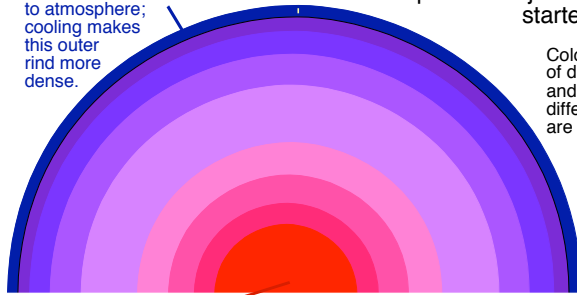


Plate tectonics and Earth dynamics

One might ask "why is there plate tectonics?" This page provides this answer: because heating of Earth's interior by radioactivity, and cooling of Earth's surface, create inversions of density. Those density inversions lead to vertical movements that result in horizontal movements of Earth's cold brittle outer rind. We call those horizontal movements of Earth's cold brittle outer rind "plate tectonics".

A. A metastable static Earth

Material that is cooling as heat is lost to atmosphere; cooling makes this outer rind more dense. (an unsustainable hypothetical construct, presented just to get started)



Colors represent zones of different temperatures and thus of differing rigidity; differences of material are ignored here.

COLD

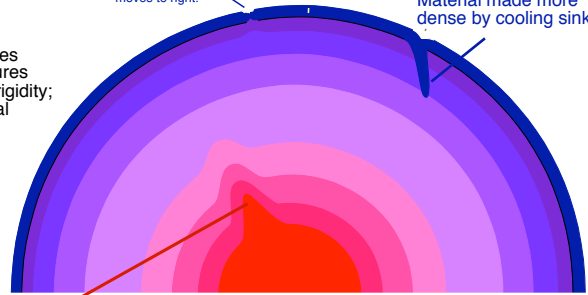
HOT

Material that is heating because of radioactive decay of dense atoms, like those of uranium. Heating makes this material less dense.

Earth's interior is also under great pressure, which makes materials more dense. Additionally, denser materials have settled to Earth's interior through time. Thus, in a hypothetical perfect Earth, compromises of temperature, pressure, and material could give layers of upward-decreasing density all the way from core to surface, and thus a perfectly stable Earth – but how long would perfection persist?

B. Metastability fails

Brittle rind begins to crack as rind to right moves to right.

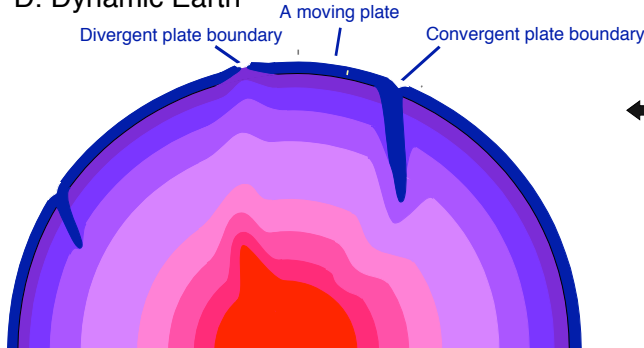


Material made more dense by cooling sinks.

Material that has been made less dense by heating, and ductile with that heat, rises.

Differential heating in the atmosphere produces rising thermals and falling rain in a matter of hours. Much the same concept is illustrated here, but with a time scale of tens of millions of years.

D. Dynamic Earth

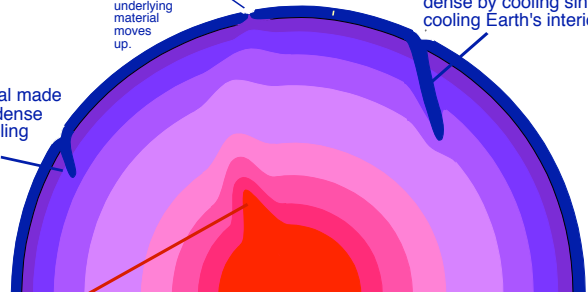


Divergent plate boundary A moving plate Convergent plate boundary

Material made more dense by cooling sinks.

C. Earth becomes dynamic

Brittle rind cracks further as rind moves to both left and right; underlying material moves up.



Material made more dense by cooling sinks, cooling Earth's interior.

Material that has been made less dense and more ductile by heating continues to rise.

Those who see the sinking cold rind as the main driver are advocates of "slab pull" or perhaps better "plate slide"; those who see the rising hot mass as the main driver are advocates of "ridge push" or perhaps better "ridge rise"; those who see a circular flow of variably heated material as the main driver are advocates of "mantle convection".