Characterization of Lunar Surface Environment at APPROACH Landing-site Candidate

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APPROACH (Advanced Penetrator Probe for a Challenge of Hard-landing) is a future lunar science mission which aims to investigate the internal structure of the Moon [1]. In this mission, a penetrator will be deployed on the Moon and observe seismic activities and heat flow. Generally, it is essential for almost all landing-missions to understand the surface environment of their landing-sites for successful touchdown. As for the Moon, recent missions (e.g. KAGUYA and LRO) obtained high-resolution imagery of lunar surface, and these data enabled us to evaluate the surface conditions.

To meet the science objectives of APPROACH [1], we selected a landing-site candidate using LROC Narrow Angle Camera (NAC) data, rock abundance map deduced from Diviner [2][3], Th map [4] and elevation map [5]. After the selection, we counted the boulders at the landing-site candidate to measure rock size-frequency distribution (RSFD).

We also simulated the deployment of a penetrator and estimated the probability of success (i. e. how many penetrators can successfully penetrate into subsurface). In the simulation, about 1 million rocks were randomly located within the error circle of the deployment. The size distribution of the rocks was given based on the RSFD we measured. Them, a penetrator was installed 1000 times. We carried out this operation 100 times and calculated the average and standard deviation of the probability of success. As a result, more than 99 % success was shown through the simulation.

In the presentation, we’ll show how the landing-site candidate was selected and what kind of analyses were demonstrated to evaluate the probability of success.

References

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