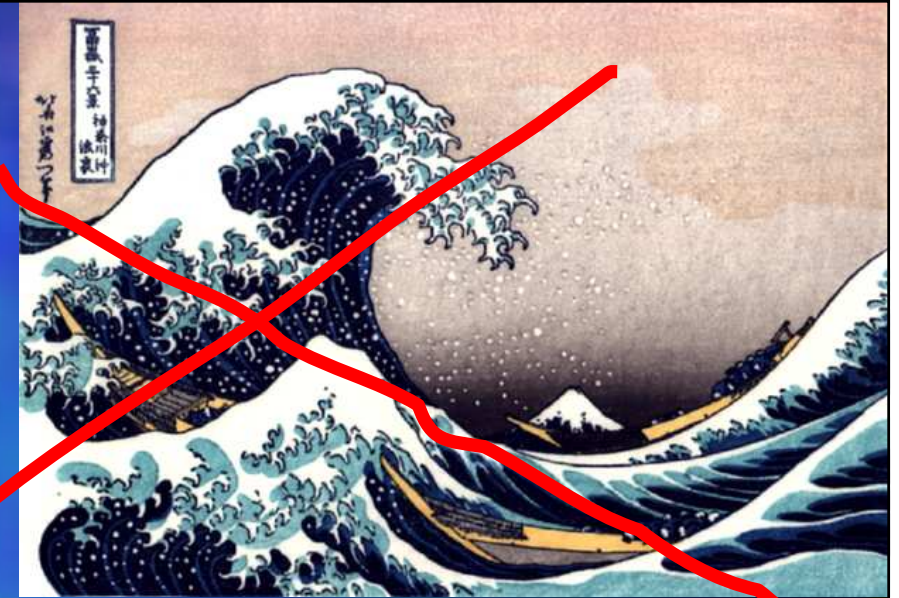
Desky a zlomy



Uplift and slip

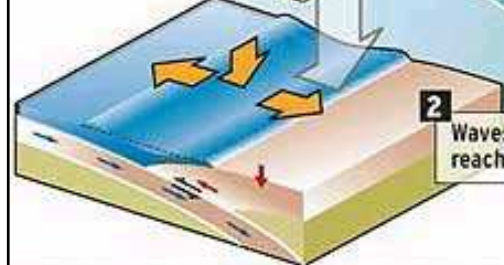
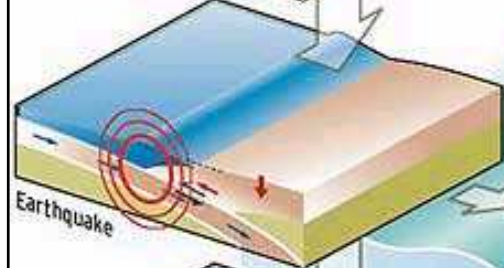
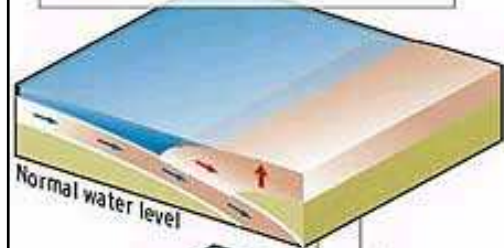


