Supercourse
Epidemiology, the Internet and Global Health

Just-in-Time Lecture

TSUNAMI

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What is the Disaster Supercourse?

http://www.pitt.edu/~super1

What is a JIT lecture?

http://www.pitt.edu/~super1

Lecture objectives:

- To provide the best possible information about the science of Tsunamias

- To learn how the science can help prepare us for primary & secondary prevention consequences of Tsunamias

What is a Tsunami?

(soo-NAH-mee)

Tsunami *or* Harbor Wave

A Japanese word represented by two characters: tsu & nami

***tsu* means harbor**

&

***nami* means wave**

History of Tsunami

Ancient city of Knossos,
the capital of the Minoan civilization

Tsunami:
Socio-economical Impacts

Tsunami Impacts: Socio-economical Factors

- Rapid growth & development of coastal areas
- Living people on or quite near the coast
- Foreign trade necessitates some maintain large fleets of ships & major port facilities
- Fishing industries
- Aqua cultural industries & canneries

Risks Posed by Tsunamis

- Flooding
- Contamination of drinking water
- Fires from ruptured tanks or gas lines
- Loss of vital community infrastructure

Tsunami Prediction:

- Adequate understanding of the phenomenon
- Good & expeditious collection of earthquake & sea level data
- Accurate & expeditious assessment & interpretation of data

Tsunami

Definition & Causes

A tsunami can be generated by ANY disturbance that displaces a large water mass from its *equilibrium* position!

Scientific term?

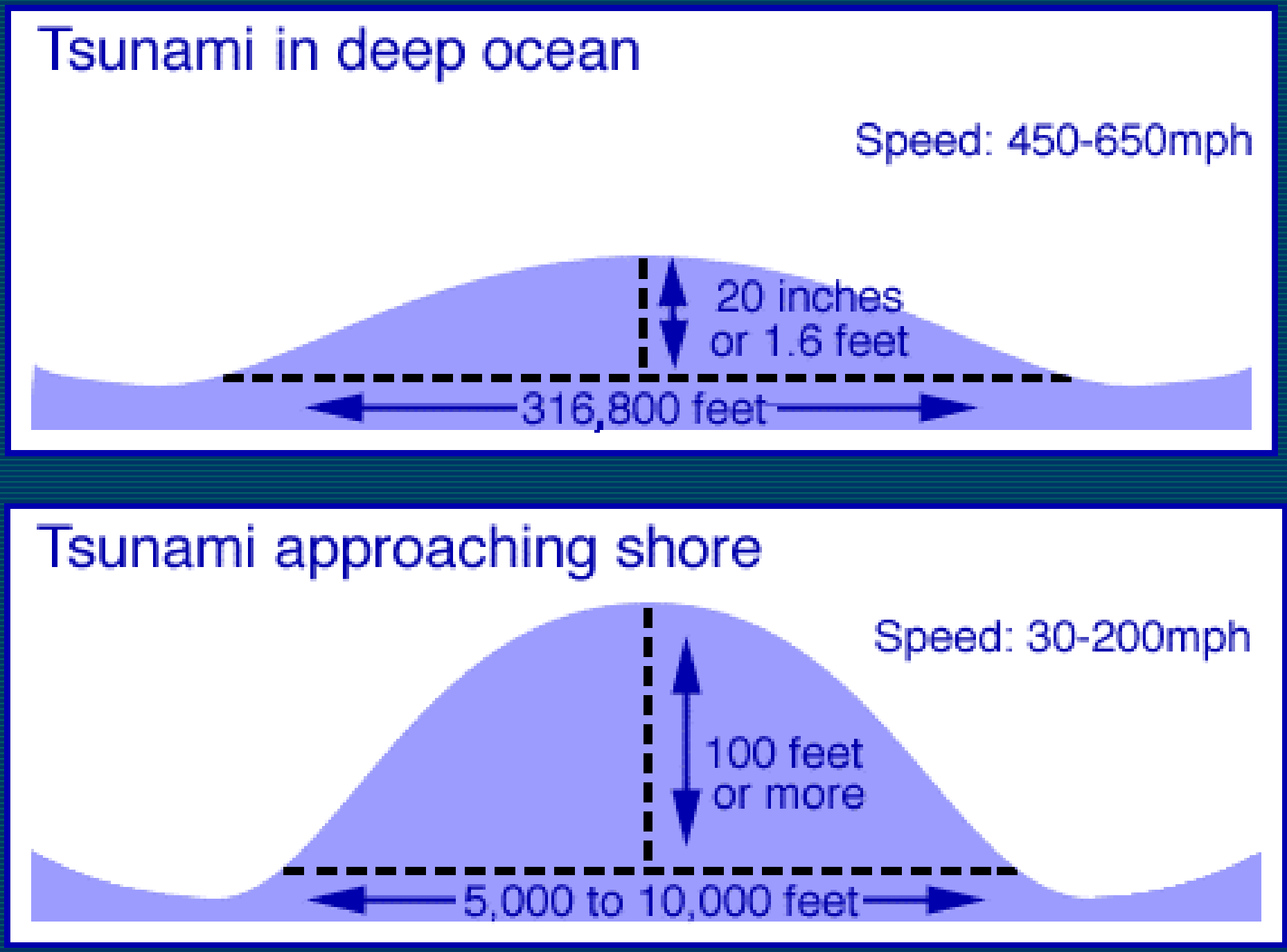
- Tsunami
- Seismic sea waves
- ~~Tidal waves~~

