Scientists reveal fate of Earth's oceans

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Scientists at The University of Manchester have uncovered the first evidence of seawater deep inside the Earth shedding new light on the fate of the planet's oceans, according to research published in *Nature* this week (May 11, 2006).

For years geologists have debated whether seawater is subducted (absorbed) into the deep Earth or whether there is a 'subduction barrier' blocking its absorption.

For the first time scientists at The University of Manchester have positively identified seawater in volcanic gas samples originating from the Earth's mantle - the region just below the crust and extending all the way down to the core – supporting the theory that seawater is subducted deep into the Earth and enabling them to test this theory further.

Professor Chris Ballentine and Dr Greg Holland of the University's School of Earth and Atmospheric and Environmental Sciences have also revealed that up to 10% of the Earth's oceans have been absorbed deep into the Earth since its formation.

Professor Ballentine said: "We can show that up to 10% of the Earth's oceans have been absorbed into the planet since formation. This accounts for about half of the water in the deep earth, the remainder of which was trapped when the Earth first formed. This work, for the first time, quantifies the 'geological water cycle'."

Trace gases were used to identify seawater in volcanic gas samples. This

was done by counting the relative number of atoms of different noble gases (Argon, Krypton and Xenon) in the samples which revealed an atomic 'fingerprint' matching that of seawater.

The study, funded by the Natural Environment Research Council, is also the first to establish the precise composition of the noble gases present in the Earth's mantle. In addition to identifying seawater the noble gases have provided a cornerstone for understanding the very origin of gases and water in our planet.

Dr Holland said: "As we now know how much seawater and associated gases were added to the deep Earth, we can identify what was down there to start with much more precisely. This is absolutely critical for understanding how our planet formed and has changed over time"

Professor Ballentine added: "Our results also explain why ocean volcanoes, like Hawaii and Iceland, which come from the where the mantle meets the core, have a higher water content than ocean volcanoes that originate from shallower regions of the mantle. Previously, geologists have thought that this is because this region of the planet preferentially preserved water and gasses trapped during earth formation and it is only now 'leaking out'. We know however that if seawater subduction is occurring, it will be carried more efficiently into the deepest parts of the earth, and that contrary to these old ideas, the water in the lavas from Hawaii and Iceland are in fact dominated by old seawater that has travelled from the surface, to the center of the earth and back again."

Source: University of Manchester

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