

Science News

Speed Gun for Earth's Insides to Help Measure Mantle Motion

ScienceDaily (Oct. 28, 2010) — Researchers at the University of Bristol have reveal in the journal *Nature* that they have developed a seismological 'speed gun' for the inside of Earth. Using this technique they will be able to measure the way Earth's deep interior slowly moves around. This mantle motion is what controls the location of our continents and oceans, and where the tectonic plates collide to shake the surface we live on.



For 2,900 km (1800 miles) beneath our feet, Earth is made of the rocky mantle. Although solid, it is so hot that it can flow like putty over millions of years. It is heated from below, so that it circulates like water on a stove. While geophysicists know something about how the material moves by the time it reaches the top of the mantle, what goes on at the bottom is still a puzzle. However researchers need to know both to predict how the Earth's surface -- our home -- will behave.

Andy Nowacki, at the School of Earth Sciences at Bristol University, explained: "The only way to measure the inside of the Earth at such huge depths is with seismic waves. When a large earthquake occurs and waves travel through the Earth, they are affected in different ways, and we can examine their properties to work out what is happening thousands of miles beneath our feet, a region where we can never go. This study focusses on a mysterious layer where the mantle meets the core, a sphere of iron at the centre of the Earth 7,000 km (4400 miles) across. This part just above the core has curious properties which we can measure using seismic waves that pass through it."

This enigmatic part of Earth is known as D" (pronounced 'dee-double-prime'). Dr James Wookey said: "We believe that D" is made from crystals which line up in a certain orientation when the mantle flows. We can measure how they line up, and in this study we do this for one part of the world -- North and Central America. In the future our method can then be used to see which direction the mantle is moving everywhere."

Professor Mike Kendall added: "This part of the Earth is incredibly important. The lowermost mantle is where two colossal, churning engines -- the mantle and the core -- meet and interact. The core is moving very quickly and creates our magnetic field which protects us from the Sun's rays. The mantle above is sluggish, but drives the motion of the plates on the Earth's surface, which build mountains, feed volcanoes and cause earthquakes. Measuring the flow in the lowermost mantle is vital to understanding the long term evolution of the Earth."