JUICE: THE ESA MISSION TO STUDY HABITABILITY OF THE JOVIAN ICY MOONS. D. Titov[1], S. Barabash[2], L. Bruzzone[3], M. Dougherty[4], L. Duvet[1] , C. Erd[1] , L. Fletcher[5], R. Gladstone[6], O. Grasset[7], L. Gurvits[8,9], P. Hartogh[10], H. Hussmann[11], L. Iess[12], R. Jaumann[11], Y. Langevin[13] , P. Palumbo[14], G. Piccioni[15] and J.-E. Wahlund[16].
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JUICE (JUpiter ICy moons Explorer) is the first L-class mission of the ESA's Cosmic Vision programme 2015-2025 [1, 2]. JUICE will perform detailed investigations of Jupiter and its system with particular emphasis on Ganymede as a planetary body and potential habitat. Investigations of Europa and Callisto will complete a comparative picture of the Galilean moons.

The overarching theme for JUICE is: *The emergence of habitable worlds around gas giants*. At Ganymede, the mission will characterize in detail the ocean layers; provide topographical, geological and compositional mapping of the surface; study the physical properties of the icy crusts; characterize the internal mass distribution, investigate the exosphere; study Ganymede's intrinsic magnetic field and its interactions with the Jovian magnetosphere. For Europa, the focus will be on the non-ice chemistry, understanding the formation of surface features and subsurface sounding of the icy crust over recently active regions. Callisto will be explored as a witness of the early solar system.

JUICE will perform a multidisciplinary investigation of the Jupiter system as an archetype for gas giants. The circulation, meteorology, chemistry and structure of the Jovian atmosphere will be studied from the cloud tops to the thermosphere. The focus in Jupiter's magnetosphere will include an investigation of the three dimensional properties of the magnetodisc and in-depth study of the coupling processes within the magnetosphere, ionosphere and thermosphere. Aurora and radio emissions will be elucidated. JUICE will study the moons' interactions with the magnetosphere, gravitational coupling and long-term tidal evolution of the Galilean satellites.

JUICE will be a three-axis stabilised spacecraft with dry mass of about 1800 kg at launch, chemical propulsion system and 60-75 m^2 solar arrays. The high-gain antenna of about 3 m in diameter will provide a downlink capability of not less than 1.4 Gb/day. The launch is foreseen is June 2022. After the Jupiter orbit insertion in January 2030, the spacecraft will perform a 2.5 years tour in the Jovian system investigating the atmosphere and magnetosphere of the giant. Gravity assists at Callisto will shape the trajectory to perform two targeted Europa flybys and raise the orbit inclination up to 30 degrees. 13 Callisto flybys will enable unique remote observations of the moon and *in situ* measurements in its vicinity. The mission will culminate in a dedicated 8 months orbital tour around Ganymede that will include high (5000 km), medium (500 km), and low (200 km) circular orbits.


JUICE artist impression (Credits ESA, ATG medialab)

The JUICE spacecraft will carry highly capable scientific payload consisting of 10 state-of-the-art instruments onboard the spacecraft plus one experiment that uses the spacecraft telecommunication system with ground-based telescopes. The *remote sensing package* includes a high-resolution multi-band visible imager (JANUS) and spectro-imaging capabilities from the ultraviolet to the sub-millimetre wavelengths (MAJIS, UVS, SWI). A *geophysical package* consists of a laser altimeter (GALA) and a radar sounder (RIME) for exploring the surface and subsurface of the moons, and a radio science experiment (3GM) to probe the atmospheres of Jupiter and its satellites and to perform measurements of the gravity fields. An *in situ package* comprises a powerful particle environment package (PEP), a magnetometer (J-MAG) and a radio and plasma wave instrument (RPWI), including electric fields sensors and a Langmuir probe. An experiment (PRIDE) using ground-based Very-Long-Baseline Interferometry (VLBI) will provide precise determination of the moons ephemerides.

The presentation will give an overview of the JUICE mission, its science scenario, observation strategy, and the newly selected payload.