potentially provide quantitative constraints on the fate and quantity of slab volatiles.

The West Mata volcano was also found to host a thriving chemosynthetic community that has built up around deep hydrothermal vents related to the volcanic arc. With continued volcanic activity, the host volcanic edifices could grow. Thus, a striking feature of arc-related hydrothermal vents is the potential for the volcanic edifices to grow large enough that they broach the shallower ocean depths where photosynthetic organisms can also capitalize on iron-rich hydrothermal emissions[5]. The chemosynthetic community at West Mata has yet to be fully characterized, but a detailed biotic study of these remarkable life forms will surely follow, because they are potentially representative of the earliest life on this planet.

Resing and colleagues[3] have given us spectacular live coverage of an explosive eruption of some of the rarest and hottest lavas on Earth, and the additional discovery of intriguing life forms. Both findings will no doubt provide fodder for future investigations. ❐

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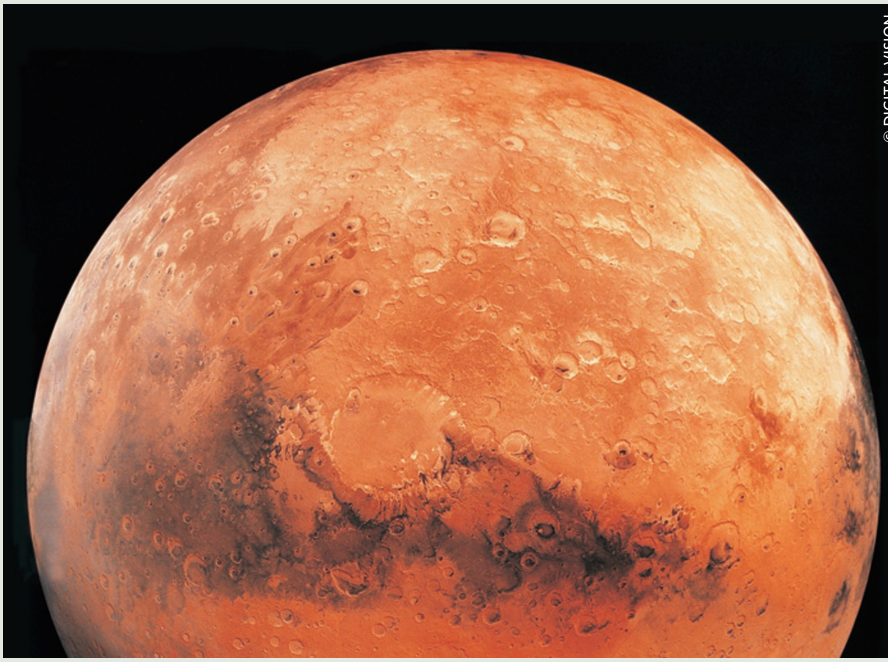
References

1. de Ronde, C. E. J., Massoth, G. J., Baker, E. T. & Lupton, J. E. *Soc. Econ. Geol. Spec. Publ.* **10,** 91–110 (2003).
2. Embley, R. W. *et al. Nature* **441,** 494–497 (2006).
3. Resing, J. A. *et al. Nature Geosci.* **4,** 799–806 (2011).
4. Martinez, F., Okino, K., Ohara, Y., Reysenbach, A-L. & Goffredi, S. K. *Oceanography* **20,** 116–127 (2009).
5. Massoth, G. *et al. Geochem. Geophys. Geosyst.* **8,** Q11008 (2007).

PLANETARY SCIENCE

Martian water aloft

Although invading martians provide the premise for many a science fiction offering, decades of data from the red planet paint a picture of a cold, dry and generally inhospitable surface unlikely to host anything other than the most extremophile microbes. Evidence for running water in the not-so-distant past is scarce, and the magnitude of the martian hydrological cycle is miniscule compared with that on Earth. Despite its modest scale, though, global circulation models suggest that the martian hydrological cycle is dynamic, and responsive to the changing seasons.



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These simulations are based on the assumptions that there is a very low level of water vapour in the martian atmosphere and that supersaturation cannot exist. According to these assumptions, water vapour should not be present in significant quantities at altitudes higher than 15 km, where temperatures would cause it to be supersaturated. However, data from the martian SPICAM instrument suggest just the opposite (*Science* **333,** 1868–1871; 2011).

SPICAM, known more formally as the Spectroscopy for the Investigation of the Characteristics of the Atmosphere of Mars instrument, was used to track the vertical distribution of water vapour in the martian atmosphere during the aphelion season, the time when Mars is farthest from the sun. This season generally has the most vigorous hydrological cycling as a consequence of the sublimation of ice in the northern hemisphere and an advection of water vapour from the northern polar region.

Using the SPICAM data, Luca Maltagliati of the Laboratoire Atmosphères, Milieux, Observations Spatiales, France and colleagues show that the concentration of water vapour in the martian atmosphere is up to 20 ppmv at an altitude of 20–50 km, a factor of 10 higher than model predictions. Temperature profiles from other martian orbiters confirmed the supersaturation of water vapour throughout the martian northern hemisphere, and show that levels of supersaturation are far higher than found in Earth's atmosphere.

The key to this superlative supersaturation, Maltagliati *et al.* suggest, is a lack of dust particles in the upper atmosphere. Dust grains serve as condensation nuclei for water vapour; without a ready supply of nuclei, water vapour can become highly supersaturated. Indeed, measurements of dust loading in the martian atmosphere show the lowest values in areas of supersaturation.

Calculations of how much water could have once been present on Mars depend on the amount of water vapour that could have made it into the upper atmosphere and eventually escaped. The finding of such relatively high concentrations suggests we may need to refine the existing estimates of water-vapour escape upwards, allowing for an even wetter ancient Mars.

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