Vznik vlny



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

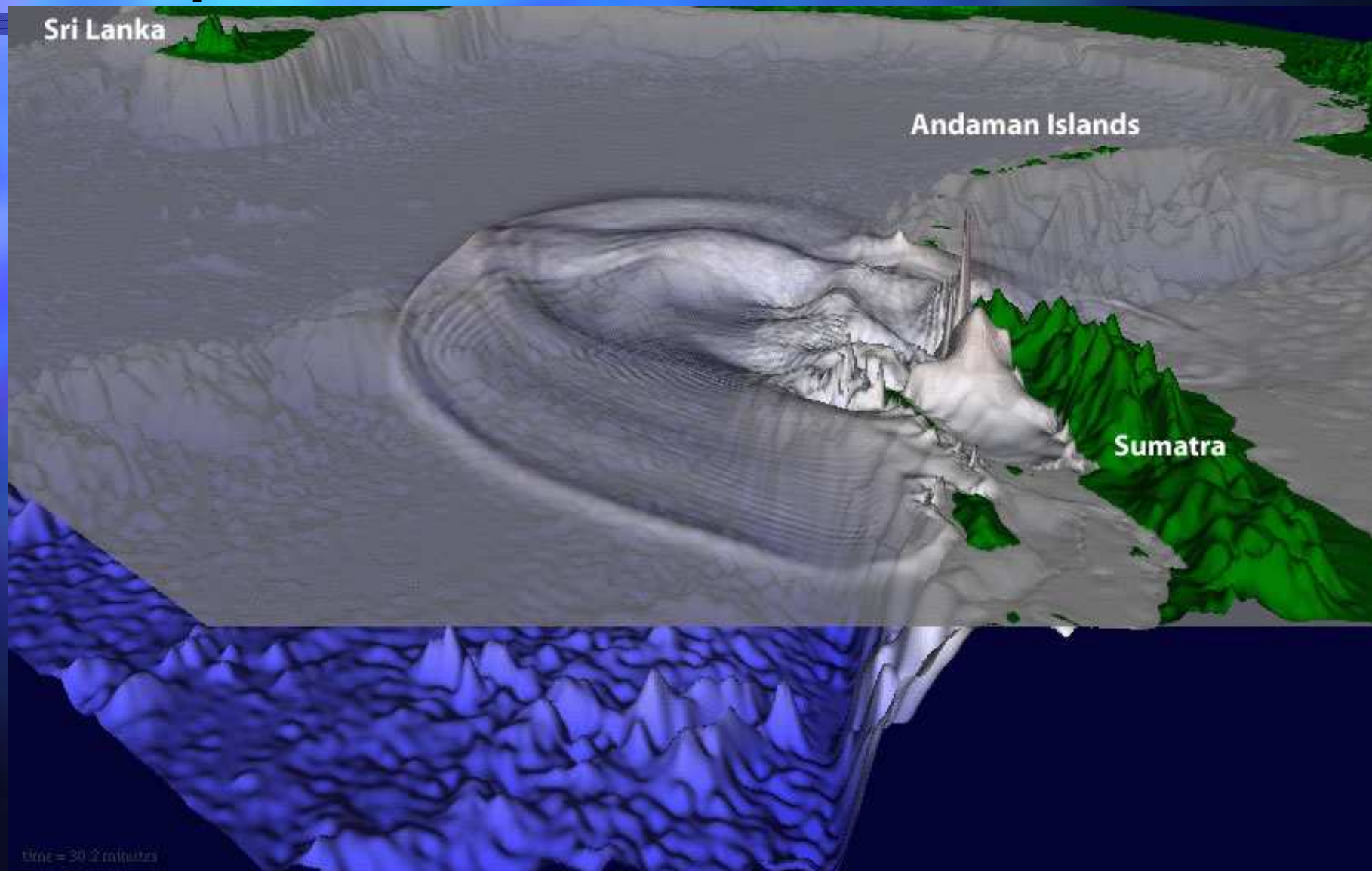
PLATE BOUNDARIES

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

