

## **FOSSIL – Fragments from the Origins of our Solar System: Exploring the Chemical Diversity of Comets, Asteroids, and Interstellar Dust at 1 AU**

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Interplanetary and interstellar dust particles (IDP and ISD) carry valuable information about their parent bodies that can now be fully harvested through in situ detection and analysis using advanced instrumentation. Placing dust analyzer instruments onboard a near-Earth spacecraft can revolutionize our understanding of the composition of IDP, at 1 AU dominated by Jupiter Family Comet particles, and ISD. Deciphering the composition of interstellar, cometary, and asteroidal dust - successive generations of the planets' building blocks - offers an unparalleled opportunity to explore the origin and evolution of our Solar System. In addition to testing ideas about planet formation, these observations will enable: a) probing the large-scale structure of the heliosphere's magnetic fields through monitoring changes in the ISD flux over space and time; b) comparing our dust disk of IDPs to Zodiacal dust disks around other stars, to assess the distribution of comets and asteroids in other planetary systems; and c) identifying the composition cosmic matter ablating in our atmosphere each day.