

Global high-resolution stereo mapping of the Moon with the SELENE Terrain Camera

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Japan will launch a full-dressed moon explorer SELENE in 2007. The SELENE will install 14 mission instruments and nominally take a polar orbit of 100km altitude. In the on-board instruments, there are 3 cameras: Terrain camera (TC), Multi-band Imager (MI), and Spectral Profiler (SP). The TC is a global stereo mapping imager, the MI is a global imager of 5-bands in visible range and 4-bands in near-infrared range, and the SP is a continuous spectral profiler of the range from visible to near infrared. These cameras share some electric circuits, radiator, and cover box, and thus compose a system that is called Lunar Imager and SpectroMeter (LISM). In this presentation, we will focus on the TC, introducing its achieved optical performance with the status of development for the on-board hardware and the data processing systems on the ground. The TC consists of two slant optical heads of focal length of 72mm: a forward (+15-degrees)-looking head and an aft (-15-degrees)-looking head. Each head is equipped with a one-dimensional CCD of nominal 3500 active pixels covered by a pan-chromatic filter of 430 to 850nm. Each pixel size of the CCD is 7-microns and the field of view of TC is +/- 10-degrees. Thus the spatial resolution of TC is 10m and the swath width of TC is 35km at the SELENE altitude of 100km. Since the SELENE paths mapped on the ground will be separated by 32km at the equator, the TC data of sequential orbits have nominally have overlap. During one year of SELENE operation, the TC will perform global stereo mapping at middle solar elevation angles and global high-contrast mapping at lower solar elevation angles for both morning and evening times. Last year, the flight model (FM) fabrication phase for TC was finished. The acquired optical performance data of TC satisfied the specific requirements: the signal-to-noise ratio at a radiance factor of 0.02 far exceeds 100, the modulation transfer function is more than 100, and the vignetting is less than 15%. On the other hand, we have started developing three data processing systems for TC data: the level 2A processing system, the level 2B, 2C, and 3 processing system, and the DTM production system. The level 2A system works the fundamental data processing such as de-pack of raw data in the form of CCSDS packet, decompression, extraction of data quality information, scene cutting, and attachment of the data label in the format of the Planetary Data System. The level 2B, 2C and 3 processing system carries out radiometric calibration, geometric correction, and photometric correction. The DTM production systems provide relative DTM for whole surface of the Moon to advance the studies in the lunar and planetary geology and geophysics considerably.