University of Anbar

College of Science

Department of Applied Geology

Tectonics

Title of the lecture

The divisions of earth´s interior

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Divisions of Earth´s interior

There are two types of earth´s interior:

The first one is according to abrupt changes in the speed of earthquake waves Fig. 1. The seismic velocity depends on their composition and mineral structure.

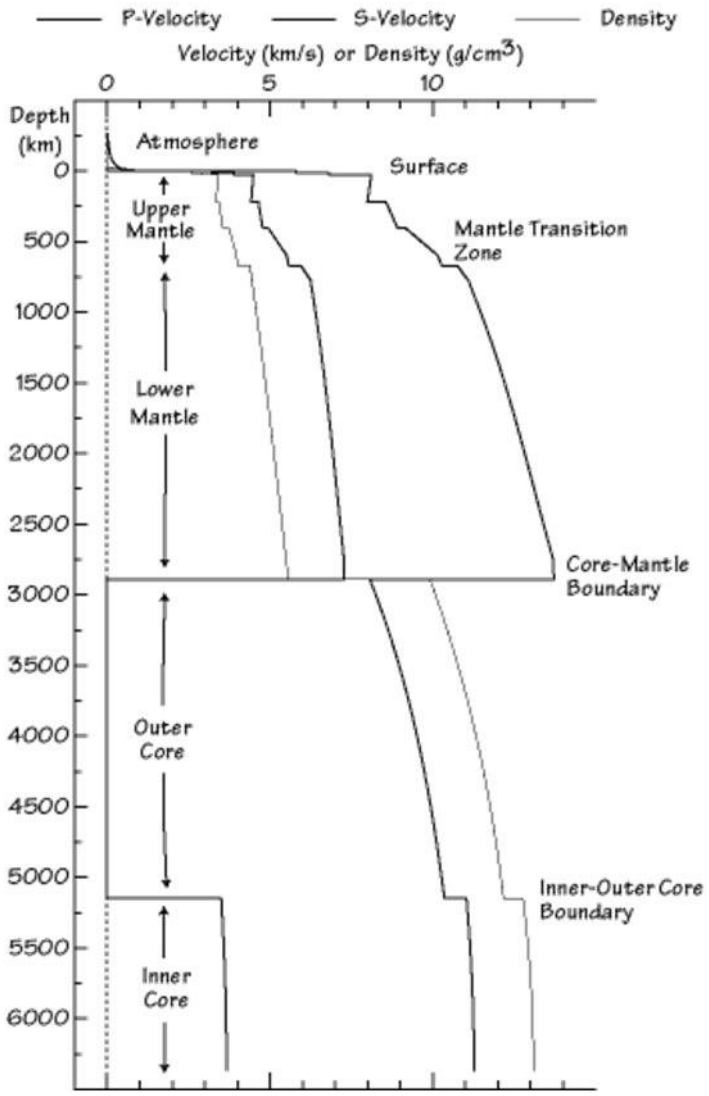

Fig. 1 Velocity and density variations within Earth based on seismic observations. The main regions of Earth and important boundaries are labeled. This model was developed in the early 1980's and is called PREM for Preliminary Earth Reference Model.

Depend on above factor the earth´ interior into three main layers crust, mantle, and core

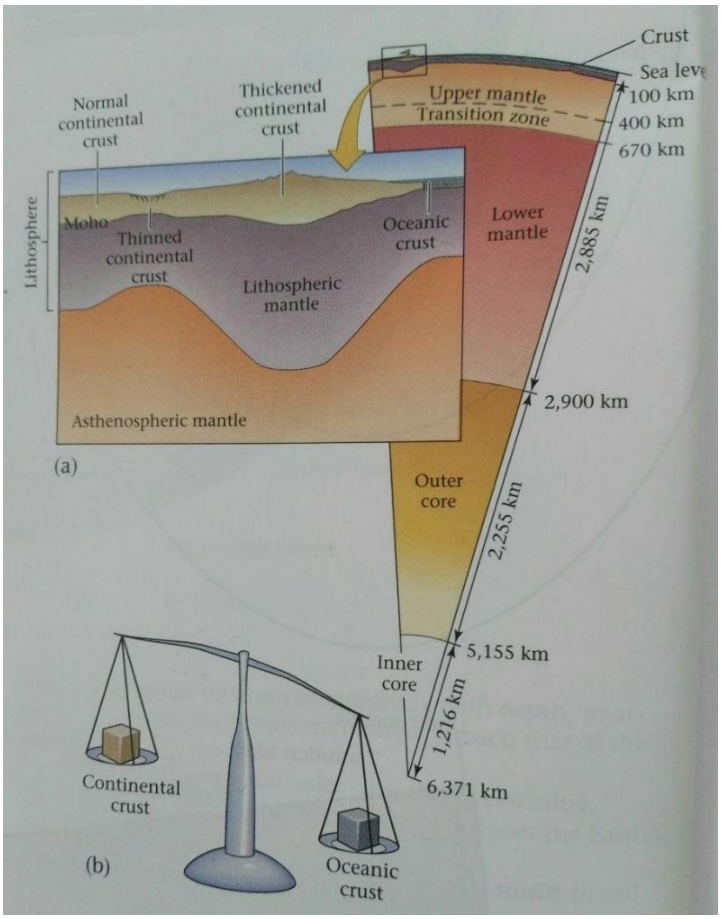

Fig. 2 (a) simplified cross section illustrates the difference between continental crust and ocienic crust. Note that the thickness of continental crust can vary greatly. (b) oceanic crust is denser than continental crust.