How is a tsunami different from a wind-generated wave?

When an earthquake occurs,

- Energy travels outward in all directions from the source.

- Waves radiate outward in all directions from the disturbance & can propagate across entire ocean basins.


Tsunami in deep ocean
Speed: 450-650mph
20 inches
or 1.6 feet
316,800 feet
Tsunami approaching shore
Speed: 30-200mph
100 feet
or more
5,000 to 10,000 feet

- A tsunami can compete with a jet airplane, traveling across the ocean in less than a day.

- When the ocean is 20000 feet (6100 m) deep, a tsunami travels at 550 miles/hr (890 km/hr).

Unlike ocean-wide tsunamis caused by some earthquakes, tsunamis generated by *non-seismic mechanisms* usually dissipate quickly & rarely affect coastlines far from the source area.

Determinant factors of the size of a tsunami at initial phase & along the coast

Tsunamis generation:

I. Initiation

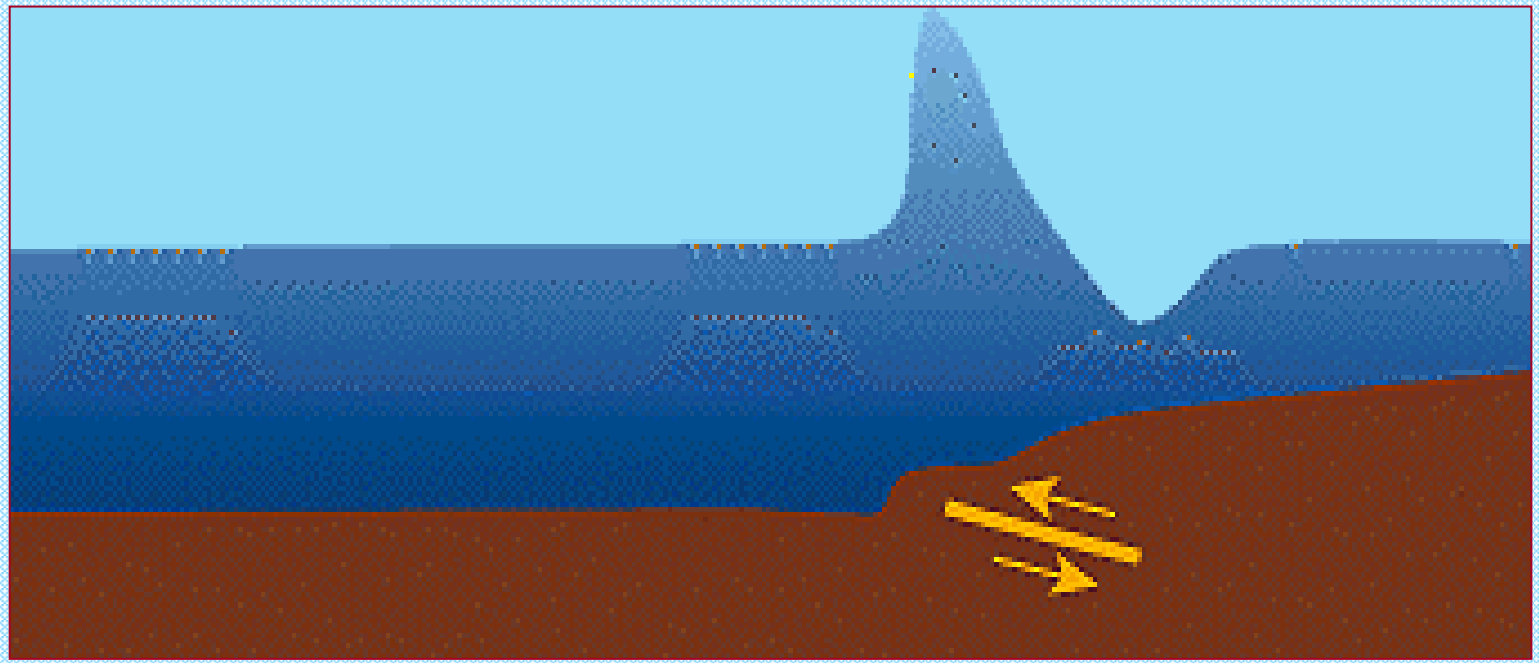
II. Split

III. Amplification

IV. Run-up

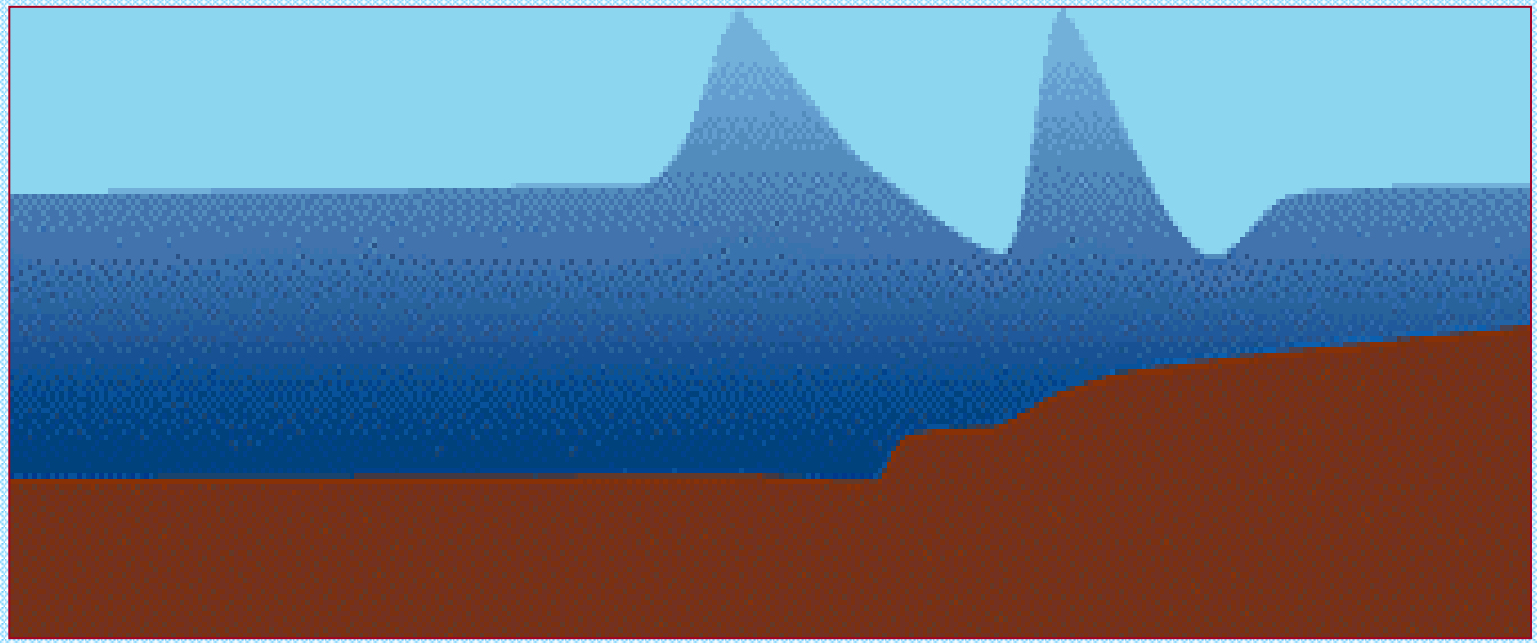
Tsunamis generation:

