

Synergies between dust and heliosphere science from the Lunar Gateway

Veerle Sterken¹

¹ETH Zürich, Switzerland

The Lunar Gateway is a new astronaut's "home" in orbit around the moon that will function as a hub for the lunar landings as well as pave the way for further exploration towards Mars. It will also serve as a platform for scientific experiments. Its construction by ESA, NASA, JAXA, and CSA is foreseen to start in 2024/2025 and first opportunities for scientific experiments may be available from the early 2030s. The Gateway offers a unique platform for interstellar, interplanetary and cometary dust research due to its location at 1 AU, away from Earthly debris. At 1 AU, it also has a heliocentric orbital velocity that is ideal for interstellar dust in situ measurements (in March every year) and interstellar dust sample return (in September every year). In particular the next focusing phase of interstellar (and interplanetary) dust in the solar system in the early 2030s makes the timeframe of the Gateway for this research ideal. Moreover, the new generation of dust instrumentation offers opportunities for "active" sample return and dust trajectory reconstruction through the use of dust surface charge grids. This is crucial for distinguishing interstellar from interplanetary dust particles (for radii larger than ca. 0.2 micron) and to trace back dust origins from comet to comet for the cometary dust streams, allowing for the first time, statistical sampling of dust from different sources. This talk gives an overview of the science case of cosmic dust from the Lunar Gateway and its implications for astrophysics, planetary sciences, and heliospheric sciences.