

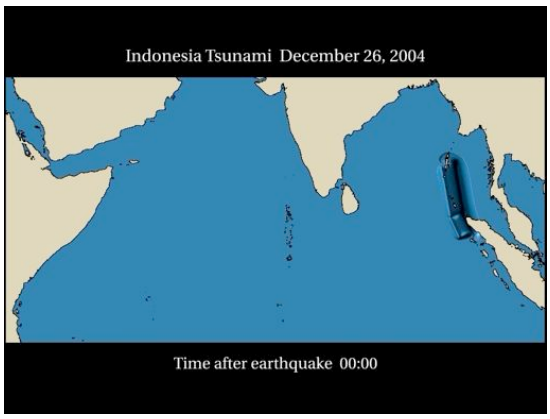

The Tsunami Risk to Sydney

Michael Paine

March 2008

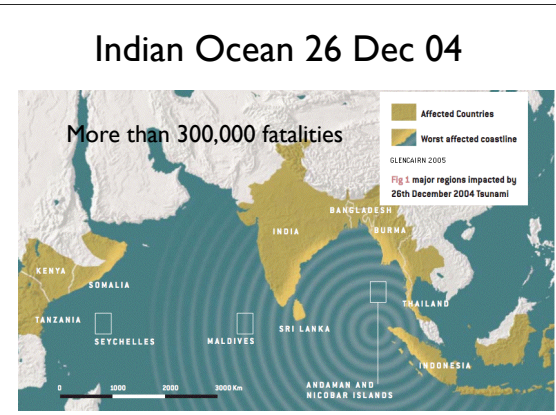
Press Page Down to advance each slide

Mega-tsunami
A recent example



3

This is a computer model of the disasterous Indian Ocean tsunami of 26 December 2004



4

It is estimated that more than 300,000 people were killed when a great earthquake triggered a mega-tsunami

5

Banda Aceh was close to the earthquake and was vulnerable due to its low elevation.

6

The waves hit Thailand about 1 hour after the earthquake

7

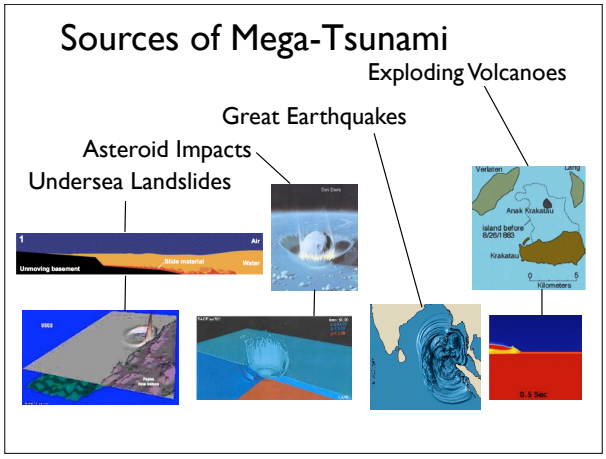
India and Sri Lanka were struck two hours after the earthquake. Unfortunately the waves tended to be concentrated along this coastline and were very destructive

8

Incredibly, the waves were still of a dangerous size when they struck Africa 7 hours after the earthquake

