SCIENCE OBJECTIVES AND CAPABILITIES OF THE NASA EUROPA MISSION. R. T. Pappalardo[1], L. M. Prockter[2], D. A. Senske[1], R. Klima[2], S. Fenton Vance[1], K. Craft, and the Europa Science Team. [1]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, [2]Johns Hopikns University Applied Physics Laboratory, 11100 Johns Hopkins Rd., Laurel, MD.

Overview: In May 2015, NASA announced selection of a suite of nine instruments for the NASA Europa mission's scientific payload. The payload consists of five remote sensing instruments that cover the wavelength range from ultraviolet through radar and four *in situ* instruments that measure fields and particles; moreover, gravity science can be achieved via the telecom system, and valuable scientific data could come from the spacecraft's planned radiation monitoring system.

The overall goal of the mission is: Explore Europa to investigate its habitability. The mission's science objectives are as follows.

Ice Shell and Ocean: Characterize the ice shell and any subsurface water, including their heterogeneity, ocean properties, and the nature of surface-ice-ocean exchange.

Composition: Understand the habitability of Europa's ocean through composition and chemistry.

Geology: Understand the formation of surface features, including sites of recent or current activity, and characterize high science interest localities.

Remote Sensing Instruments: The mission's remote sensing instruments are the following:

Europa Ultraviolet Spectrograph (Europa-UVS), an ultraviolet spectrograph with the following science objectives:

Atmosphere: Composition & chemistry, source & sinks, structure & variability from equator to pole;

Plumes: Distribution, structure, composition, and variability of active plumes;

Surface: Explore surface composition & microphysics and relation to endogenic & exogenic processes;

Plasma Environment: Investigate energy and mass flow into Europa's atmosphere, neutral cloud & plasma torus;

Europa Imaging System (EIS), made up of a narrow angle and wide angle camera with the obectives to constrain the formation of surface features and the potential for current activity, characterize the ice shell, and characterize the surface regolith at small scales; constrain the formation of surface features and the potential for current activity, characterize the ice shell, and characterize the surface regolith at small scales;

Mapping Imaging Spectrometer for Europa (MISE), an instrument operating in the 0.8 to 5.0 µm range in order to, assess the habitability of Europa's ocean by understanding the inventory and distribution of surface compounds, investigate the geologic history of Europa's surface, and search for areas that are currently geologically active;

Europa Thermal Imaging System (E-THEMIS) to detect and characterize thermal anomalies that may indicate recent activity, identify active plumes, and determine the regolith particle size, block abundance and subsurface layering for surface process studies;

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Radar for Europa Assessment and Sounding: Ocean to Near-surface (REASON), which will, characterize the distribution of any shallow subsurface water, search for an ice-ocean interface and characterize the ice shell's global thermophysical structure, investigate the processes governing material exchange among the ocean, ice shell, surface, and atmosphere, constrain the amplitude and phase of the tides, and characterize scientifically compelling sites, and hazards, for a potential future landed mission.

***In Situ* Instruments:** The *in situ* fields and particles instruments are the following:

Interior Characterization of Europa using Magnetometry (ICEMAG) with the objectives to, determine the location, thickness, and salinity of Europa's ocean by magnetic field induction at multiple frequencies, identify sources of Europa's atmosphere and atmospheric loss processes by characterizing any active vents, plumes, and ionized plasma trails, and understand coupling of Europa to Jupiter's ionosphere, and coupling of plumes to flowing plasma;

Plasma Instrument for Magnetic Sounding (PIMS) that will, determine Europa's magnetic induction response, corrected for plasma contributions, to estimate ocean salinity and thickness, provide a means to understand mechanisms of weathering and releasing material from Europa's surface into the atmosphere, and facili-

tate understanding of how Europa influences its local space environment and Jupiter's magnetosphere;

MAss Spectrometer for Planetary EXploration (MASPEX), that will provide in situ analysis to determine the distribution of major volatiles and key organic compounds in Europa's exosphere/plumes and their association with geological features and Determine the relative abundances of key compounds to constrain the chemical conditions of Europa's ocean (isotopologues, radiolysis products, hydrocarbons C1-C8 in plume materials);

SUrface Dust Analyzer (SUDA) that will map the surface composition of Europa, characterize the alteration of Europa's surface via exogenous dust, and determine the composition of the particulate matter in active plumes.

Using the spacecraft telecommunication system, gravity measurements will characterize Europa's time-varying gravitational tides and confirm the existence of Europa's subsurface ocean.

Summary: Taken together, the Europa mission's instrument payload has the potential to test hypotheses relevant to the composition, interior, and geology of Europa, in order to address the potential habitability of this intriguing moon. The unified science traceability matrix is currently being honed by the full Europa Science Team. This presentation will summarize the unified science objectives and the capabilities of the instrument suite, providing an overview of the outstanding synergistic science that can come from this mission.