The crust

The thickness of the crust comprises only 0.2 to 0.6% of the earth´s radius. There are two different types of crust; oceanic crust which underlies the sea floor, and continental crust which underlies continents. The base of the crust (crust – manle boundary) is defined by a seismic – velosity discontinuity called **Moho**.

Oceanic cust is only 7 to 10 km thick. It consists of uniform layers. At the top, we find a blanket of sediment, generally less than 1 km thick, composed of clay grains and plankton shells. Beneath this blanket, the oceanic crust consists of a layer of basalt, below that, a layer of gabbro (both mafic igneous rocks).

Most continental crust is about 35 to 40 km thick on average, but its thickness varies much more than does oceanic crust. Sometime reach to 25 km in rift (where the continet stretchs) while the thickness reach to 70 km in miontain belt. Continental crust contains a great variety in rock types, ranging from mafic to silisic in composition. It has minaly slicic and intermadiate composition, so a block of average continental crust weighs less than a same size block of oceanic crust Fig. 2 (b).

The mantle

The mantle of the earth forms a 2885 km thick layer surround the core. It consists of ultramafic rocks, peridotite, which is very rich in iron and nagnesuim and very poor in silica. The density increase from 3.5 g/cm^3 at the top of the mantle to 5.5 g / cm3 at the base of it. The mantle divides into upper mantle downward to depth 400 km, transion zone reachs to 670 km, and lower mantle down to the mantle – core boundary.

Almost all the mantle is solid rock, but it so hot that it is soft enough to flow at the rate of less than a few centimeters a year, not liquid but can change its shape without breach.

The core

The core subdivided into outer core and inner core Fig. 2. The outer core is a liquid iron alloy with a density of 10 to 12 g/cm^3. The temperature in outer core is very high and sufficient to outer core to become liquid. Because it is a liquid, the iron alloy of the outer core can flow, this flow generates earth´s magnetic field Fig. 3.

The density of inner core is 13 g/cm^3. It is a solid iron alloy. Even though it is hotter than the outer core, the inner core is solid because it is deeper and subjected to even greater pressure.

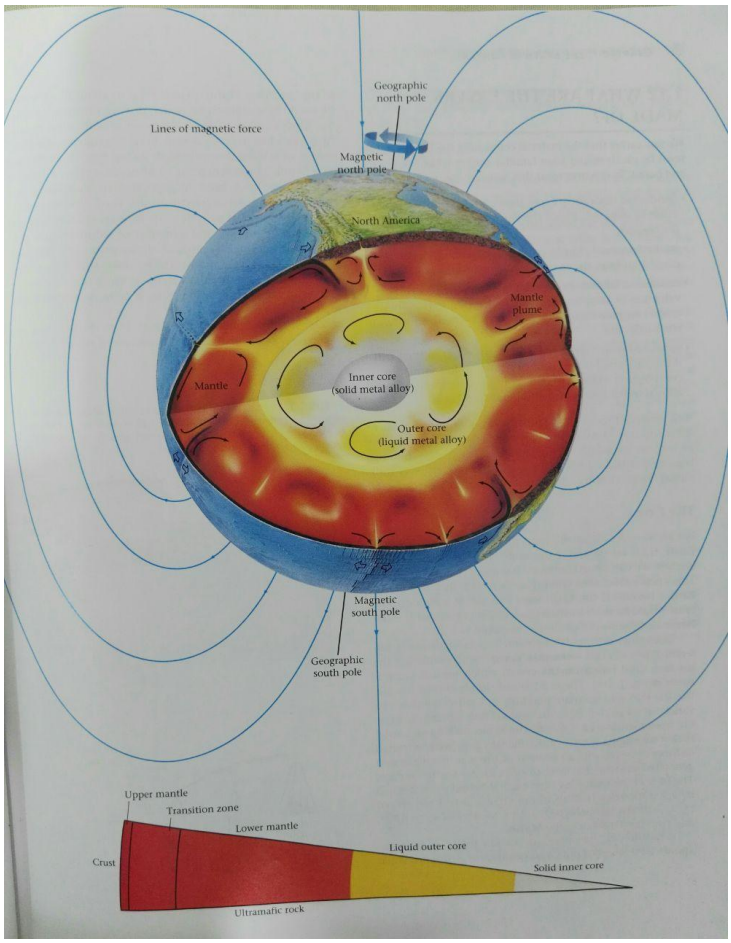

Fig. 3. Within the mantle and outer core, there is swirling, convective flow. Flow within the outer core creates the earth´s magnetic field.

The second division of earth´s interior is according to how the rocks behave when subject to forces. Depend on this factor the geologists divide the outer part of earth´s interior into two main layers, lithosphere and asthenosphere.

The lithosphere consists of the crust plus the top (cooler) part of the upper mantle. It behaves relatively rididly, tt does not flow easily, but bend and fleses, or break, when subject to force. The lithosphere floats on a relatively soft layer called asthenosphere, composed of mantle that can flow like soft plasticbut very slowlywhen acted to force, because it is warmce, because it is

warmer than litosphere; it hotter than about 1280º C. The asthenosphere can convert, because of its ability to flow, but the lithosphere cannot.

Continental lithosphere and oceanic lithosphere differ in thickness. On average, continental lithosphere has a thickness of 150 km, while old oceanic lithosphere, has a maximum thickness of about 100 km. somewhere the thikness of the oceanic lithosphere rechs to less than 10 km. the crustal part of continental lithosphere has an average 35 – 40 km and cnotains relatively low – density rock (granite and many other rock types), while the crustal part of oceanic lithosphere reaches a thickness of only 10 km and consists of relatively high – density rock (basalt and gabbro).

The reference

Stephen, M., (2004) Essentials of geology, first edition, printed in United State of America, P 536.