Variation of halogens in martian soil calls for an atmosphere-surface cycle

November 15 2013

In the November issue of *Icarus*, researchers from LSU's Department of Geology & Geophysics and Stony Brook's Department of Geosciences assess the details of halogen variability and an unusual process that may influence it. The group, led by LSU's Suniti Karunatillake, investigated the potential for an existing halogen cycle on Mars, which would alter the current paradigm of halogens distributed mostly by water-related processes.

Karunatillake and colleagues find evidence for bromides converting preferentially to reactive gases and a more variable S/Cl ratio in bulk soil than currently thought. Volatilized halogens will require current models of aqueous processes and oxidants on Mars to be refined. The potential effect on oxidants such as perchlorates may in turn affect the potential for life inferred from recent Phoenix Lander and Curiosity Rover observations.

Given the evidence, the scientists also infer that volatilized halogens may have altered subsurface halogen distribution, mirroring processes known to occur in Middle Eastern Sabkhas and Andean Salt Pans on Earth. Some pathways evident during the springtime Br explosion (i.e., Ozone Depletion Event, ODE) in Earth's Arctic, and to a lesser degree, Earth's Antarctic regions, may also play a role.

Secondarily, S and Cl may vary differently in bulk soil despite shared sources – such as alteration fluids and volcanic gases—and nearly uniform S/Cl ratios seen in surficial soil of Mars. These possibilities,

rarely considered before, motivate the planetary science community to reconsider atmospheric cycles on Mars as well as the variability of perchlorate-type minerals considered hospitable to some Earth microbes.

More information: *Icarus*, Volume 226, Issue 2, p. 1438-1446. DOI: 10.1016/j.icarus.2013.07.018