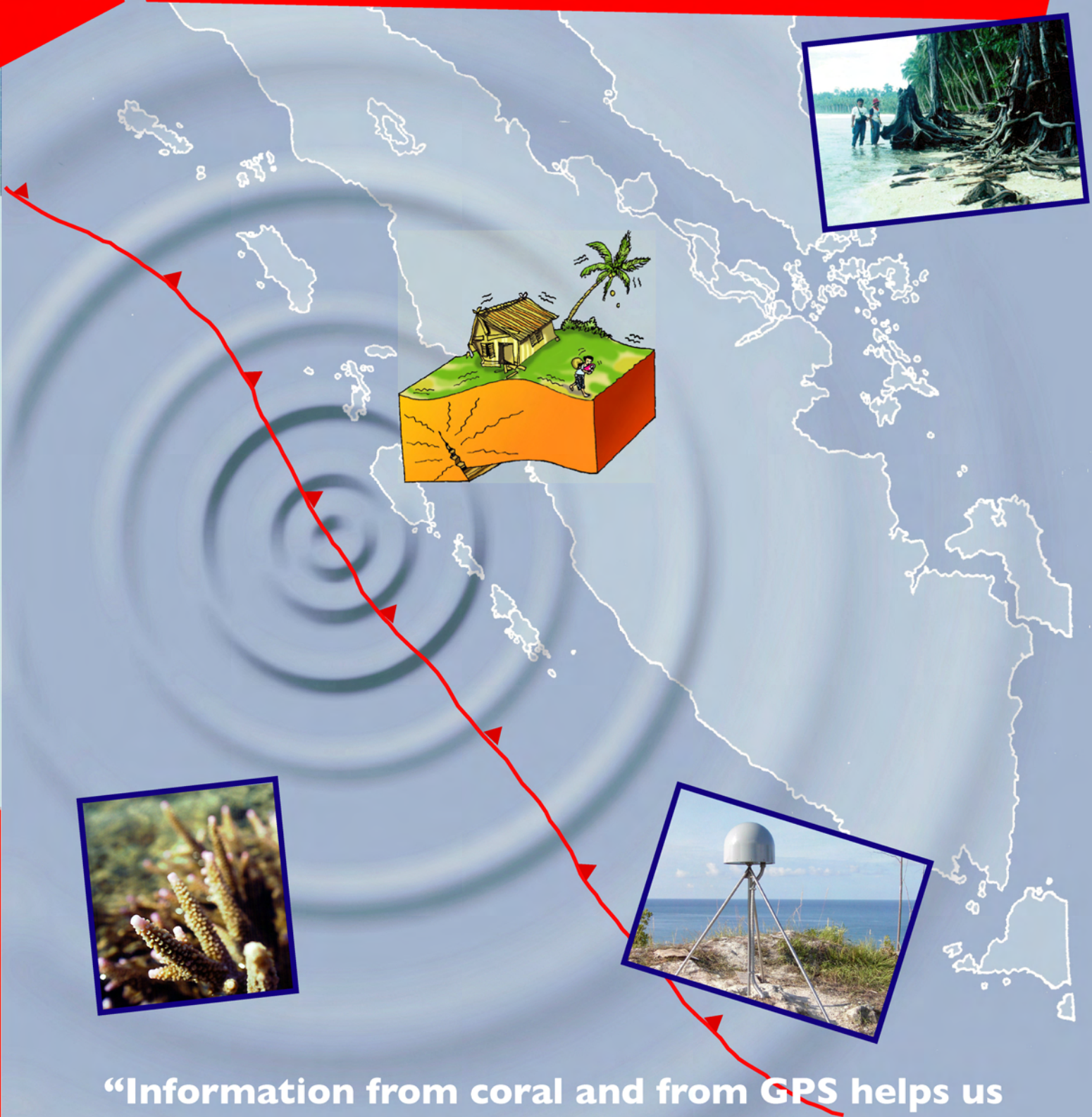


OUR ISLANDS ARE SINKING... IN BETWEEN EARTHQUAKES!



“Information from coral and from GPS helps us understand why our islands are sinking”



WHAT ARE EARTHQUAKES AND TSUNAMIS?



An earthquake is a trembling of the ground, caused by sudden breakage and sliding of rock along a fault zone. The region of western Sumatra has many earthquakes because it is located along a plate boundary, where an oceanic plate is subducting under a continental plate (Fig. A).

