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Understanding the Solar System Through the In Situ Detection and Analysis of Cosmic Dust Particles

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Abstract

The detection and analysis of cosmic dust particle can reveal an ongoing process in the Solar System. Thus, providing a window into the formation of the Solar System, and history of its original building blocks. Cosmic dust is continually generated, processed, and destroyed. In situ detection and analysis provide information on the conditions at the source, and interactions that govern their faith. The Cosmic Dust Analyzer (CDA) instrument onboard the Cassini mission showed that dust analyzer instruments may be uniquely able to provide critical information on the workings of the Solar System; the origin of organics within, and the habitability of words outside of Earth. At LASP, we operate a unique laboratory calibration facility using a 3 MV electrostatic dust accelerator that allows the study of impact processes at the hypervelocity range, and the development and testing of instruments. This presentation will review the open science questions, the technicalities and operation principle of dust analysis, and the preparations for interpretation of data to be collected. There are three selected space missions that will carry dust analyzer instrument to answer important questions about the habitability of Jupiter's moon Europa (Europe Clipper), the state of the original building blocks that formed the Solar System (Interstellar Mapping and Acceleration Probe, IMAP), and investigate and active asteroid and map out the dust environment near Earth's orbit (Destiny+).

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A short biography:

Zoltan Sternovsky is an associate professor at the Laboratory of atmospherics and Space Physics (LASP) and the Smead Aerospace Engineering Sciences Department at the University of Colorado. His past experience includes working on laboratory plasma physics and elementary processes that lead to the charging of dust particles in space. He has developed instruments for the detection and analysis of dust for sounding rockets and space missions. He is a co-investigator on a number of space flight missions, including Europa Clipper to Jovian moon Europa, or the recently selected IMAP mission. His main focus is on the understanding of first principles of dust detection and analysis in space.