DIVINER MEASURED BRIGHTNESS TEMPERATURES AND ROCK ABUNDANCE OF THE CHANG'E 4 LANDING SITE R. Nuno[1], P.O. Hayne[2], L. Rubanenko[1] and D.A. Paige[1] [1]University of California, Los Angeles, CA, USA, [2] Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder (rgnuno@ucla.edu)

Introduction: Chang'E 4 (CE-4) [1, 2] is a Chinese mission that successfully soft-landed a rover, Yutu 2, in Von Karman crater (45.5 S, 177.6 E) on the far side of the Moon on 3 January 2019. This site was chosen for its geologic interest, in a large pre-Nectarian crater in the NW of the South Pole-Aitken (SPA) basin, where questions can be addressed regarding the crustal formation and chemical evolution of the Moon [3]. The mission has several scientific objectives, among them is measuring the temperature of the lunar surface at different times and lighting conditions. Here, we present data from the Lunar Reconnaissance Orbiters Diviner radiometer instrument [4], which provides a unique view of the landing site. We investigate the temperature cycles and thermophysical properties of the landing region, specifically the rock abundance and regolith thermal inertia. These parameters have been shown to indicate the evolutionary state of the surface materials, and can also be used to age-date younger craters [5, 6, 7].

Diurnal Temperatures: We first present the surface brightness temperatures obtained by Diviner. Figure 1 shows the diurnal brightness temperature curve for the landing site using Diviner's channels 3-9, ranging from wavelength of a few micrometers to a few hundred micrometers. The landing site is a typical sub-equatorial surface on the Moon with relatively low surface roughness, indicated by the relatively low anisothermality (shown as the difference between channels 7 and 4 [8]).

Rock abundance: Figures 2 and 3 show the rock abundance thermally sensed by Diviner [5]. The landing site is within a relatively rock-free region though many sub-km sized craters on the floor of Von Karman have rocky ejecta blankets, indicating a relatively thin regolith cover. The largest of these young rocky craters is a 5-km diameter crater located at (176.14°E, 45.3°S), whose ejecta likely extends to the CE-4 landing site. Previously, the 95_{th} percentile rock abundance distribution around craters was correlated with their known radiometric ages to produce a power-law relation between the crater age and its rock abundance [6]. Using this approach and the 95_{th} percentile rock abundance value of 0.03 within the continuous ejecta, we derive an approximate age of ~ 100 Ma for this crater. There are also several nearby cold spots, though small, which should have ages < 1 Ma [9, 10].

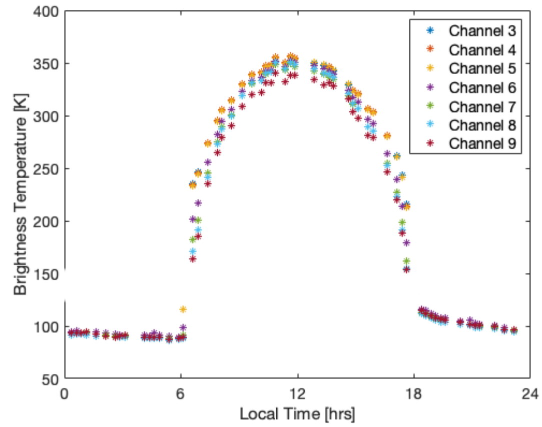

Figure 1: The diurnal brightness temperatures obtained by Diviner for the Chang'E 4 landing site, for Earth found in perihelion.

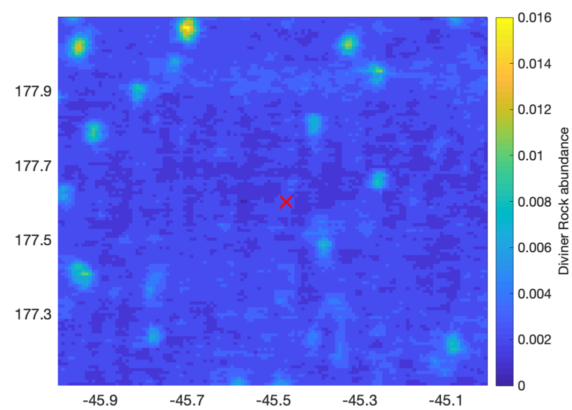

Figure 2: Diviner rock abundance map for the Chang'E 4 landing site marked by a red X.

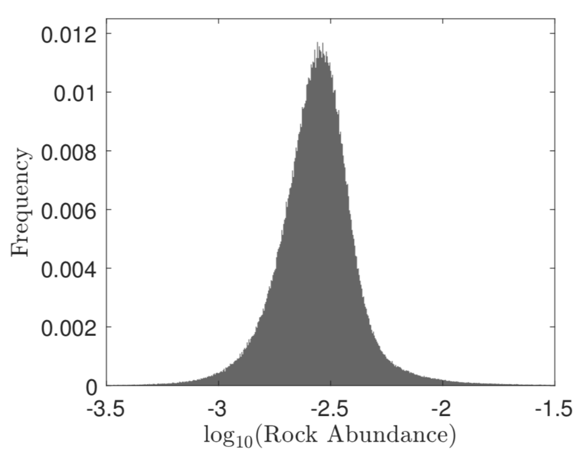

Figure 3: Histogram of rock abundance at the Change-4 landing site. The vast majority of the surface has $< 1\%$ rock abundance.

References

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