EXOSPHERIC WATER PRODUCTION FROM METEOROIDS: SPORADICS VERSUS METEOR SHOWERS. M. Sarantos\(^1\) (menelaos.sarantos-1@nasa.gov), D. Janches\(^1\), and P. Pokorny\(^{1,2}\), \(^1\)Heliophysics Science Division, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA \(^2\)Department of Physics, The Catholic University of America, Washington, DC 20064, USA

**Introduction:** The Lunar Atmosphere and Dust Environment Explorer (LADEE) measured the lunar atmosphere for a period of five months with two instruments, a Neutral Mass Spectrometer (NMS) and an UltraViolet Spectrometer (UVS). Initial analyses of returned data indicate detections of exospheric water and OH for the first time and enhancements coincident with meteor showers \(^1\). These observations provide new constraints about the transport of volatiles at the poles, enable us to constrain the physical processes that contribute to the generation of the lunar exosphere, and provide insight about the meteoroid environment around the Moon.

**Methods:** We will quantify the expected difference in source rates of water and OH during sporadics, the continuously present rain of meteoroids on the Moon, and Geminids if the released water is endogenous to the Moon. For this calculation we utilize a dynamical model of the zodiacal cloud, which includes meteoroids from Jupiter Family, Halley Type and Oort Cloud Comets, and which predict where meteoroids arrive at the Moon \(^2\), with what velocity distribution, with what distribution in latitude and local time, and how this changes with lunar phase. The volume vaporized by a meteoroid is a function of its size and velocity \(^3\). The Geminids stream consists of bigger particles than the sporadic background, and to capture this effect in our estimates we use constraints from radar measurements. This calculation will provide limits to the relative importance of high-speed meteoroids from long-period comets.

Furthermore, we will present studies of the temporal evolution of water and OH released by impacts during Geminids with a Monte Carlo simulator of the exosphere-surface reservoir. The thermal environment for these transport simulations is provided by 0.5°×0.5° Diviner measurements (Fig 1). The temperature of the released ensemble can be 3000-5000 K (impact vaporization). Given the estimated release profile of water group vapor during Geminids, the simulations seek to quantify the nature (e.g., is there more hydroxyl than water released initially?) and fate of the water group exosphere by testing different sets of microphysical parameters of the soil.

Fig 1: Our simulator provides both gas density as well as surface abundance of an adsorbate. Here the evolution of the water reservoir in the South Pole region was simulated assuming a continuous release from meteoroids for 60 lunar months. If that were true, a monolayer of water frost would quickly accumulate on PSRs grains.