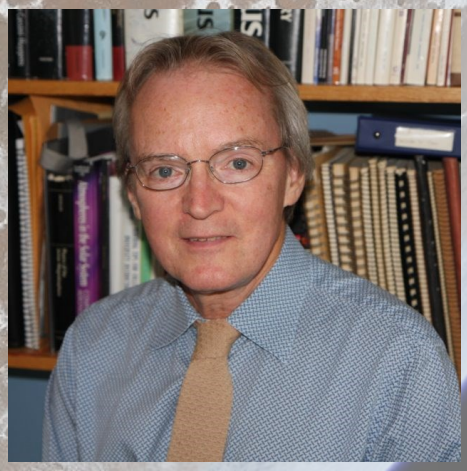
BOSTON UNIVERSITY

Boston University College of Arts & Sciences
Center for Space Physics

2020—2021 SPACE PHYSICS SEMINAR SERIES

The Deuterium/Hydrogen Ratio and the Escape of Water from Mars

The history of water on Mars has received much attention with recent spacecraft missions, and one key indicator of the amount of water lost into space is the ratio of the isotopes deuterium to hydrogen. The constituent atoms of water are known to escape the weak Martian gravity into space, and the lighter isotope H escapes faster than D leading to a gradual increase in the D/H ratio of the remaining water. The present D/H ratio is proportional to the total amount of water that has escaped, but deriving the depth of water on a warmer and wetter primordial Mars requires understanding the factors that control escape processes today. In particular, it is important to measure the escaping atoms H and D, rather than rely on the D/H ratio in water and modeling. Observations of UV resonance line emissions from H and D atoms has been carried out with the MAVEN and Hubble Space Telescope (HST) missions, providing direct measurements of the H and D densities and escape rates from the upper Martian atmosphere. These are highly variable over the course of a Martian year, with strong seasonal changes in the densities and the D/H ratio of escaping atoms. A scenario is proposed to explain these changes that can be verified by future measurements.



Thursday, October 15th

4:00-5:00 p.m.

See website for Zoom information

John Clarke

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