

Magnetic Fields, Atmospheres, and the Connection to Habitability (MACH) –Using Team Science to determine how magnetic fields influence habitability

*Dave A Brain¹, William Peterson¹, Ofer Cohen², Tom Cravens³, Kevin France¹, Yoshifumi Futaana⁴, Alex Gloer⁵, Mats Holmstrom⁴, Lynn M Kistler⁶, Yingjuan Ma⁷, Laura Peticolas⁸, Robin Ramstad¹, Kanako Seki⁹, Bob Strangeway⁷, Aline Vidotto¹⁰

1. U. Colorado, 2. UMass Lowell, 3. U. Kansas, 4. IRF, 5. NASA GSFC, 6. UNH, 7. UCLA, 8. Sonoma State U., 9. U. Tokyo, 10. Trinity U.

In order to determine the extent to which a global magnetic field is required for a planet to be habitable at its surface, expertise is required from diverse communities, some of which have diverged from each other over the past several decades. For example, modelers and observers of the terrestrial magnetosphere have limited overlap and interaction with modelers and observers of unmagnetized planets or the giant planets in our solar system. There is relatively limited interaction between any of the above communities and those who study exoplanets, though efforts are increasing to bridge the solar system and exoplanet communities.

We describe a NASA Heliophysics DRIVE Science Center selected to answer the central question of this session: “Do Habitable Worlds Require Magnetic Fields” . This Center, named MACH (Magnetic Fields, Atmospheres, and the Connection to Habitability) includes scientists who study atmospheric escape from Earth, unmagnetized planets, and exoplanets. Over the next several years MACH will construct a framework that enables the evaluation of atmospheric loss from an arbitrary rocky planet, given information about the planet and its host star. The MACH Center will host a community-wide workshop in June 2021 centered around this topic, and is seeking to grow their interactions with interested scientists from relevant disciplines. In this presentation we report on progress toward answering the central question of MACH via comparison of spacecraft observations of atmospheric ion escape from Earth, Venus, and Mars - as well as comparison of global plasma simulations for ion loss from planets.

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