I. Initiation



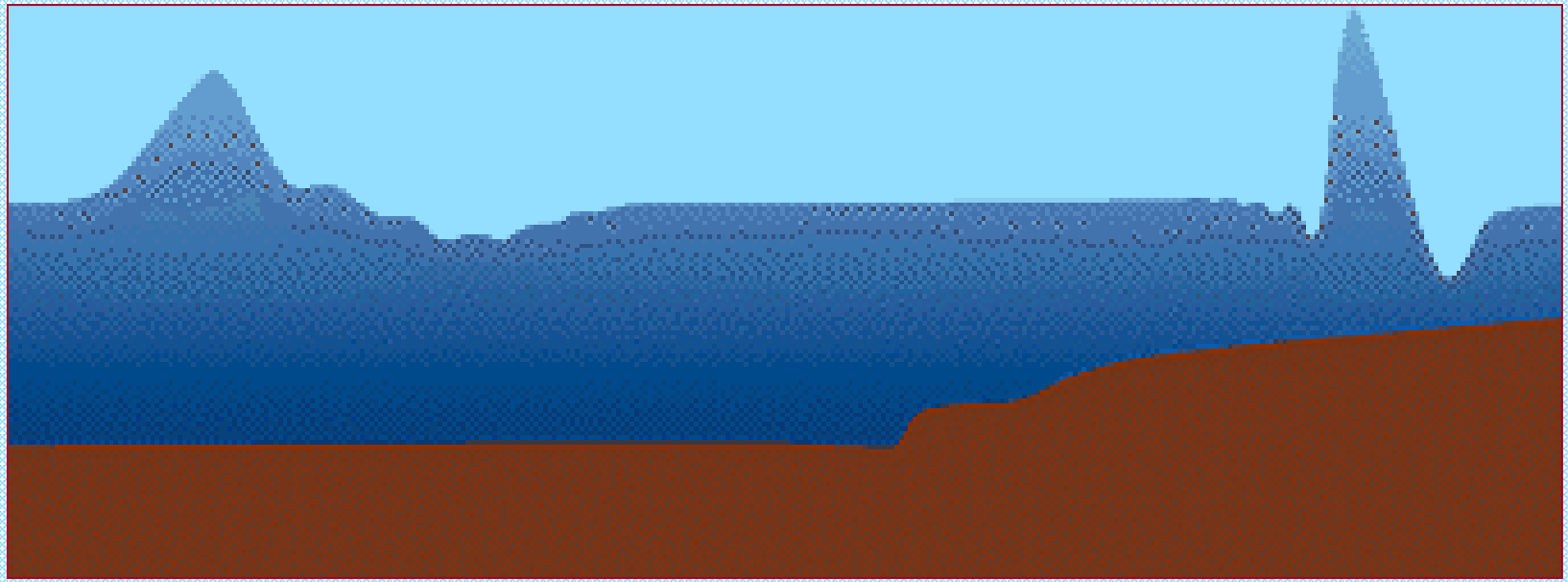
Tsunamis generation:

II. Split



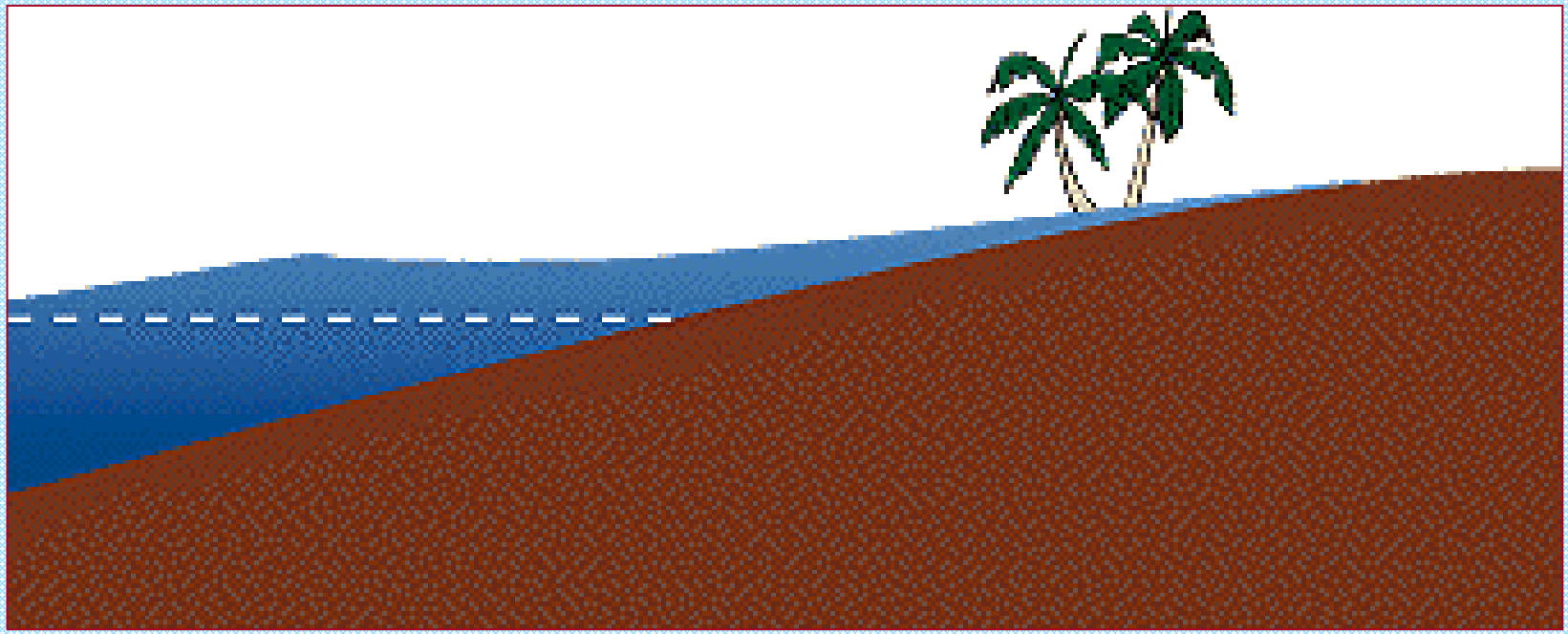
Tsunamis generation:

