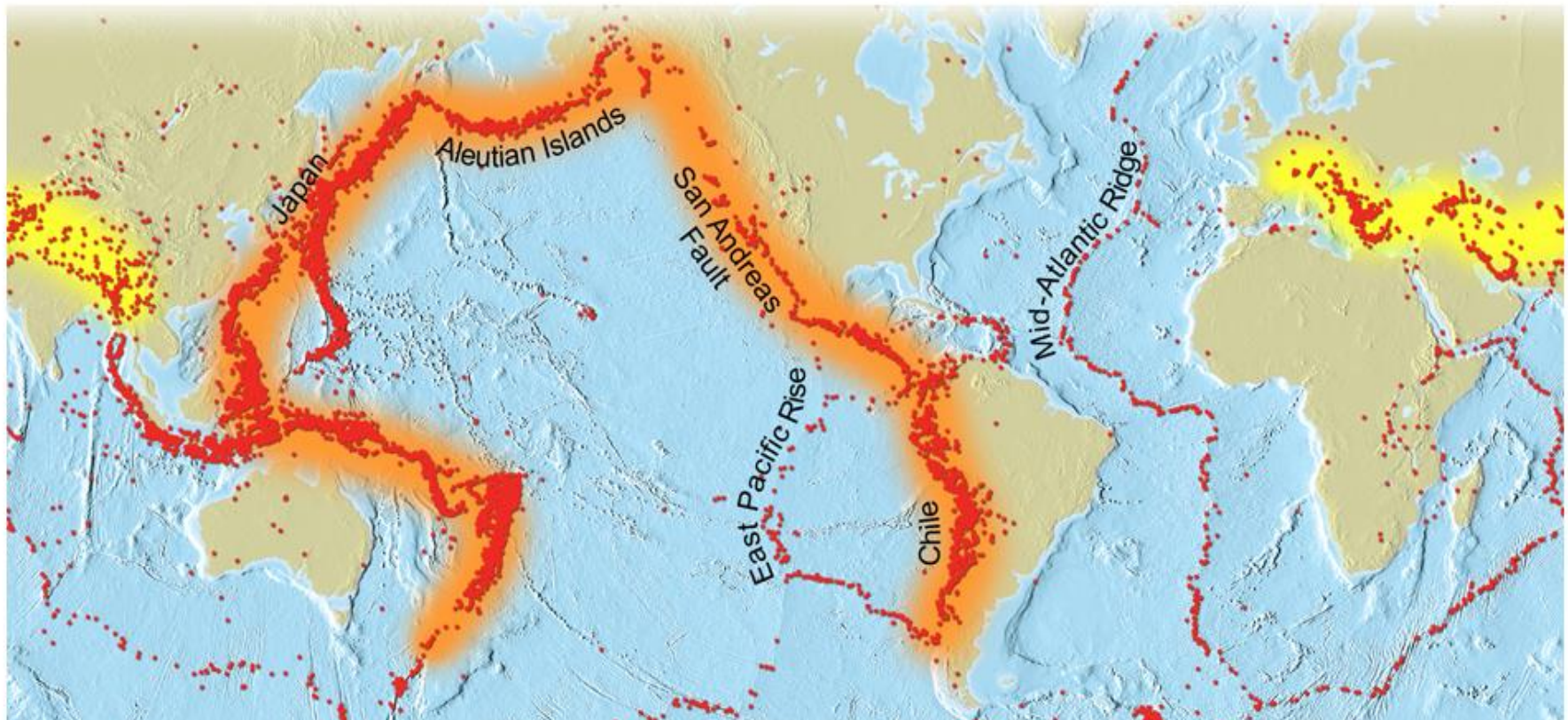


Earthquakes around the world mostly happen near tectonic plate boundaries



80% - Circum-Pacific Belt, border of the Pacific Ocean.

15% - Alpine-Himalayan Belt, from southern Asia to the Mediterranean region.

5% - parts of the Arctic, Atlantic, and Indian Oceans.

Antarctica and **Australia** experience the least amount of earthquake activity then any other areas of the world.