For tens to hundreds of years, the rocks of each plate squeeze very slowly against each other. The pressure builds up until it exceeds the rock strength, at which time the rocks break suddenly. This sudden breaking causes the Mentawai and Batu islands to pop up and seismic waves to spread through the surrounding region (Fig. B).



The plate beneath the ocean moves toward and under Sumatra. The islands are stuck to the oceanic plate most of the time, so they get slowly squeezed and dragged down.

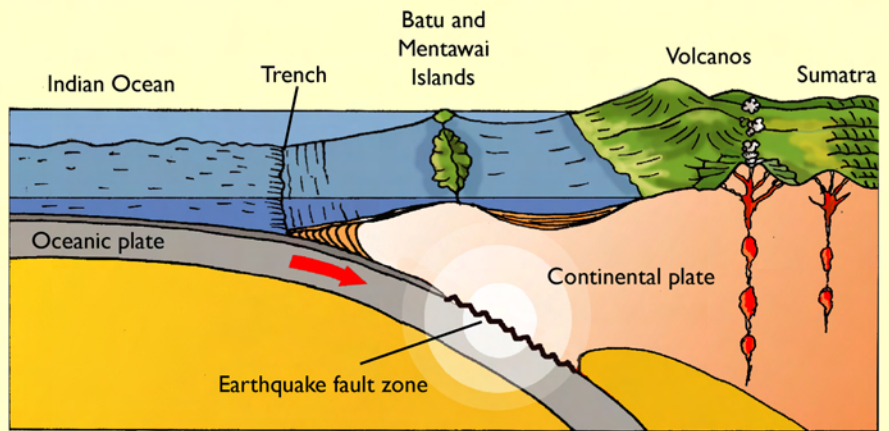


One day the fault between the islands and the oceanic plate breaks, and the islands suddenly snap upward and oceanward. The land shakes severely because of this.

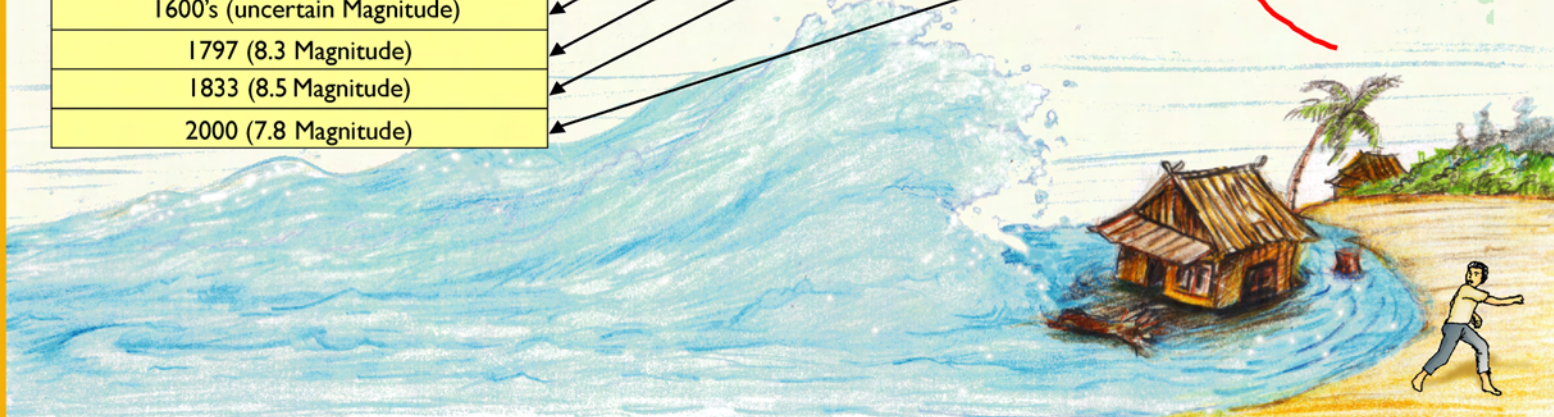


When the islands suddenly rise, water flows away from the land, but it comes back as a series of ocean waves, called tsunamis.

