

INTERIOR STRUCTURE OF THE EARTH

We have already seen how we can combine data with our knowledge of the basic parameters of the Earth to determine that the Earth is a stratified planet, that means, that the density of the Earth increases as we go down to greater depths in the Earth.

We describe a number of different zones or regions inside the Earth, based on the chemical and physical properties of each region. A well-known and simplified diagram of the interior of the Earth:

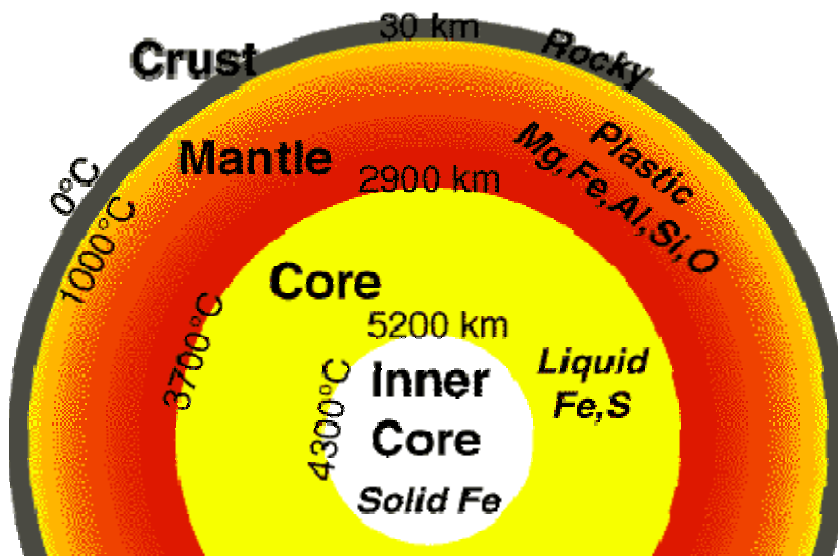


image courtesy of the Univ. Nevada Reno

This diagram shows us how thin the crust is in relation to the rest of the Earth, along with relative sizes of the mantle and core. Interestingly, there are two cores noted (the inner and the outer). Notice also how the chemical composition of the Earth varies with depth; near the surface, the Earth is dominated by silicon and oxygen. In fact, 74% of the crust of the Earth consists of the atoms silicon and oxygen; these two atoms are able to chemically react to form a number of molecules, so not surprisingly the vast bulk of rocks on the surface of the Earth are made of silicates, that is, compounds formed from silicon and oxygen.

Think about the rest of the diagram; notice that the outer core is liquid and the inner core is solid? Can we figure out why this is the case?

There is another way to describe the regions of the Earth, especially those near the surface of the Earth. This description is nicely shown below

