Exploring water in the deep Earth

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(PhysOrg.com) -- Research published today in *Nature Geoscience* provides new insight into the water cycle of the deep Earth, volcanic activity in the Pacific and the potential catastrophic effects when these two combine.

Geologists and geochemists have had longstanding problems measuring and understanding what happens in the water below the earth because of the difficulty in sourcing authentic recent, samples.

To address this, ARC Professorial Fellow Professor Simon Turner has led a team of US, French and Australian scientists to source and measure a set of very rare geological samples.

"We normally study lava samples, which are an indirect source of a volcano, not the real source. In this study we were able to use source rocks from xenoliths in the Philippines, very young rocks, carrying deep water samples. They tell a more recent story of what is happening below the earth's surface."

The team obtained the rocks five years before they had developed techniques precise enough to extract a result from the low-level sources. Over the last year they have used an isotopic method used only at Macquarie University and just a few other labs around the world.

The U-series Research team pushed the capabilities of uranium series techniques, and their results tell a story of the subterranean ocean moving in two directions: up to the surface through mantle plumes and down, beyond volcanic arc fronts and carrying into the deep mantle of the core of the earth.

It is this second aspect that has catastrophic potential. When the water goes further into the earth, it may become stored in mantle materials at depth. As these become heated they can rise as mantle plumes and erupt in large volcanic provinces, emitting voluminous aerosols powerful enough to change earth. This discovery provides a new perspective on earlier catastrophic events, including the Deccan Traps of million years ago in India, when volcanic gases were released, resulting in mass extinction.

Turner hopes this research will help to understand events like the Deccan Traps and be better prepared for future events.

Provided by Macquarie University

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