

Centre of the Earth seems turned on its side

Written by The Conversation

A paper published in the journal [Nature Geoscience](#) today reports evidence for a new way of looking at the centre of the Earth. Geophysicists from the US and China claim that the innermost solid core of the Earth is turned on its side, compared to its outer reaches.

The research provides new clues about how the solid inner core formed and began to freeze. Sitting in a shell of molten iron alloy, the inner core grows at about half a millimetre a year. Probing deeper into the solid inner core is like tracing back in time, to the beginnings of its formation.

The problem is that this is the part of Earth that is farthest away from us. It can get hidden behind the complications of all the rest of the Earth that seismic waves have to pass through on their journey to the core and back. Decoding what is going on in the centre of the Earth is one of the most challenging problems in geophysics.

Despite this, Earth's magnetic field and the existence of the core may have been essential to the development of life on Earth. The core's magnetic field acts like a shield to the magnetic storms that the sun continually throws at us.

Hard core

It isn't clear when the inner core first started to solidify, but estimates suggest somewhere between half a billion years ago and one and a half billion years ago. This is well into the mature years of the planet, which is more than four and a half billion years old.

People have noticed differences in the way seismic waves travel through the outer parts of the inner core and its innermost reaches before, but never before have they suggested that the alignment of crystalline iron that makes up this region is completely askew compared to the outermost parts.

If true, this would imply that something very substantial happened to flip the orientation of the core fairly early after it formed and turn the alignment of crystals in the inner core north-south as is seen today in its outer parts. Interestingly, some researchers who measure the

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palaeomagnetic field in old rocks from Earth's surface have previously suggested that the Earth's magnetic field switched between equatorial axes and polar axes more than half a billion years ago.

It could be that the strange alignment that these researchers see in the innermost core explains the strange palaeomagnetic signatures from ancient rocks that may have been present near the equator half a billion years ago. Some people have correlated this with a sudden increase in the speed of evolution of new life, termed the "Cambrian explosion".

For the moment, however, the model proposed in this paper needs testing against other ways of analysing the seismic data from Earth's innermost core, especially since no other researchers have suggested evidence for the same conclusions in previous studies.

Simon Redfern does not work for, consult to, own shares in or receive funding from any company or organisation that would benefit from this article, and has no relevant affiliations.

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