Whirling dust devils bust martian methane

01 August 2006

Snow storms of hydrogen peroxide might sound like an easy way to go platinum blonde, but their existence on Mars could help solve the conundrum about levels of methane gas in the martian atmosphere.

Scientists have claimed that hydrogen peroxide could be generated by dust devils – vortices that whip up grains from very dry surfaces – which hold large electric charges, caused by all those dry particles rubbing against each other. Lightning discharges could trigger the production of hydrogen peroxide that would fall to the surface as dusty 'snow', they argue. This oxidising 'weather' could in turn mop up methane in the atmosphere in isolated spots, say scientists from the University of Michigan, Ann Arbor, US, and colleagues.

Scientists have puzzled over data from the Mars Express orbital probe, which showed variable concentrations of methane at different spots in Mars's atmosphere. Methane is regarded by some as evidence for microbial life on Mars, but could also come from geothermal activity. Hydrogen peroxide could help explain why methane isn't always evenly spread, and also spells bad news for martian bugs. 'Any nascent life or even prebiotic molecules would find if hard to get a foothold on the surface of Mars, as the organic material would be scavenged efficiently by the surface oxidants,' said Michigan's Sushil Atreya, who led the team.

The researchers behind the peroxide hypothesis have measured the electric charges generated by dust devil storms in Arizona. 'We had an inkling it could be important on Mars because it's so dry there,' said astrobiologist David Catling from the University of Bristol, UK, and part of the team. 'If you have a large electric field on Mars, it's more important [than on Earth] because the air is so thin,' he said.

Based on these measurements, the team suggest that up to 200 times more hydrogen peroxide can be produced through ionisation in dust devils than through photochemistry alone. The presence of so much hydrogen peroxide could 'be one way to explain why methane can be spatially non-uniform,' said Catling, and may mean that far more methane is being produced by Mars than previous measurements have suggested.

Martian dust devils can be up to 10 kilometres high and hundreds of metres across. The scientists believe that dust devils' electricity breaks up water vapour in the atmosphere into reactive hydroxyl radicals and negative hydride ions. Carbon dioxide is similarly split into carbon dioxide and negative oxygen ions. This highly-charged soup can then recombine into a variety of different products, including hydrogen peroxide.

'This could provide a previously unrecognised source for peroxide on Mars,' said Mike Mumma, whose team at Nasa's Goddard space flight centre, Maryland, US, has been searching for methane on Mars since 2001. 'The same physics should work on Mars as works on Earth,' he said. But the production rates need to be measured, or at least simulated, before the work can be verified, he added.

Although it is a reasonable hypothesis, 'no-one has yet demonstrated that peroxides supported on aerosols can in fact destroy methane,' he said. Mars Science Laboratory, a roving probe due to be launched in 2009, should be able to test the idea.

Katharine Sanderson

References

G T Delory *et al*, *Astrobiology*, 2006, **6,** 451

S K Atreya *et al*, *Astrobiology*, 2006, **6,** 439

Related Links

Dust devil on Mars
Mars Exploration Rovers: Spirit dust devil movies here.

Mars Express finds methane
Results from the ESA probe

External links will open in a new browser window

© Royal Society of Chemistry 2006