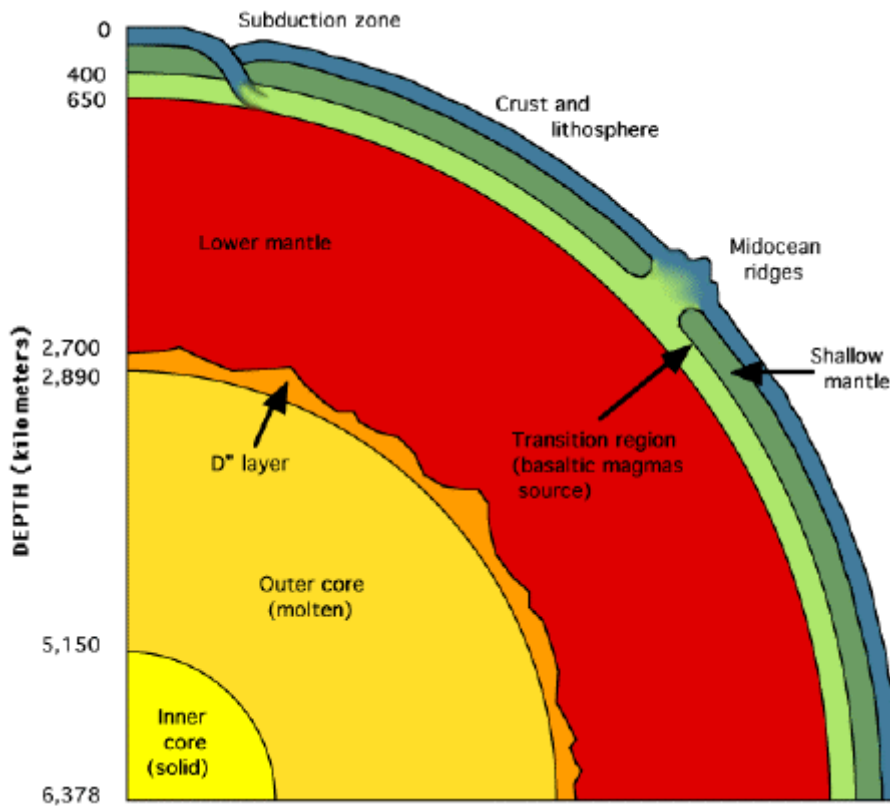


image courtesy Univ. of Hawaii

This diagram introduces us to a few new terms that we need to know in order to understand how the structure of the Earth allows for plate tectonic activity. When we familiar with the crust of the Earth shown in the first diagram. The distinction between the crust and mantle is based on **chemical differences** between the two regions. The transition between the crust and mantle is sharp (discontinuous is the word often used in science to describe sharp, non-gradual transitions), with the rocks of the mantle being noticeably denser (and darker in color) than the rocks of the crust. However, the crust and upper portion of the mantle are fused together to create a rigid, rocky layer called the **lithosphere**. The lithosphere floats on a partially fluid, "slushy" region called the **asthenosphere** (asthenosphere mean "weak layer" in Greek; this region is also referred to as the "Low Velocity Layer" because seismic (earthquake) waves travel slowly through this region of the Earth.) The diagram below shows the relationship between the crust, mantle, lithosphere and asthenosphere:

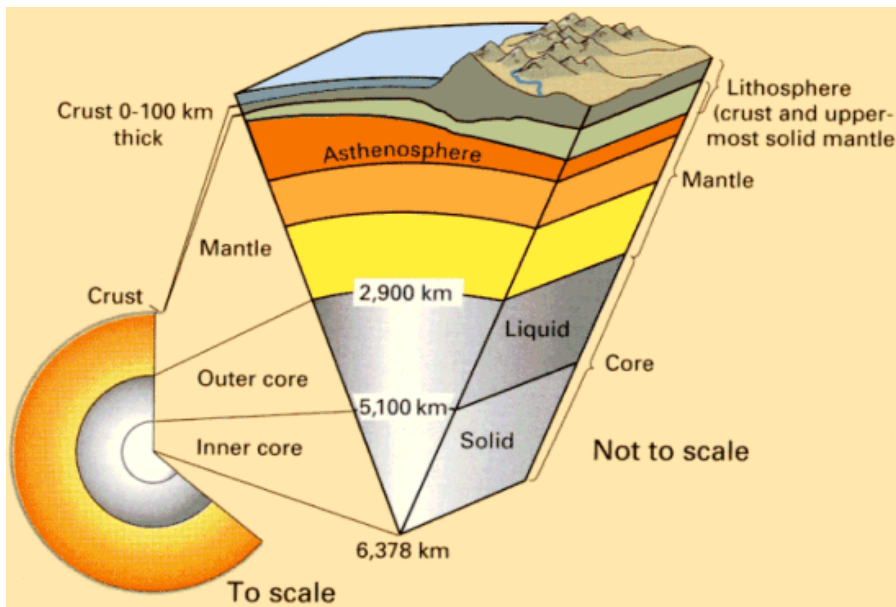


image courtesy Univ. of Oklahoma

Note again that the lithosphere is a fused region consisting of the crust and upper mantle. The lithosphere is supported by another region of the mantle, called the asthenosphere. At the depths indicated on the diagram, the temperature and pressure of the Earth cause this region to partially melt, making it somewhat "slushy" and allowing it to move. This is critical to our understanding of plate tectonics because **the lithosphere of the Earth is divided into about 12 fragments (which we call *plates*), and these plates move on the partially molten asthenosphere.**

