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DUST MEASUREMENT OPPORTUNITIES FROM THE LUNAR GATEWAY: A SCIENCE BASED APPROACH

Abstract

Cosmic dust particles in the solar system are charged through various processes. Since they move through the heliospheric magnetic field that depends on the 22-year magnetic solar cycle, their trajectories are affected: every 11 years, they focus near the ecliptic plane, and every other 11 years they defocus. These focussing phases of the solar cycle present unique opportunities to analyze those interstellar dust particles in the solar system that in other phases of the magnetic solar cycle would not be able to reach 1 AU. The next focussing phase will occur around 2030, yielding an excellent science case for having a dust detector on the Lunar Gateway. Larger particles are not affected, but can be captured using an (active) dust collector, and be brought back to Earth thanks to a fairly low relative speed between the Gateway and the interstellar dust in September each year.

In addition to interstellar dust, the Lunar Gateway will provide a great opportunity to measure or bring back to Earth various populations of interplanetary dust - with long integration times. Dust species may be investigated like interplanetary dust particles (including alpha-meteoroids), lunar ejecta, nanodust, cometary streams from various types of comets that can provide insights in the history of the solar system, and finally beta-meteoroids that would allow to characterize the present-day outflow of dust from

the solar system.

In this talk we outline the unique science case for a dust detector on the Lunar Gateway, we present predictions for dust fluxes of each type, and conclude about what instrumentation could be used with ist assets and with its limitations.