

The Europa Clipper Mission: Addressing the Habitability of a Dynamic Ocean World

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Europa is a key target for astrobiological exploration, potentially hosting the ingredients for life: liquid water, bioessential elements, and chemical energy. It is a complex and potentially currently active world on which to study a wide range of processes relevant to understanding ocean worlds, including: tectonics; tidal deformation and heating; impact cratering; mass wasting; surface-plasma, exospheric, and magnetospheric interactions; solid state convection; and cryovolcanism, potentially including plumes.

The overarching science goal of the Europa Clipper Mission is to investigate the habitability of Europa, with the following specific science objectives: (1) Ice Shell & Ocean: Characterize the ice shell and any subsurface water, including their heterogeneity, ocean properties, and the nature of surface-ice-ocean exchange; (2) Composition: Understand the habitability of Europa's ocean through composition and chemistry; (3) Geology: Understand the formation of surface features, including sites of recent or current activity, and characterize high science interest localities. It will additionally search for any current activity, including plumes or thermal anomalies, using multiple instruments.

To address Europa science objectives, NASA has selected a highly capable suite of instruments, including both those that will directly sample fields and particles around Europa and those that will globally characterize the surface through remote-sensing, covering wavelengths from ultraviolet through radar. These instruments include: (1) Europa Ultraviolet Spectrograph (Europa-UVS); (2) Europa Imaging System (EIS); (3) Mapping Imaging Spectrometer for Europa (MISE); (4) Europa Thermal Imaging System (E-THEMIS); (5) Radar for Europa Assessment and Sounding: Ocean to Near-surface (REASON); (6) Interior Characterization of Europa using Magnetometry (ICEMAG); (7) Plasma Instrument for Magnetic Sounding (PIMS); (8) MAss Spectrometer for Planetary Exploration (MASPEX); and (9) SUrface Dust Analyzer (SUDA). Gravity science will also be investigated via the spacecraft telecom system in combination with REASON altimetry, and a planned radiation monitoring system will provide valuable scientific data about the environment around Europa. Together, these investigations will test hypotheses relevant to the interior, composition, and geology of Europa and to provide a synergistic framework to address the potential habitability of this intriguing moon.

An overview of the status of planned Europa Clipper mission, including the synergistic science investigations, will be presented.

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