A map of the major tectonic plates of the Earth is shown below:

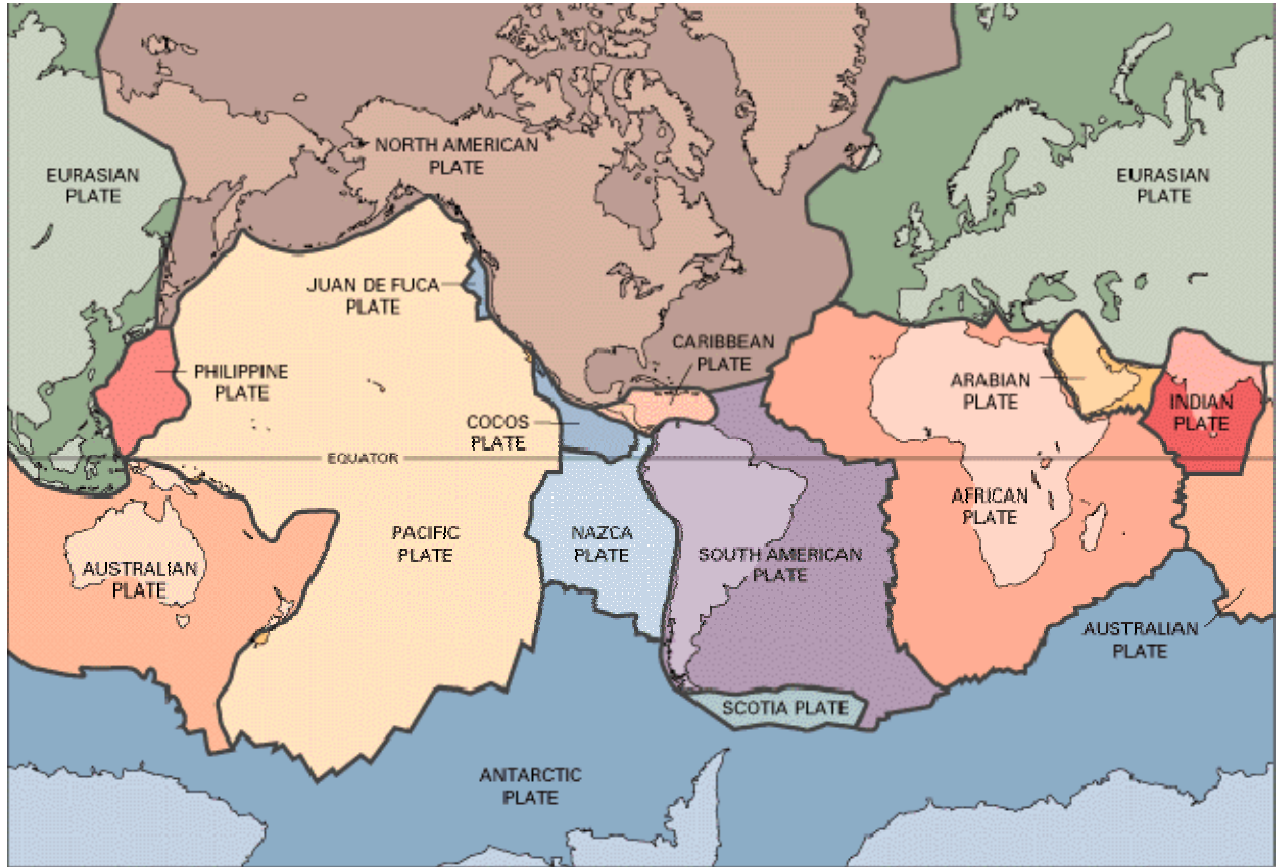


image courtesy US Geological Survey