III. Amplification



Tsunamis generation:

IV. Run-up



Appearance of a tsunami when reaches the shore

- A rapidly rising or falling tide
- A series of waves
- A bore

Run-up height:

- Tsunamis of distant origin: > 50 ft (15 m)
- Tsunami generated near the earthquake epicenter: > 100 ft (30 m)
- First wave may not be the largest in the series of waves.

The flooding of an area can extend inland by 1000 feet (305 m) or more, covering large expanses of land with water & debris.

Do tsunamis stop once on land?

- Energy reflection back
- Edge waves

Complicated behavior of tsunami waves near the coast !

- The first run-up of a tsunami is often not the largest.

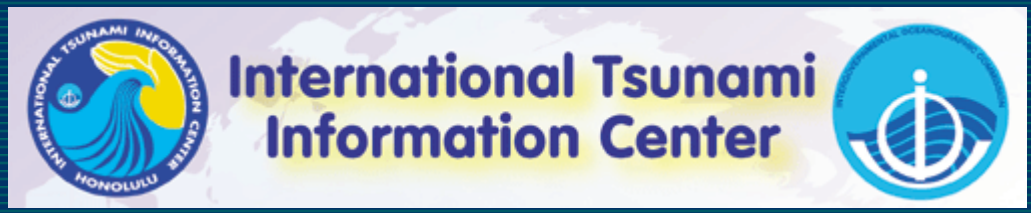
- *Do not return* to a beach several hours after a tsunami hits.

Tsunami can not be felt aboard ships nor can they be seen from the air in the open ocean.

Why are tsunami so destructive?

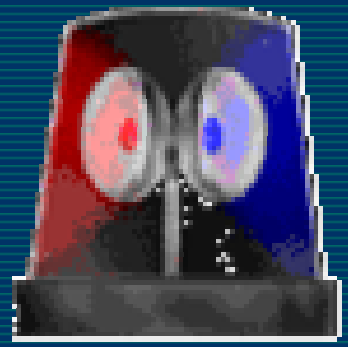
Learn about :

- International Tsunami Information Centre (ITIC)
- International Tsunami Warning System (ITWS)



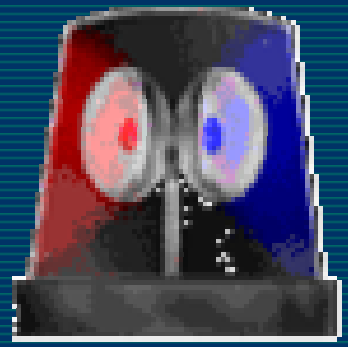
http://www.prh.noaa.gov/itic/

- Mandate
- Functions
- Research and Data Collection Responsibilities
- Visiting Scientists Program
- Education, Preparedness & Disaster Reduction



What is the International Tsunami Warning System (ITWS)?

- Seismic station



What is the International Tsunami Warning System (ITWS)?

- Tide station

International Tsunami Warning System (ITWS)

- ITWS includes 31 seismic stations & > 60 tide stations

- The stations have ability to transmit their data immediately & in real time to the headquarters at PTWC in Hawaii.

How does the International Tsunami Warning System Work?