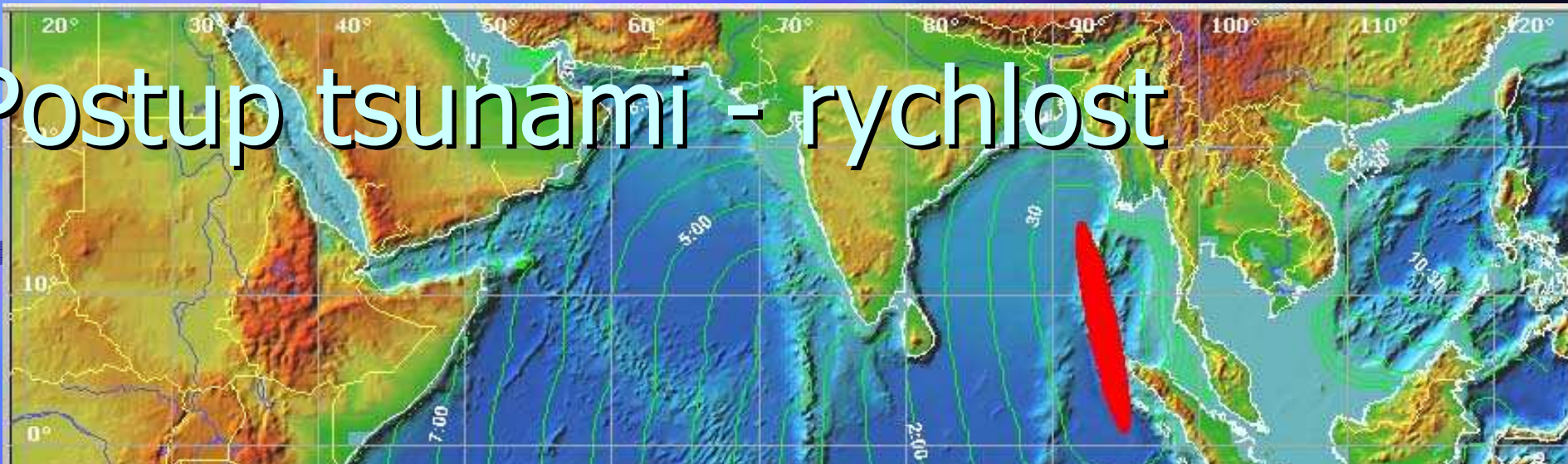
3 As waves near land, they slow to about 45kmh but are squeezed upwards, increasing in height

