Overview of Smart Lander for Investigating Moon and Scientific Instrument

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Smart Lander for Investigating Moon(SLIM) is a technology demonstration mission to be launched in FY2021 aimed at precise landing(within a 100 m radius) of a small and lightweight lander. To achieve safe landing on steeper sloped areas such as its observation target, the SLIM adopts a unique two-stagelanding procedure. Lunar mantle constitutes more than 90% of the lunar volume. Ascertaining the mantle composition is therefore crucially important to estimate the bulk composition of the Moon. Such knowledge will enable us to understandlunarformation and evolution processes. However, no samples, which are believed to be directly derived from the mantle are available among lunar samples. Although olivineis believed to be a major mineral component oflunar mantle, its composition remains unclear. Recent remote-sensingdata obtained using the SELENE (Kaguya) Spectral Profiler(SP) revealed exposures with olivine-rich spectral features, distributed throughout the lunar surface. Surrounding largebasins, their spectral characteristics indicate an olivine-rich, pyroxene-poor composition. Distributions of olivine-rich materials at recent crater walls and ejecta suggestthat these olivine-rich exposures originated from mantleexcavated from depths bybasin-forming impacts. To investigate the olivine-rich lithology revealed by SELENE (Kaguya), SLIMcarries one scientific instrument: a MultiBand camera(MBC).For direct investigation of this unexplored lithology, onesmall (approximately 200 m)fresh crater justoutside of the Theophilus crater was selectedas a SLIM landing site, designated as Shioli. The MBC, a compact visible and near-infrared camera, has an imaging sensor (InGaAs), a filter wheel with 10 band-pass filters, a telephoto optical system, and a movable mirror for azimuth and elevation scanning. The MBC will observe boulders on the lunar surface with high spatial resolution of 1.3 mm/pixel at 10 m. It will investigate the mineralogy and composition of the olivine-rich lithology.To achieve high spatial resolution, the camera has afocusing mechanism that will operate automatically.It has four driving motors withinits small and lightweight body. It is approximately 4 kg, includingelectronics. The MBC technology is useful not only for optical instruments in future exploration missions, but for allinstrumentsthat require scanning.Afterthe SLIM mission, JAXA is planning a lunar polar exploration mission to investigate the abundance and distribution of water in the polar region for evaluation of the possibility of using wateras a resource, possibly asfuel. The precise landing technology demonstrated bySLIM is expected to be extremely important for polar missions and for future landing missions, includingMars missions, because targeted landing sites in these missions are likely to be verysmall to fulfill their intended scientific interest.

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