Jupiter icy moon explorer (JUICE)

Understanding our Solar System

JUICE is an ESA Large class science mission. It will study Jupiter and three of its icy moons: Ganymede, Europa and Callisto. Liquid water is thought to be below the icy surface of these moons, so a key aspect will be to study them for potential habitability.

The JUICE mission will help us understand big questions about our solar system – how it was formed, what are the conditions for planet formation and how life might form in a Jupiter type planetary system.

JUICE will also study the atmosphere and magnetosphere of Jupiter and the interactions of the magnetosphere with its moons. It will carry 11 different science experiments, including a magnetometer, an optical camera and a geophysical package.

Set for launch in 2022, it will arrive in 2030 and will then spend 3.5 years in orbit in the Jovian system.

10 scientific instruments on one unique space craft

The JUICE spacecraft will carry 10 scientific instruments to carry out powerful remote sensing and geophysical measurements and observations across its 11 year life. You can read about each of these instruments on the ESA mission webpages.

Remote sensing instruments

- JANUS – Camera system lead by a team in Italy.
- MAJIS – Moons and Jupiter Imaging Spectrometer
- UVS – UV imaging Spectrograph
- SWI – Sub-millimeter Wave Instrument

Geophysical instruments

- GALA – GAnymede Laser Altimeter
- RIME – Radar for Icy Moons Exploration

Radio science instrument

- 3GM – Gravity & Geophysics of Jupiter and Galilean Moons

In situ instruments

- PEP – Particle Environment Package
- J-MAG – A magnetometer instrument for JUICE
- RPWI – Radio & Plasma Wave Investigation

How is the UK involved?

UKSA has invested approximately £9 million spanning across all UK involvement in the mission up to instrument delivery.

The UK is leading the development of the magnetometer, J-MAG. The team at Imperial College London are led by Principal Investigator, Prof. Michele Dougherty.

Scientific measurements from the J-MAG magnetometer will lead to an understanding of the formation of the Galilean satellites, a characterisation of their oceans and interiors, and will provide deep insight into the behaviour of rapidly rotating magnetised bodies and how they accelerate particles.

Recent work for the J-MAG team has concentrated on the Qualification Model (QM) and Flight Model (FM) units which has culminated in the delivery of the J-MAG FM unit for integration on the spacecraft in May 2021.

The spacecraft arrived at ESTEC in April 2021 and is undergoing environmental and functional test campaign. JUICE aims to launch on the Ariane 5 rocket, with launch window opening at the end of August 2022. Following its cruise phase JUICE would then reach Jupiter Orbit insertion in July 2031, followed by:

1. Europa phase: June 2032 – end July 2032
2. High latitude phase: 14 August 2032 – 10 August 2033
3. Transfer to Ganymede: 1 November 2033 – 18 November 2034
4. Ganymede Orbit Insertion: December 2034
5. End of nominal mission: September 2035

The UK Space Agency is also funding the Open University, under the management of Dr Mark Leese, to characterise, test and calibrate the CMOS imaging sensors for the Italian-led optical camera system, JANUS.

These sensors have been specially designed by Teledyne e2v in Chelmsford to withstand the harsh radiation environment of Jupiter.

University of Leicester, led by Dr Nigel Bannister, has also been supported to contribute to the radiation-hardness and mechanical designs.

University College London's Mullard Space Science Laboratory is providing the Solid-State Detectors for the (Swedish-led) Particle Environment Package (PEP), and Aberystwyth University is contributing to the radiation design of PEP instrument suite.