4 Waves head inland, destroying all in path

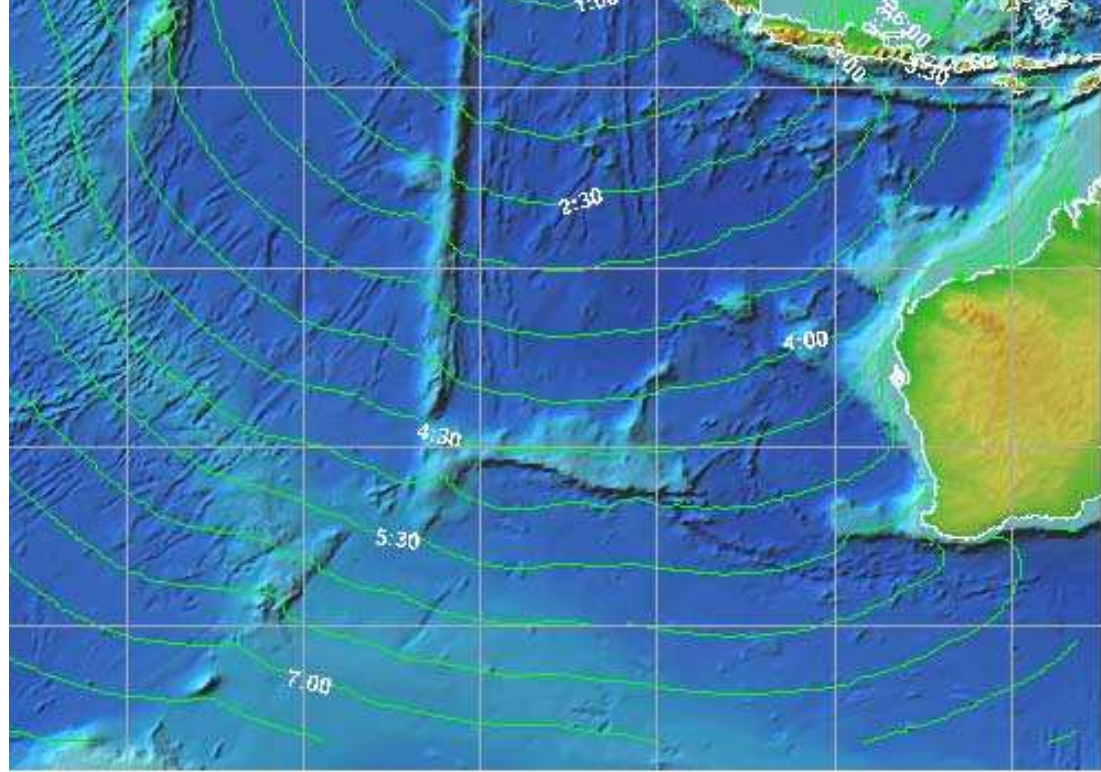
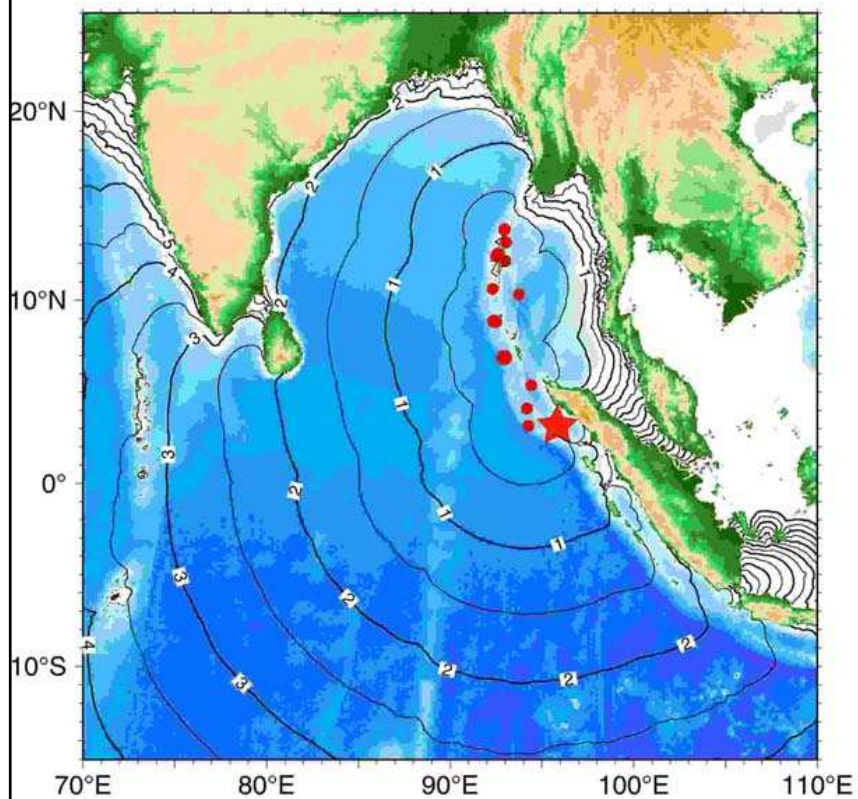
Postup tsunami