Tsunami WARNING

&

Tsunami WATCH

Dissemination of Watches & Warnings by ITIC

When Earthquake is Strong Enough to Cause a Tsunami !!

- Monitoring the tide gauges near the epicenter
- Watch bulletins for all earthquake ≥ 7 in the Aleutian Islands & ≥ 7.5 elsewhere in the Pacific
- Watching cancellation: Negligible tsunami or no tsunami

Watching → Warning if a tsunami threat

Capabilities & Limitations of the International Tsunami Warning System (ITWS)

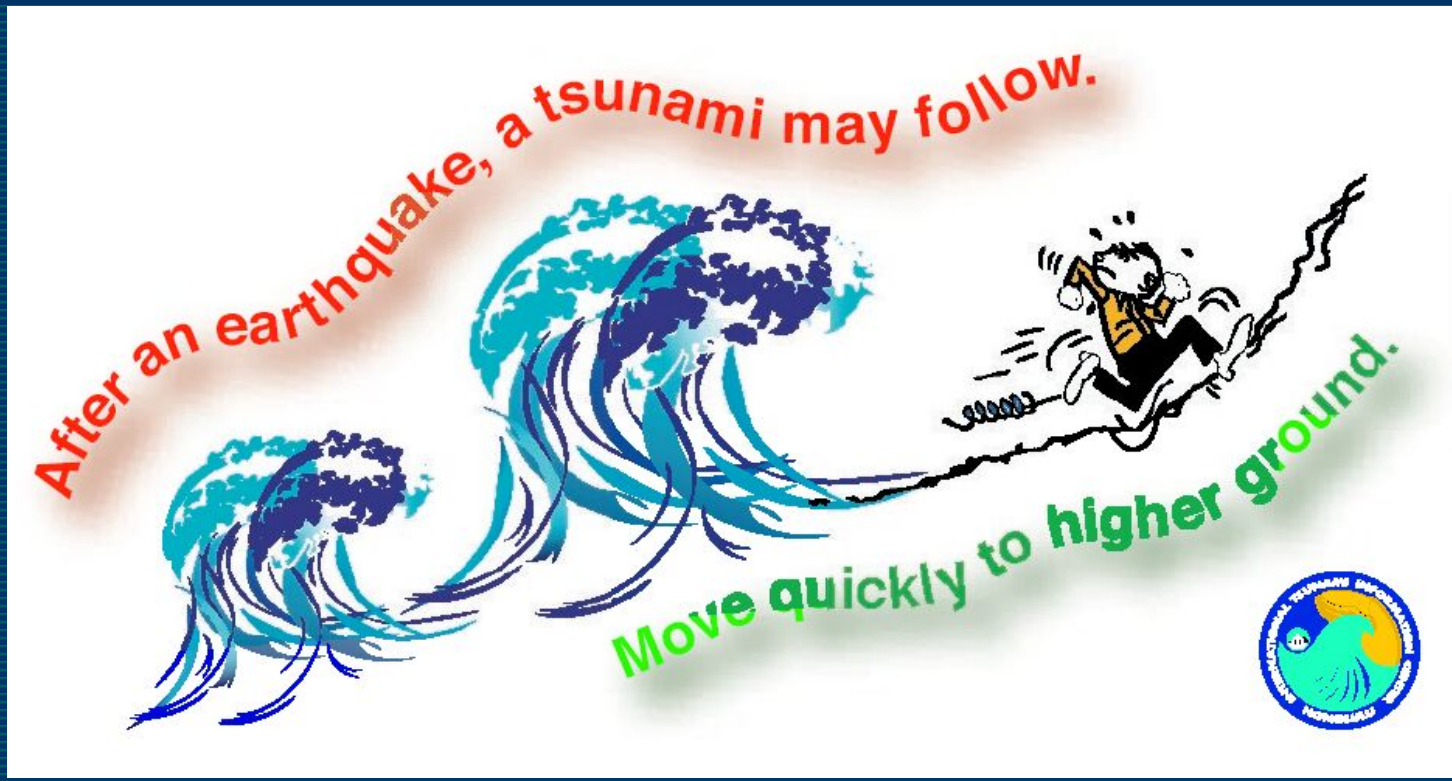
No Tsunami Warning

Issued at 26 Dec 2004

Disaster !!

No Tsunami Warning System exists for the Indian Ocean !!

Be Prepared for Tsunamis & Protect Yourself



Tsunami is coming!

What you must do!

Tsunami is coming!

What you must do,

If you are on a boat!