Energy dissipation and ice sublimation at the LCROSS impact site: constraints from the Diviner Lunar Radiometer

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Abstract. Energy dissipation in the lunar regolith by the LCROSS Centaur impact generated sufficient heat for the Diviner Lunar Radiometer to observe its infrared emission for the following four hours. Based on temperature constraints provided by Diviner, we model the cooling of a hot surface layer including the sublimation of ice and diffusion of water vapor. Of the total ice vaporized,the vast majority is lost instantaneously and the remainder escapes gradually as the thermal wave propagates into the ~ 40 K subsurface. Ice accelerates cooling due to latent heat and enhanced conduction. Evidence exists in near-infrared imagery from the LCROSS Shepherding Spacecraft that several minutes post-impact, the central region of the impact crater had cooled more rapidly than the rim; our models suggest this may be attributed to higher ice content at depth, even if the heating was spatially uniform.