

## Redistribution of lunar polar water to mid-latitudes and its role in forming an OH veneer – Revisited

W. M. Farrell<sup>1,5</sup>, D. M. Hurley<sup>2,5</sup>, R. R. Hodges<sup>3,5</sup>, R. M. Killen<sup>1,5</sup>, J. S. Halekas<sup>4,5</sup>, and G. T. Delory<sup>4,5</sup>

1. NASA/Goddard SFC, Greenbelt, MD

2. Johns Hopkins/Applied Physics Laboratory, Laurel MD

3. Univ. of Colorado, Boulder, CO

4. Univ. California, Berkeley, CA

5. NASA Lunar Science Institute, Moffett Field, CA

**Abstract.** We suggest that energization processes like ion sputtering and impact vaporization can eject/release polar water molecules residing within lunar cold trapped regions with sufficient velocity to allow their redistribution to mid-latitudes. We consider the possibility that these polar-ejected molecules can be an additional (but not dominant) contribution to the water/OH veneer observed as a 3 micron absorption feature at mid-latitudes by Chandrayaan-1, Cassini, and EPOXI. Taking the conservative case that polar water is ejected only from the floor of polar craters with an 0.1% icy regolith then overall source rates are near  $10^{18}$  H<sub>2</sub>O/s. This outflow amounts to  $\sim 10^{-7}$  kg/s of water to be ejected from each pole and is a water source rate that is  $10^{-5}$  lower than the overall exospheric source rate for all species. Hence, the out-flowing polar water is a perturbation in the overall exosphere composition & dynamics. This polar water ‘fountain’ model may not fully account for the relatively high concentrations in the mid-latitude water veneer observed in the IR ( $\sim 10$ -1000 ppm). However, it may account for some part of the veneer. We note that the polar water fountain source rates scale linearly with ice concentration, and larger mass fractions of polar crater water should provide correspondingly larger fractions of water emission out of the poles which then ‘spills’ on to mid-latitude surfaces.

