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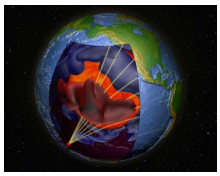

The red and blue regions in the mantle have different chemical compositions, determining different seismic wave traveling speeds. In orange you can see the Earth's molten iron core. AAAS/Science

# Earth's Inner Workings More Complicated than Previously Thought

*Earth's mantle shows regions with different chemical compositions*

The previous model regarding Earth's interior put things very simply. The Earth is made up of several distinct layers sitting on top of each other. The first and outermost layer is the crust, spanning over 25 kilometers towards the center of the planet. Next comes the mantle, a thick, dense layer of silicate rock surrounding the molten iron-nickel core. The mantle is divided into two areas, the upper and lower mantle, both stretching up to 2,900 kilometers inwards. And last but no least the molten core with a radius of 1250 kilometers.But is it really so? Apparently, not. A new study reveals that the mantle layer is made of more materials than previously believed, affecting the way heat convection takes place inside our planet. "Imagine a pot of water boiling. That would be all one kind of composition. Now dump a jar of honey into that pot of water. The honey would be convecting on its own inside the water and that's a much more complicated system", explains Arizona State University researcher, Allen McNamara.When earthquakes are triggered, seismic waves start traveling through the inner regions of the Earth much in the same way as sound waves do in the atmosphere - the type of gases composing the atmosphere and the pressure of air greatly affect the speed at which sound waves travel. The same is available for the inner regions of our planet. Seismic waves start traveling inexplicably at different speeds, suggesting that the mantle is composed of different materials than the model leads us to believe.According to seismic wave speed measurements, two blobs of chemically distinct materials, each a couple of hundred kilometers thick, lie one beneath the Pacific Ocean and the other beneath the Atlantic and the African continent. "You can picture these piles like peanut butter. It is solid rock, but rock under very high pressures and temperatures becomes soft like peanut butter, so any stresses will cause it to flow. The piles dictate how the convective cycles happen, how the currents circulate. If you don't have piles then convection will be completely different", says McNamara.Heat convection also controls the movement of the tectonic plates, generating earthquakes and creating new surface features.