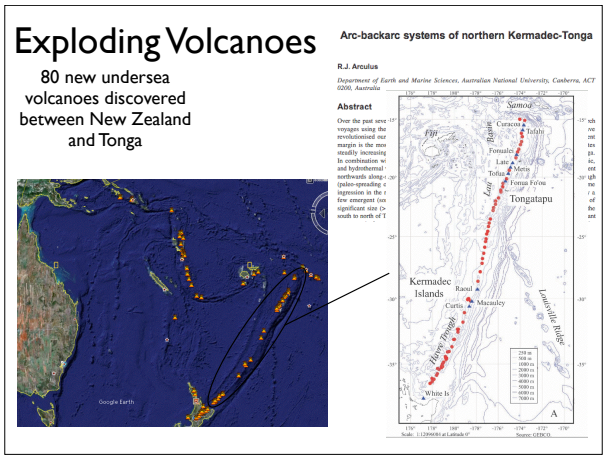
Sources of Mega-tsunami

9



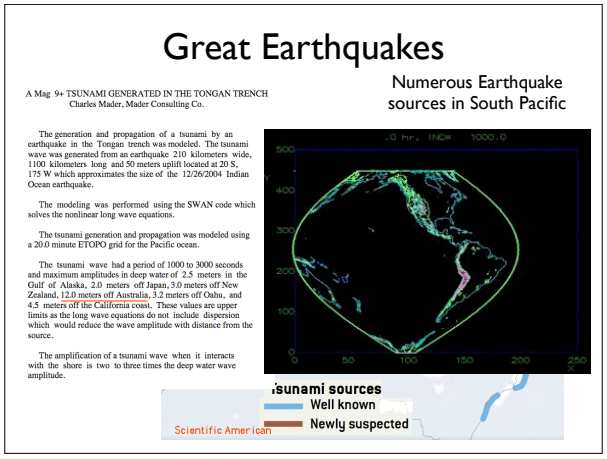
10

There are 4 main sources of mega-tsunami: undersea volcanoes that explode, great earthquakes that rapidly raise or lower the sea floor, large asteroids or comets impacting the ocean and undersea landslides (which tend to be localised tsunami). Let's look at these sources near Australia.



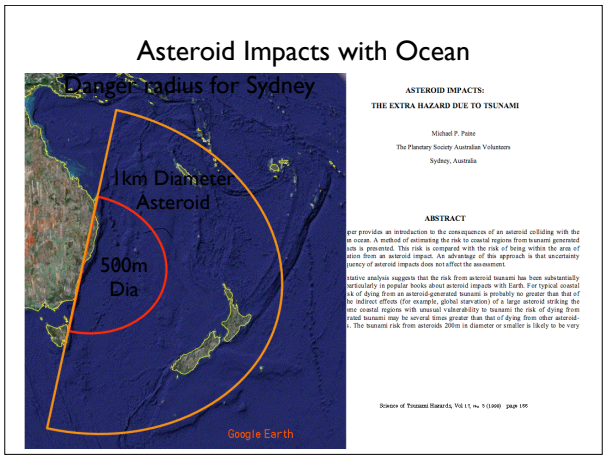
11

The east coast of Australia is about 3,000km from a chain of undersea volcanoes between New Zealand and Tonga. Fortunately the tsunami from a single, moderate size exploding volcano is likely to disperse quickly and is unlikely to be a severe threat to the East Coast of Australia – but modelling needs to be carried out to confirm this.



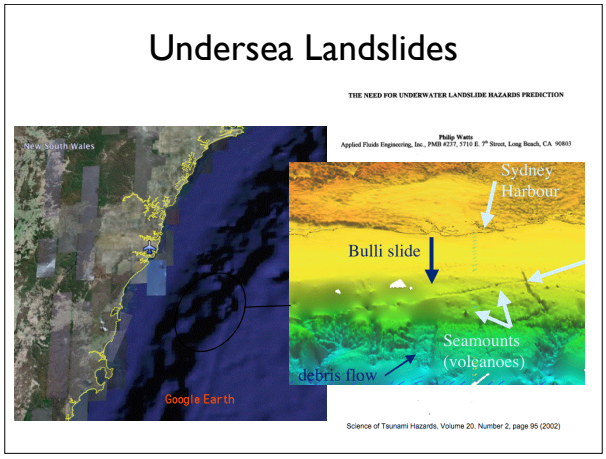
12

The Tonga Trench is a potential source of a great earthquake (it is one of the fastest moving subduction zones known). Recent computer modelling suggests that, like Sri Lanka, a tsunami from this source would tend to be concentrated on the East Coast of Australia. The tsunami would reach the East Coast in less than 4 hours.



13

A 1km diameter asteroid that impacted the Pacific Ocean within 3,000km of Sydney would result in a 10m tsunami or greater. Fortunately asteroids of this size rarely impact the Earth and none are known to be on a collision course. A 500m asteroid would need to impact within 800km to cause a 10m tsunami.

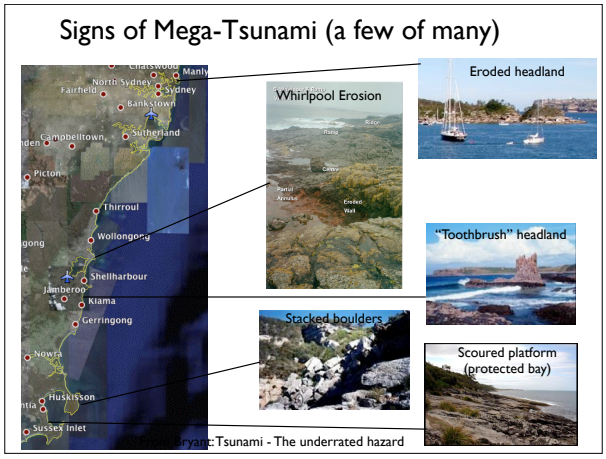


14

At least one giant landslide has been detected on the continental slope off the coast of Sydney. This probably generated a local mega-tsunami. The timing of the landslide is uncertain. A moderate earthquake (such as the “Newcastle earthquake” of 1989) could trigger this type of landslide. Coastlines need to be evacuated if an earthquake is felt.