Postup tsunami - rychlost

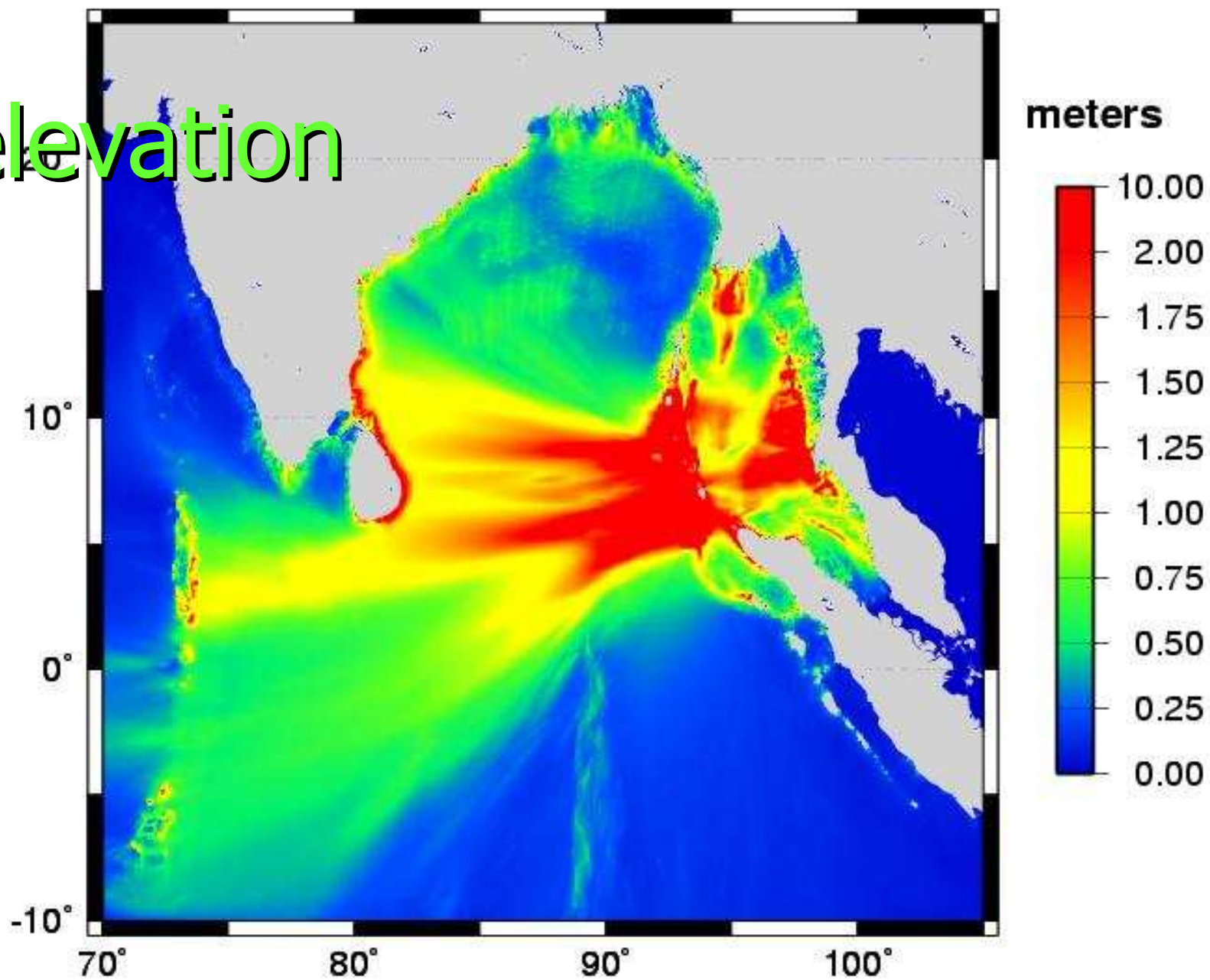


2004/12/26 Sumatra

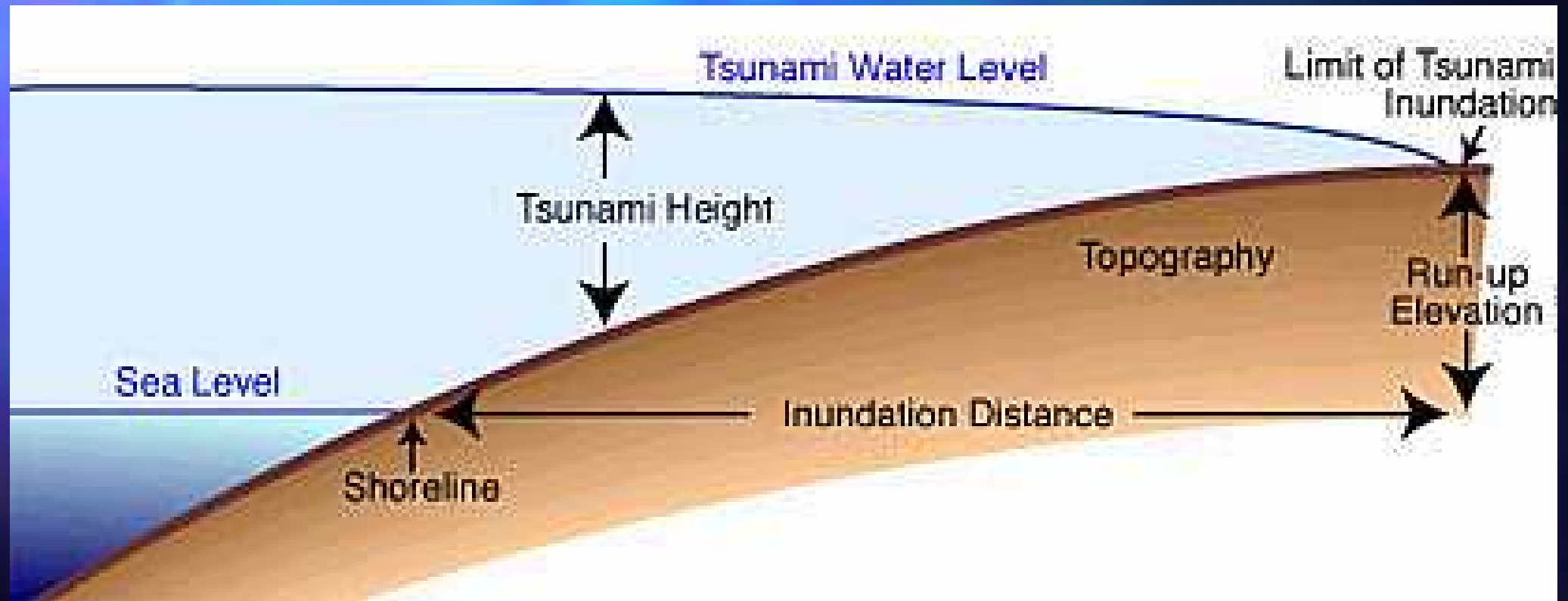


Water elevation

Maximum water elevation



Tsunami - terminologie



Následky



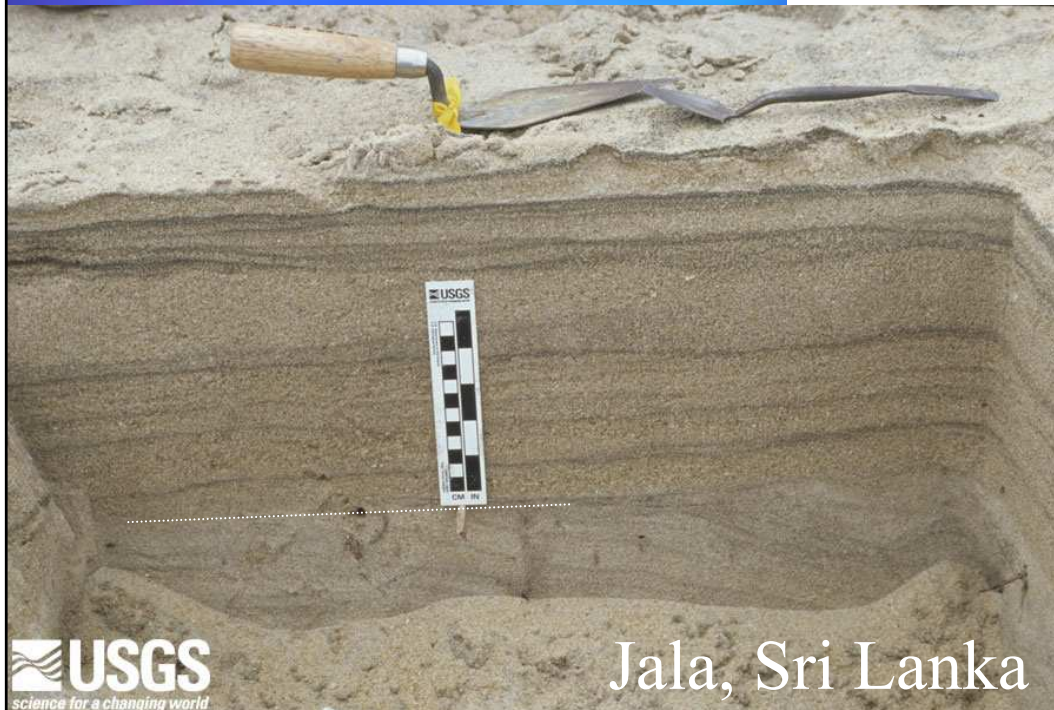
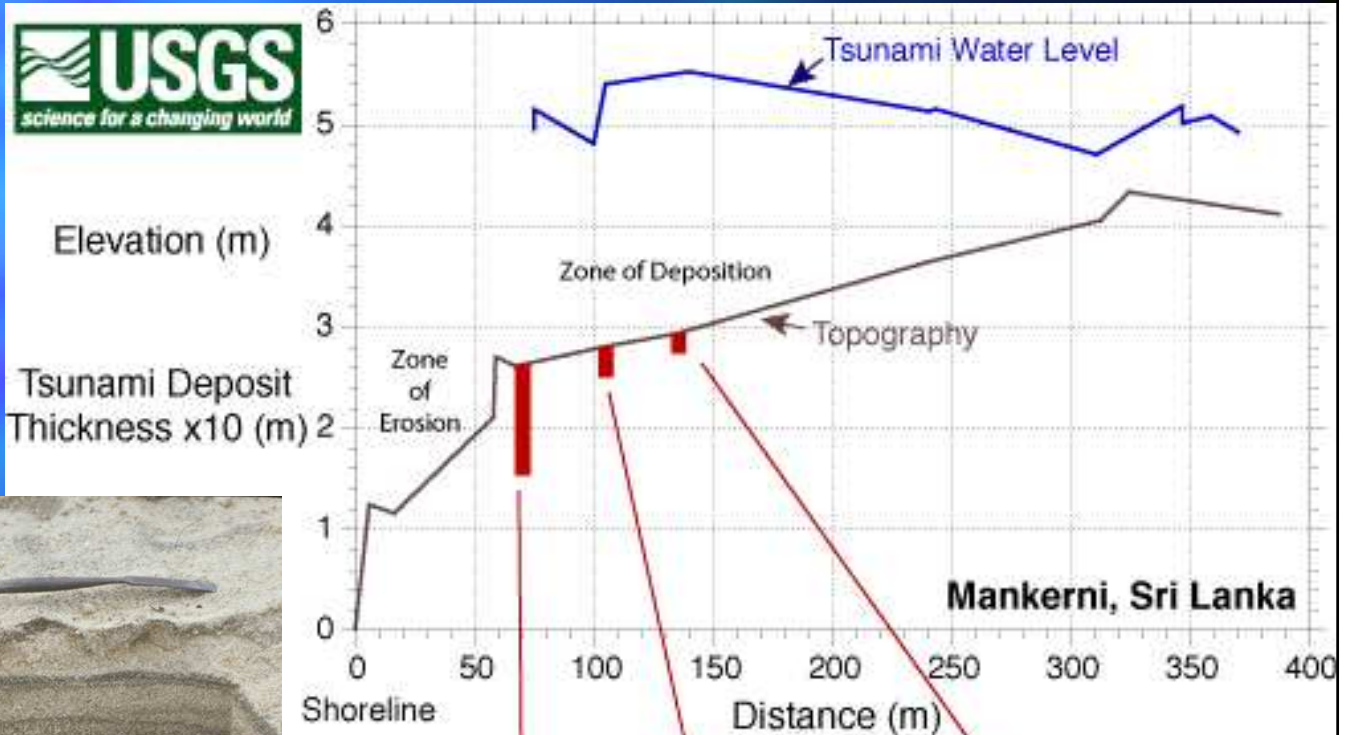
Kalmunai, Sri Lanka

Maledivy



Malé, Maledivy

Sedimenty a jejich mocnost



Tsunami Sand Deposits

34 m



Banda Aceh, 34 metru

Before - after

Indonesia - Banda Aceh Subset 4

IKONOS - January 10, 2003 - PRE-DISASTER IMAGE



Indonesia, Banda Aceh

IKONOS - December 29, 2004 - POST-DISASTER IMAGE



1 : 5000

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 failure in the area of Banda Aceh on the island of Sumatra. (Indonesia) before and after the devastating Tsunami food wave, 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 wave. In the harbour one can see a large ship that was wrecked.

Scale



1 : 5000

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



Data Source

IKONOS images provided through

Centre for Remote Imaging,
Sensing and Processing (CRISP)



Map created December 26, 2004 by J79@DLR.de



Before – after II

Center for Satellite based
Crisis Information
Emergency Mapping & Disaster Monitoring

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German Aerospace Center



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