The Interstellar Dust Experiment (IDEX) onboard NASA's Interstellar Mapping and Acceleration Probe (IMAP) mission

Mihaly Horanyi*[1]

[1]LASP and Department of Physics, University of Colorado (CU), Boulder – United States

Abstract

The Interstellar Mapping and Acceleration Probe (IMAP) is scheduled to launch in September 2025, to be stationed at the Sun-Earth L1 Lagrange point with a combination of 10 in-situ and remote sensing instruments. A primary science goal of IMAP is to improve our understanding of the composition and properties of the local interstellar medium. The local interstellar medium contains plasma, magnetic fields, neutral atoms, cosmic rays, and dust which all influence the heliosphere through interconnected time-dependent and multi-scale processes. IDEX will measure interstellar dust particles' (ISD) flux, size distribution, and composition, characterizing the inflowing solid matter from the local interstellar medium reaching the inner heliosphere. IDEX will determine whether the composition of the contemporary local interstellar cloud's dust population is consistent with being the feedstock for forming the Solar System. IDEX will also detect the shared pool of interplanetary dust particles (IDP) of cometary and asteroidal origin and determine whether some IDPs preserve unprocessed pre-solar molecular cloud particles or show signatures of processing in the solar system. IDEX will identify basic organic material from asteroids and various cometary families to determine if they share a common source or are formed from distinct reservoirs. The variability of the size distribution and the directionality of the ISD flux, compared to the modeling of their propagation through the solar system, will test our models of the large structure of the heliospheric magnetic fields, and the temporal variability of the processes that control the filtering of small ISD particles that prevent them from reaching the inner solar system. IDEX dust detection is based on impact ionization, where elemental and molecular ions are generated in a high-velocity dust impact and analyzed in a time-of-flight (TOF) setup. This talk will discuss the first scientific results of IDEX. Representing the IMAP/IDEX Project.

*Speaker