

Member Lecture – 18 November 2021

Our earth: the history of plate tectonics
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Questions answered post-lecture

Q1 When did geologists first understand the layers of the earth, i.e. crust, mantle, core?

Most of these boundaries were recognized from the 1930s onwards. Inge Lehmann was the first to recognize the inner core through seismic readings she was writing up for her male counterparts! You can learn more about her if you come along to a course I can run "Geoscientists and their influence on Modern Science".

Q2 if a point on the surface went down a subduction zone, how long would it take before it came back up again and what would have happened to it on its journey? How high would the pressure and temperature be and would anything in the way of structure survive?

This is a really tricky question to answer! As the crust descends into a subduction zone it begins to melt as it reaches the middle of the mantle, about 50km down. Its chemical makeup would change as the rocks would become metamorphosed through heat and pressure. The image below is one interpretation of what happens to a slab as it descends into the subduction zone. It is unlikely that any structures would survive.

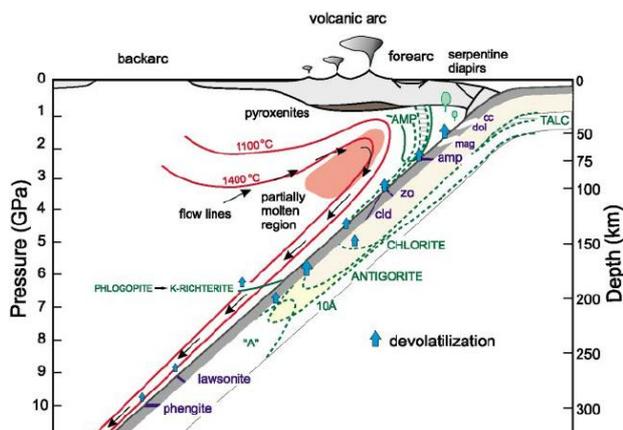


Image from: Poli, Stefano & M.W. Schmidt. (2002). Petrology of subducted slabs. Annual Review of Earth and Planetary Sciences. 30. 207-235. Link: <https://www.researchgate.net/profile/Stefano-Poli-3/publication/236110762/figure/fig9/AS:299412879364107@1448397001917/Schematic-arrangements-of-major-processes-governing-subduction-zone-dynamics-Mineral.png>

Q3 What is the main unanswered question on plate tectonics today?

What triggered plate motion in the early Earth?

Q4 When is the next magnetic reversal likely to happen and what will be the consequences?

Another tricky question! We don't know at this time but within the last 20 million years the poles have flipped every 200,000 to 300,000 years. Although it hasn't flipped for the last 780,000 years!

It is thought that the geomagnetic protective layer around Earth will diminish, and this would allow harmful solar rays to reach Earth causing electrical outages and harmful cancers could result.

Q5 If we know the speed that plates are moving, is that helping to inform the prediction of earthquakes and volcanic eruptions?

Not necessarily, it just allows scientists to know where, rather than when, earthquakes and volcanoes will occur.

Q6 Do we have predictive maps of what earth's plates will look like in the future?

Yes, see the link below to Scotese's Paleomap Project.

Useful links and further reading

<http://www.scotese.com/> - The PALEOMAP Project illustrating the plate tectonic development of the ocean basins and continents, as well as the changing distribution of land and sea during the past 1100 million years.

<https://www.nationalgeographic.org/media/plate-tectonics/> - National Geographic resources on plate tectonics.