SOLAR WIND IMPLANTATION INTO LUNAR REGOLITH: HYDROGEN RETENTION IN A SURFACE WITH DEFECTS. W. M. Farrell [1,3], D. M. Hurley [2,3], M. I. Zimmerman [2,3], [1.] NASA/Goddard Space Flight Center, Greenbelt, MD, [2.] Johns Hopkins University/Applied Physics Laboratory, Laurel, MD, [3.] NASA's Solar System Exploration Research Virtual Institute, NASA/Ames Research Center, Moffett Field, CA

Abstract. Solar wind protons are implanted directly into the top 100 nanometers of the lunar near-surface region, but can either quickly diffuse out of the surface or be retained, depending upon surface temperature and the activation energy, U, associated with the specific implantation site. In this work, we explore the distribution of activation energies upon implantation and the associated hydrogen-retention times; this for comparison with recent observation of OH on the lunar surface.

We apply a Monte Carlo approach: for simulated solar wind protons at a given local time, we assume a distribution of U values with a central peak, U_c and width, U_w, and derive the fraction retained for long periods in the near-surface.

We find that surfaces characterized by a distribution with predominantly large values of U (> 1 eV, like that expected for vacancies) will retain implanted Hs. Surfaces with the distribution predominantly at small values of U (< 0.2 eV) will quickly diffuse away implanted Hs. However, surfaces with a large portion of activation energies between 0.3 eV < U < 0.9 eV will tend to be H-retentive in cool conditions but transform into H-emissive surfaces when warmed. These mid-range activation energies give rise to a diurnal effect with diffusive loss of H at noontime.