

SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Poster session (2D)

Author: Mr. Takeshi Hoshino

Japan Aerospace Exploration Agency (JAXA), Japan, hoshino.takeshi@jaxa.jp

Ms. Sachiko Wakabayashi

Japan Aerospace Exploration Agency (JAXA), Japan, wakabayashi.sachiko@jaxa.jp

Mr. Shoichi Yoshihara

Japan, yoshihara.shoichi@jaxa.jp

Prof. Tatsuaki Hashimoto

Japan Aerospace Exploration Agency (JAXA), Japan, hashimoto.tatsuaki@jaxa.jp

DEVELOPMENT OF TEST FACILITY FOR LUNAR SURFACE EXPLORATION

Abstract

As a follow-on mission of Kaguya (SELENE), a lunar lander SELENE-2 is planned by the Japan Aerospace Exploration Agency (JAXA). To realize the SELENE-2 mission, the JAXA Space Exploration Center (JSPEC) endeavors to develop advanced technologies that will enable lunar surface activities. In addition, advanced test facilities required for technology verification of surface elements are being developed. It is well known that the length of the lunar day is equivalent to 29.5 Earth days. As a result, a point on the Moon can receive continuous sunlight for two weeks and then be without sunlight for two weeks. Therefore, the temperature change at low latitudes is intense. The lowest Moon surface temperature is below 100 K at night and the highest temperature is approximately 400 K during the day. To carry out long-term activities on the lunar surface, the spacecraft and instruments must survive the cold temperatures of the long lunar night. For example, a power supply system and thermal insulation technology that are necessary for long-term activity have been investigated using a test facility that simulates the thermal conditions of the lunar surface. Therefore, a test facility to simulate lunar temperature environment has been developed for technology verification. The test facility is a set of vacuum chambers that are 0.4 to 1.5 m in diameter. Each chamber has a plate that simulates lunar surface temperature. Besides these chambers, an in-door test field for lunar landing exploration has been constructed. The test field is mainly intended to be used for experimental investigation of landing legs and lunar rovers. The most important feature of our field is that it is covered with lunar regolith simulant with a depth of about 250 mm. The field is divided into a section of about 2x3 m with variable slope and a planar section of about 3x5 m. The variable slope section has a mechanism that can achieve an inclination of up to about 30 degrees and is equipped with a leveling machine to maintain the condition of the lunar regolith simulant. Recently, an advanced leveling machine for the planar section has also been developed. It has a feature to control hardness of the simulant. This paper details our technology development of test facilities for lunar surface exploration.