

Effects of an ICME on the Lunar Exosphere

Dana M. Hurley, Rosemary M. Killen and William M. Farrell

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The lunar exosphere is produced in part by the sputtering of atoms off of the Moon's surface by solar wind ions. We present simulations of He, Na, K, Mg, and Ca in the lunar exosphere under nominal conditions. Next, we examine the resulting exospheric enhancement that occurs during the passage of an Interplanetary Coronal Mass Ejection (ICME). Enhanced sputtering under ICME conditions can increase the mass of the lunar exosphere 10-50 times the nominal value. The increase occurs rapidly within the onset of the ICME. Similarly, after the storm passes the Moon, the return to nominal exospheric density is also rapid. Because sputtered particles are energetic, many escape the Moon. Thus ICMEs induce a mass loss from the Moon. However, the implantation of solar wind into the lunar regolith is also enhanced during an ICME, resulting in mass addition to the Moon. This partially mitigates the mass loss caused by ICME sputtering. We present model estimates of the net lunar mass loss induced by ICMEs