Evidence of Mega-tsunami on the East Coast of Australia

15



16

Dr Ted Bryant from Wollongong University has documented the evidence for mega-tsunami around the Australian coastline. Here are a few features along the NSW coast.

Australian concerns in 1999

Rynn & Davidson, From Science of Tsunami Hazards Vol 17, No 2

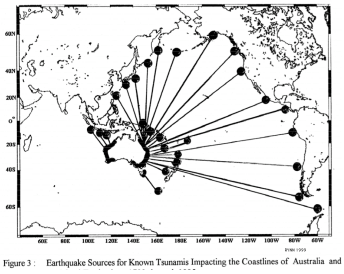


Figure 3 : Earthquake Sources for Known Tsunamis Impacting the Coastlines of Australia and

Conclusion: Newcastle to Wollongong coastline is at high risk of tsunami and is highly vulnerable

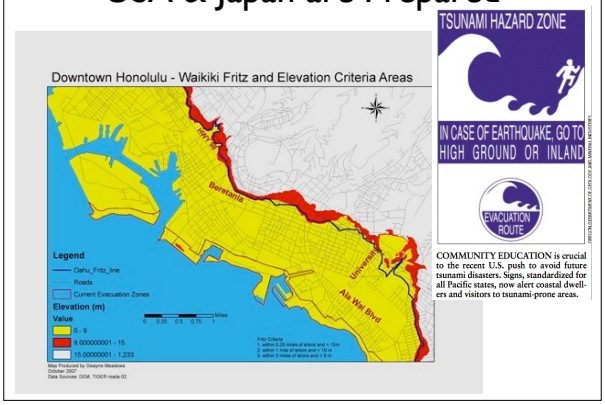
17

In a 1999 publication Jack Rynn and Jim Davidson assessed risk (hazard) and vulnerability of the Australian coastline. Sydney, Newcastle and Wollongong were rated A – the highest hazard.

Tsunami Warning Systems

18

USA & Japan are Prepared



19

Japan and the USA (Hawaii and the West Coast) have community programs to improve tsunami awareness. Inundation maps help with town planning and emergency management.

Advice from an expert

- If you are at the beach and feel an earthquake – GO TO HIGH GROUND (>30m above MSL)
- If the water level drops below low tide level – GO TO HIGH GROUND
- If you hear a siren near the beach – GO TO HIGH GROUND (shark alarms an issue for Sydney)
- If in or near multi-storied concrete building – GO UP IN BUILDING ABOVE THIRD FLOOR

Credit: Charles Mader

20

This is the message that anyone near the coast needs to learn

(Slow) Action in Australia

- Emergency Management Australia (EMA) is working on an Australian Tsunami Warning System.

  "The establishment of the fully functional Australian Tsunami Warning System is a four-year project funded by the Federal Government that is due to be completed in June 2009. At the completion of the project Australia will have considerably improved earthquake and tsunami detection equipment in Australia and around the region, enhanced scientific modelling of tsunami, a responsive warning system, and increased public awareness and community preparedness."

  http://tinyurl.com/4mb7um

21

Maybe Australia is moving too slowly? The recent modelling of the potential tsunami from an earthquake along the Tongan Trench is a sobering reminder that coastal communities deserve to be informed about the tsunami risk. Fortunately the Sydney Coastal Councils Group has recognised the need for action on this threat.

(Slow) Action in Australia

- Coastal communities are apparently being consulted to develop community awareness.
- But timely tsunami warnings for the East Coast of Australia are already issued by the Pacific Tsunami Warning Center in Hawaii - for example the Center gave Sydney a 4 hour warning of a possible tsunami from the Solomon Islands on 2 April 2007
- There is an urgent need to raise community awareness/ preparedness along Sydney's coastline and to undertake inundation mapping to help emergency services
- The Sydney Coastal Councils Group recently initiated some research on tsunami risk mitigation - a promising first step.

22

Maybe Australia is moving too slowly? The recent modelling of the potential tsunami from an earthquake along the Tongan Trench is a sobering reminder that coastal communities deserve to be informed about the tsunami risk. Fortunately the Sydney Coastal Councils Group has recognised the need for action on this threat.