Legend:
Circum-Pacific belt (orange)
Alpine-Himalayan belt (yellow)

Graph shows 15,000 larger magnitude (>5) earthquakes over 10-year period.

Measuring Earthquakes

Two measurements that describe the “power” or “strength” of an earthquake are:

Mercalli
scale

- **Intensity** – a measure of the **degree of shaking** at a given locale based on the amount of damage.

Richter
scale

- **Magnitude** – estimates the **amount of energy** released at the source of the earthquake:

- Magnitude is a *logarithmic* scale (not linear!): **one unit of magnitude increase corresponds to ~10-fold increase in intensity and ~30-fold increase in energy.**
- Magnitude 2 or lower earthquakes cannot be felt by humans.
- Magnitude 7 and over potentially cause serious damage over larger areas, depending on their depth.
- The **largest earthquakes in historic times** have been **slightly over 9**, although there is no limit to the possible magnitude.

Modified Mercalli Scale vs. Richter Scale



Intensity category	Effects	Magnitude scale
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8 +

Greatest Earthquakes Ever Recorded

1. **(M 9.5)** 22 May 1960 – Great Chilean Earthquake, Valdivia, Chile:
most powerful earthquake ever recorded; lasted ~10 min; triggered tsunami which reached Hawaii and Japan; 3000-5000 dead.



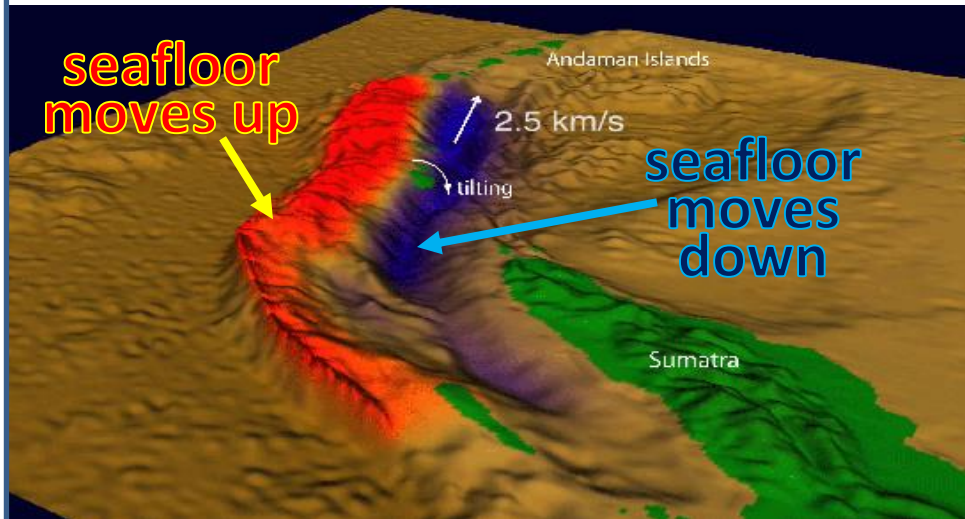
2. **(M 9.2)** 27 March 1964 – Great Alaskan Earthquake (aka Good Friday earthquake), Prince William Sound, AK:
lasted ~4.5 min; tsunami, soil liquefaction; 128 dead.



Greatest Earthquakes

3. (M 9.1-9.3) 26 December 2004 – Indian Ocean Earthquake (aka Sumatra-Andaman earthquake), off the west coast of Sumatra:

shaking lasted ~8 min; **surface wave oscillations exceeded 1 cm everywhere on Earth**; the **longest ever fault rupture of 1600 km** triggered tsunami waves (up to 30 m high reaching as far as 2 km inland in Indonesia); killed 230,000 people in 14 countries.



Ever Recorded

4. (M 9.0) 11 March 2011 – Great East Japan Earthquake (aka Tohoku earthquake), off the west coast of Japan:

lasted ~6 min; tsunami waves (up to 40 m high, travelled as far as 10 km inland); the disaster caused **partial meltdown at Fukushima Daiichi Nuclear Power Plant**; 15,800 dead.

