IAF SYMPOSIUM ON ONGOING AND NEAR FUTURE SPACE ASTRONOMY AND SOLAR-SYSTEM SCIENCE MISSIONS (A7)
Science Goals and Drivers for Future Exoplanet, Space Astronomy and Space Physics (2)

Author: Dr. Veerle Sterken
ETHZ, Switzerland

Mr. Pietro Gentile
ETHZ, Switzerland
Ms. Megha Choudhary
ISAE-Supaero University of Toulouse, France
Ms. Alessandra Bergese
ISAE - Institut Supérieur de l'Aéronautique et de l'Espace, France
Dr. Joan-Pau Sanchez Cuartielles
ISAE-Supaero University of Toulouse, France
Dr. Harald Krueger
MPS, Germany
Dr. Silvan Hunziker
ETHZ, Switzerland
Dr. Kostas Dialynas
Greece
Dr. Arik Posner
NASA Headquarters, United States
Dr. Kyung-Suk Cho
Korea Astronomy and Space Science Institute, Korea, Republic of

DUST-HELIOSPHERIC SCIENCE WITH THE DOLPHIN AND SUNCHASER+ MISSION CONCEPTS

Abstract

Cosmic dust particles in the solar system are messengers from their birth places and from processes in the solar system or in interstellar space. They can be measured by in situ measurements using dedicated or "serendipity" instruments on spacecraft, like by time of flight mass spectrometers, trajectory grids, simple dust counters, or by plasma wave antennas, using the fact that hypervelocity impacts create small plasma clouds from which information on the impacting dust can be inferred.

These particles' trajectories are shaped by various forces in the solar system of which the most intriguing one is the Lorentz force, which affects in particular sub-micrometer dust: due to the charged dust particles' motion through the solar system magnetic fields, their trajectories get coupled to the solar system plasmas. These dust particles become tracers of the heliospheric magnetic fields, and open up new science synergies connecting cosmic dust and plasma physics.

The Dust Observatory to study the Lic, interPlanetary dust, and Heliospheric Interactions in our Neighbourhood (DOLPHIN) mission concept, initially submitted for the last ESA call for F-class proposals, is dedicated to unravel the mysteries of cosmic dust in the solar system and in particular its dust-plasma interactions. The SunCHASER+ mission concepts, on the other hand, are dedicated to solar activity research in benefit of (human) interplanetary space exploration, and would offer the opportunity to fly a dedicated dust instrument.

In this talk we outline the unique science cases of the DOLPHIN and of the SunCHASER+ mission concepts. We present predictions for cosmic dust fluxes at the DOLPHIN spacecraft trajectory and conclude about what instrumentation can be used to reach the science goals for dust, each with their assets and its limitations.