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Direct solar wind proton access into permanently shadowed lunar polar craters

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Recent analyses of Lunar Prospector neutron spectrometer (LPNS) data have suggested that high abundances of hydrogen exist within cold traps at the lunar poles, and it has often been assumed that hydrogen-bearing volatiles sequestered in permanent shadow are topographically shielded from sputtering by solar wind protons. However, recent simulation results are presented showing that ***solar wind protons clearly access the floor of an idealized, shadowed lunar crater*** through a combination of thermal and ambipolar processes, in effect creating a plasma "mini-wake". These simulations are the first to model the mini-wake environment in two spatial dimensions with a self-consistent lunar surface-plasma interaction. Progress is reported on constraining the nonzero particle fluxes and energies incident on kilometer-scale shadowed topography, such as a small crater embedded within a larger one. The importance of direct solar wind proton bombardment is discussed within the context of understanding the stability and inventory of hydrogen-bearing volatiles in shadow at the lunar poles. *The support of the National Lunar Science Institute, the DREAM Institute, LPROPS, and the NASA Postdoctoral Program at NASA Goddard Space Flight Center administered by ORAU are gratefully acknowledged.*