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A Pragmatic Path to Investigating Europa's Habitability

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Abstract

Assessment of Europa's habitability, as an overarching science goal, will progress via a comprehensive investigation of Europa's subsurface ocean, chemical composition, and internal dynamical processes. The National Research Council's Planetary Decadal Survey placed an extremely high priority on Europa science but noted that the budget profile for the Jupiter Europa Orbiter (JEO) mission concept is incompatible with NASA's projected planetary science budget. Thus, NASA enlisted a small Europa Science Definition Team (ESDT) to consider more pragmatic Europa mission options. In its preliminary findings (May, 2011), the ESDT embraces a science scope and instrument complement comparable to the science "floor" for JEO, but with a radically different mission implementation. The ESDT is studying a two-element mission architecture, in which two relatively low-cost spacecraft would fulfill the Europa science objectives. An envisioned Europa orbital element would carry only a very small geophysics payload, addressing those investigations that are best carried out from Europa orbit. An envisioned separate multiple Europa flyby element (in orbit about Jupiter) would emphasize remote sensing. This mission architecture would provide for a subset of radiation-shielded instruments (all relatively low mass, power, and data rate) to be delivered into Europa orbit by a modest spacecraft, saving on propellant and other spacecraft resources. More resource-intensive remote sensing instruments would achieve their science objectives through a conservative multiple-flyby approach, which is better suited to handle larger masses and higher data volumes, and which aims to limit radiation exposure. Separation of the payload into two spacecraft elements, phased in time, would permit costs to be spread more uniformly over multiple years, avoiding an excessively high peak in the funding profile. Implementation of each spacecraft would be greatly simplified compared to previous Europa mission concepts, minimizing new development while achieving the key Europa science objectives. We will report on the status of this evolving concept, and will solicit community feedback, as we pursue innovative and low-cost ways to explore Europa and investigate its habitability.