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Exploration of Jupiter's atmosphere and magnetosphere with the European Jupiter Icy Moon Explorer (JUICE)

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Abstract

JUICE - JUpiter ICy moons Explorer - is the first large mission in ESA's Cosmic Vision 2015-2025 programme. The mission was selected in May 2012 and adopted in November 2014. The implementation phase started in July 2015. Planned for launch in June 2022 and arrival at Jupiter in October 2029, it will spend at least three years making detailed observations of Jupiter and three of its largest moons, Ganymede, Callisto and Europa. JUICE will then orbit Ganymede for almost a year.

JUICE will perform a varied and extensive orbital tour with access to high latitudes to provide a comprehensive study of the unique environmental conditions at Jupiter's poles.

The overarching theme for JUICE is: *The emergence of habitable worlds around gas giants*. JUICE will also perform a multidisciplinary investigation of the Jupiter as an archetype for gas giants. In this paper, we will present the science objectives and key measurements performed by the instrument suite, relevant to the study of the atmosphere and magnetosphere of Jupiter. We will also present the first steps of the science implementation, as performed by the ESA Working Groups and Science Working Team.

Jupiter Atmospheric Science

JUICE will study Jupiter's atmosphere as a complex, coupled system from the dynamic weather layer to the upper thermosphere. It will study the variability of Jovian climatology, dynamics, winds, gaseous composition and cloud structure.

The instruments of the remote sensing package will conduct the required measurements. It consists of imaging (JANUS) and spectral-imaging capabilities from the UV to the sub-mm wavelengths (UVS, MAJIS, SWI).

Jupiter Magnetospheric Science

JUICE will investigate the 3D properties of the magnetodisc, and will study the coupling processes within the magnetosphere, ionosphere and thermosphere.

The instruments of the in situ package will perform the key measurements relevant to these objectives. It comprises a suite to study plasma and neutral gas environments (PEP) with remote sensing capabilities via energetic neutrals, a magnetometer (J-MAG) and a radio and plasma wave instrument (RPWI).