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Surveying the edge of our solar system and the interstellar interaction with IBEX and preparing for IMAP

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By exploring our global heliosphere and its myriad interactions, we develop key physical knowledge of the interstellar interactions that control our space environment. IBEX was the first mission to explore the global heliosphere and, in concert with Voyager 1 and Voyager 2, is discovering a fundamentally new and uncharted physical domain of the outer heliosphere. The enigmatic IBEX ribbon and INCA belt were unanticipated discoveries demonstrating that much of what we know or think we understand about the outer heliosphere needs to be revised. With more than 9 years of observations, we now can directly observe the evolution of the global heliosphere manifest in both the IBEX ribbon and the globally distributed flux (GDF) emitted from the inner heliosheath. The time evolution of the ribbon and GDF are key to understanding the physical mechanisms that control the evolving global heliosphere. At the heart of our heliosphere's interstellar interaction lies a population of suprathermal particles that exert enormous pressures, channeling much of the energy from the solar wind into particle acceleration. The next quantum leap enabled by the Interstellar Mapping and Acceleration Probe (IMAP) will open new windows on the frontier of Heliophysics at a time when the space environment is rapidly evolving. IMAP provides the first comprehensive in situ and remote global observations to discover the fundamental physical processes that control our solar system's evolving space environment. IMAP images the global boundaries that surround our heliosphere across an unprecedented energy range (100 eV to 70 keV) to make the next major advances in understanding the temporal and spatial evolution of the boundary region in which the solar wind and the interstellar medium interact. IMAP revolutionizes our understanding of the composition and properties of the local interstellar medium, and provides leaps in understanding the physical processes that mediate the magnetic fields and plasma processes active within the interaction boundaries surrounding our solar system. Additional information about IMAP can be found at imap.princeton.edu.