the ratio of deuterium to hydrogen, to probe a possible solar origin. During the formation of the Sun, all the deuterium in the accreting nebula gas reacted with hydrogen to form ^{3}He such that the Sun is devoid of deuterium — unlike all other objects in the Solar System.

Liu and colleagues demonstrate that a large fraction of the analysed glass samples contain between 200 and 300 ppm of dissolved hydroxyl and water, and both are poor in deuterium. These observations are consistent with an origin by impact melting of lunar soils that were enriched in hydrogen implanted by the solar wind. The range of measured deuterium to hydrogen ratios also indicates at least two other sources of hydrogen: a minor component produced during nuclear reactions with the incoming high energy particles, and another component that is enriched in deuterium, similar to water in most comets.

The Moon was once considered to have been left with little water following the putative Moon-forming giant impact[5]. However, it has been shown that the lunar environment is not totally dry[6–9]. The origin and distribution of this water, and the timing of its delivery to the Moon, remain an open debate.

Liu and colleagues[2] present evidence that the lunar surface contains water that originates from the solar wind — as well as the water delivered by comets, as previously proposed[9,10]. To understand and predict the surface water budget of inner Solar System bodies that have generally been considered dry, the next step is to constrain the delivery fluxes from these two very different sources. ❑

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VOLCANOLOGY

Rockfall-induced eruption

As a tourist attraction, Kīlauea Volcano in Hawai'i beats all other volcanoes on Earth. It is also high up on the list of the most active volcanoes: the Halema'uma'u Crater at Kīlauea's summit has been spewing out poisonous gases continuously since 2008, leading to increased levels of volcanic smog and concerns about air quality.

The gas emissions started in March 2008 with the opening of the Overlook Vent, and have been punctuated by explosive eruptions caused by the sudden degassing of volatile elements from magma. On 12 October 2008, a small explosive eruption occurred at this new vent. Rebecca Carey and colleagues (*J. Geophys. Res.* http://doi.org/jhn; 2012) show that the 12 October eruption was triggered by rocks falling from the steep, overhanging vent walls into the lava lake below, rather than by uprising gas from the deeper magma plumbing system, as happens usually during basaltic explosive eruptions. They argue that rocks hitting the lava surface created a pressure wave — a train of high and low pressure areas — whose decompression component triggered degassing of the magma.

Micro-textural analysis of pyroclastic rocks ejected on 12 October 2008 reveal numerous tiny bubbles. These small-scale features formed when rock impacts at the lava lake surface caused a decrease in magma pressure, analogous to the formation of bubbles in a newly opened bottle of fizzy water.

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The tiny bubbles record a sudden change in pressure, but their formation was not responsible for the 12 October event. The micro-textural analyses also revealed numerous larger bubbles that form more slowly, and thus must have existed in the magma before the eruption. Calculations show that in the wake of the rockfalls, decompression could cause pre-existing, large bubbles in shallow parts of the lava lake to expand. Growth and explosive expansion of these pre-existing bubbles probably triggered the eruption.

In the light of the findings, it would seem wise to let a sleeping lava lake lie undisturbed.

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