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The Science Planning Process for the JUICE mission

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The Science Planning Process for the JUICE mission

Claire Vallat et al.

JUICE is the first large mission chosen in the framework of ESA's Cosmic Vision 2015-2025 program.

The focus of JUICE is to characterize the conditions that might have led to the emergence of habitable icy satellites, in particular Europa, Callisto and Ganymede. In addition, JUICE will also perform a multi-targeted study of the Jupiter system as an archetype for gas giants.

To address those key science objectives, the spacecraft payload consists of 10 state-of-the-art instruments (including the spacecraft telecommunication system with ground-based instruments) that will perform remote sensing of Jupiter, its moon and their environment.

From a trajectory's point of view, the mission calls for a three-year orbital survey of the Jupiter System, including orbits around the planet of different periods and inclinations, and includes 35 flybys of Europa (2), Ganymede (1) and Callisto (1). The second part of the mission will devote an additional 9 months in orbit around Ganymede for a detailed study of Ganymede as a planetary object and possible habitat.

By its touring nature and due to the diversity of science targets and different disciplines involved in the observation plan will often face conflicting observations opportunities, also limited in resources as a function of the varying and geo-centric distances at play.

The Science Operations Center, together with the Project Scientist and the Science Working Team, is currently developing a science planning strategy for the mission to ensure that the prime science objectives of the mission are remaining compatible with the mission constraints.

The JUICE Science Planning Process for the Jupiter tour consists of two main pillars:

- **Segmentation of the trajectory.** Based on the Cassini heritage, this activity relies on the analysis of the trajectory along the tour to subsequently support the decision on selecting a prime scientific objective to be observed given the available resources (data volume, power and pointing) for a specific time window (a.k.a segment). Taking into account the activities' constraints (navigation, wheel off-loading etc) and high-level resources' estimate, an a

coverage and resource status along the tour is performed, and several iterations between (through the science working groups) take place to converge towards a plan that should ensure the mission are fulfilled within the operational constraints of the mission.

- **Detailed sizing case analysis for science operations:** For specific operationally of scientific segmentation, in-depth analysis is needed in order to refine resources assumptions (attitude, p segmentation level. Those detailed analysis, performed down to observation level, is done in c teams.

The present work will describe the different steps and groups involved in the science planning, the cur and the detailed analysis of the first JUICE Europa flybys will be presented.

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