
Physics of plasma–surface–exosphere–dust coupling at the lunar surface for future exploration programmes

Yoshifumi Futaana (Swedish Institute of Space Physics)

Matt Taylor, Iannis Dandouras, Ruth A. Bamford, Jan Bergman, Arnaud Beth, Jean-Yves Chaufray, Dragos Constantinescu, Vincenzo Dellacorte, Benjamin Grison, Riku Jarvinen, Yanwei Li, Rumi Nakamura, Frank Postberg, Sylvain Ranvier, Elias Roussos, Audrey H. Vorburger, Nadine M. Boersma, James Carpenters, Francesca McDonald, Josef Winter

The Moon is a unique location to study heliophysics, providing an opportunity to investigate the deep space environment upstream of geospace and, conversely, the terrestrial magnetosphere and associated space weather phenomena. The Moon interaction with the solar wind adds novel, interdisciplinary aspects to fundamental space research: a complex coupling between the solar wind/magnetospheric plasma – energetic particles – exosphere – dust – solid-surface – mini-magnetosphere. Such coupling is common in Universe, physics of which are applicable to rocky exoplanets, exomoons and interstellar objects, while these are (yet) beyond the scope of in situ exploration. As the Moon is the next step in space exploration, characterizing the environment is a vital support to this endeavor. With these aspects as a background, we formed an ESA topical team to formulate scientific questions in the area of space plasma physics that can be uniquely investigated on or near the lunar surface. We also derived the required measurements, which can be addressed by lunar missions in the short and long term, including the EL3 (European Logistic Lunar Lander) mission. In this presentation, we introduce the background scientific context and describe the derived scientific concepts.