When the rock beneath the islands springs-up during an earthquake, the sudden lurching of the ocean floor displaces ocean water, which can then run up onto land in waves, called tsunamis. Tsunamis can be very small (tens of centimeters) to very high (tens of meters).



Year	Magnitude
2002	7.6
1861	8.5
1935	7.7
1600's	uncertain
1797	8.3
1833	8.5
2000	7.8



HOW DO WE KNOW THAT THE BATU AND MENTAWAI ISLANDS ARE SINKING?

- 1 Beaches are slowly retreating onto land.
- 2 Big trees that used to grow on land now are drowning off shore.
- 3 From investigating corals and measuring land movements by modern GPS instruments.



HOW DO CORALS SHOW THE RISING AND SINKING OF THE ISLANDS?

One type of corals, microatolls, grow abundantly in the shallow water of the reefs. Microatolls are sensitive to changes in sea-level. They can only live underwater, and will die if taken out of the water. Microatolls under water grow freely upward to the low-tide level (Fig.A). Then, if the sea level is stable, coral only grows laterally (Fig.B). But if the land sinks, the coral grows upward again (Fig. C). The uplift of the islands during earthquakes is documented by sudden changes in growth level. This may produce hat-shape corals

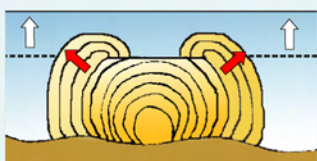


Coral grows up to low tide level.

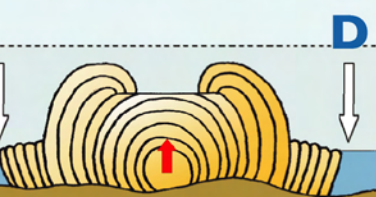
A (Fig.D). So, for tens to hundreds of years coral growth faithfully records when the islands have suddenly popped up and periods when the islands have slowly sunk.



Once at low tide level, coral can only grow sideways.



When the islands sink coral continues to grow upward.

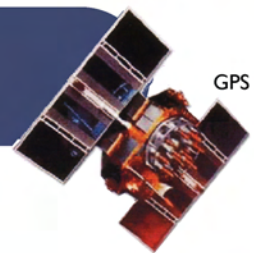


When the islands pop up, during an earthquake, the upper part of the coral dies, but the lower part that is still under low tide level continues to grow.

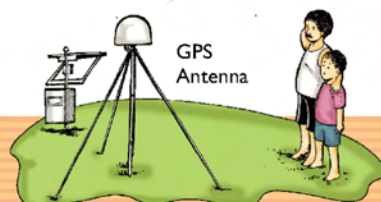


WHAT IS HAPPENING TO OUR ISLANDS NOW?

The GPS (*Global Positioning System*) instrument deployed on the Batu and Mentawai islands are modern tools for measuring movements of land very accurately. Data from the instruments show us that the islands are slowly sinking and are moving closer to Sumatra by several centimeters per year. This indicates that we are in a period of earth-pressure accumulation that began after the last, major earthquakes. This squeezing will continue until the next large earthquake, when the islands will rise suddenly and jump several meters away from the Sumatran mainland.



GPS Satellite



GPS Antenna





HOW CAN WE PREPARE FOR EARTHQUAKES AND TSUNAMIS?

Earthquakes may strike without warning. However, we can lessen their damaging effects. First, by understanding the causes of earthquakes and second, by learning how to avoid the dangers future earthquakes present. Earthquakes are part of a natural cycle. Now we are in a quiet period between large earthquakes, so let's prepare for earthquakes that are certain to happen in the future.

Learn about why earthquakes happen. Start by reading this brochure and keeping it handy for future reference



Understand that we live in a region where big earthquakes occur once every century or so. However, be calm, and live normally

Following an earthquake, high ground faraway from the beach is a good place to be to avoid tsunami waves

Buildings made from wood or other light materials are safer than those made from heavy materials, because if they fall during an earthquake they are less likely to hurt us



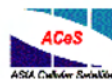
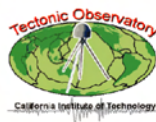
✓ Government officers and local people can coordinate to create safety plans, such as determining a safe place to get together if an earthquake strikes and having a particular warning alarm/signal for the approach of a tsunami.

✓ Thanks to the people of the Batu and Mentawai islands, for their help and participation in our research about earthquakes.

More Earthquake Information

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