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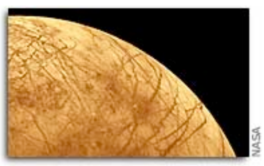

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New Rochelle, July 5, 2006 – The production of chemically reactive oxidants on the surface of Mars and icy moons such as Europa may provide clues to their habitability and offers new avenues for future space exploration and the analysis of surface soil and ice shells, according to three Special Papers published in the most recent (Volume 6, Number 3) issue of Astrobiology, a peer-reviewed journal published by Mary Ann Liebert, Inc.

Astrobiology is the leading peer-reviewed journal in its field. To promote this developing field, the Journal has teamed up with The Astrobiology Web to highlight one outstanding paper per issue of Astrobiology. This paper is available free online at www.liebertpub.com/ast and to visitors of The Astrobiology Web at www.astrobiology.com.

In a Special Paper entitled, "Clathrate Hydrates of Oxidants in the Ice Shell of Europa," Kevin Hand, Christopher Chyba, Robert Carlson, and John Cooper present the following hypothesis: that the formation of mixed clathrate compounds could make up 12% to 53% of the moon's ice shell and stably trap O_2 and other gaseous oxidants within the ice. The clathrate compounds, which consist of a lattice, or cage, made of H_2O molecules, could trap a variety of gas molecules including O_2, CO_2, and SO_2 produced by radiation-induced chemistry at Europa's surface. Mixed gas clathrates are more stable, yet denser, at Europa's outer surface than pure O_2 clathrates and could more easily sink through the thick ice crust to the subsurface ocean.

In regions of pure H_2O ice, oxygen produced by radiation escapes from the relatively unstable pure O_2 clathrate to form Europa's extremely thin oxygen atmosphere. Earlier Hubble Space Telescope measurements indicate that the atmosphere appears denser over the pure water-ice regions than over sulfate-rich regions where the mixed gas clathrates form. This finding may be further confirmed next March during the New Horizons spacecraft flyby through the Jovian system en route to Pluto.

The authors, from Stanford University, the SETI Institute, Princeton University, NASA Jet Propulsion Laboratory and NASA Goddard Space Flight Center, also describe the usefulness of Raman spectroscopy for studying clathrates and detecting life forms. They propose a role for this instrument on future spacecraft landers for studying the characteristics of the moon's icy surface and the habitability of Europa.

"The Hand et al. hypothesis is intriguing for a couple of reasons," says journal Editor-in-Chief, Sherry L. Cady, Ph.D., Associate Professor in the Department of Geology at Portland State University. "The presence of O_2 enclathrating compounds not only explains the paradoxical occurrence of solid O_2 on the europan surface, but it provides a plausible mechanism for delivering O_2 to the europan ocean, which may be oxidant limited. This work has important implications for habitability assessments of Europa."

In a second Special Paper in this issue of the journal, Gregory Delory, William Farrell, Sushil Atreya, et al. conclude that electrically charged dust could greatly increase the production of the oxidant hydrogen peroxide on Mars, and this could explain the inability of the Viking spacecraft to detect organic materials and signs of possible life.

The authors propose that dust devils and dust storms on Mars generate electrostatic fields—similar to the electric fields produced by thunderstorms on Earth--capable of transforming carbon dioxide and water into the precursors of H_2O_2. In their paper entitled, "Oxidant Enhancement in Martian Dust Devils and Storms," the authors, from the University of California, Berkeley, NASA Goddard Space Flight Center, the University of Michigan, Ann Arbor, Duke University, the University of Alaska, Fairbanks, the SETI Institute, Southwest Research Institute, the University of Washington, Seattle, and the University of Bristol (U.K.), used a plasma physics model to determine that the strong electric fields produced by dust storms can drive atmospheric chemical reactions that enhance oxidant production.

In a companion paper, Sushil Atreya, Ah-San Wong, Nilton Renno, et al. propose that hydrogen peroxide —formed by chemical reactions induced by electrostatic fields generated by sand and dust in martian dust

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devils and storms—or another superoxide formed from hydrogen peroxide may be responsible for scavenging organic material from Mars and could accelerate the loss of methane from the martian atmosphere.

Astrobiology is an authoritative peer-reviewed journal published quarterly in print and online. The journal provides a forum for scientists seeking to advance our understanding of life's origins, evolution, distribution and destiny in the universe. A complete table of contents and a full text for this issue may be viewed online at www.liebertpub.com/ast.

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- Clathrate Hydrates of Oxidants in the Ice Shell of Europa
  full paper available for readers of Astrobiology.com
- Oxidant Enhancement in Martian Dust Devils and Storms: Storm Electric Fields and Electron Dissociative Attachment
- Oxidant Enhancement in Martian Dust Devils and Storms: Implications for Life and Habitability
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