

# **Cesa** JUICE: a European mission to Jupiter and its icy moons

## **Juice science**





Europa

### **Europa interior**

Subsurface

ocean

Volcanic

seafloor





### List of instruments:

- JANUS: camera to study geology on the icy moons, and to perform mapping of the clouds on Jupiter. • MAJIS: imaging spectrometer for observing cloud features and species on Jupiter and for the characterisation of ices and
- minerals on the surfaces of icy moons.
- UVS: A UV spectrometer to characterise the composition and dynamics of the atmospheres of the icy moons, to study the Jovian aurorae, and to investigate the composition and structure of the upper atmosphere.
- SWI: A sub-millimeter wave instrument to investigate the Jupiter's atmosphere, and the atmospheres and surfaces of the icy moons. • GALA: a laser altimeter for studying the tidal deformation of Ganymede and the morphology and topography of the surfaces of the icy moons.
- **RIME**: an ice penetrating radar to study the subsurface structure of the icy moons down to 9 km depth. • **3GM**: a radio science package to study the gravity field at Ganymede and the extent of internal oceans on the icy moons, and to investigate the structure of the atmospheres of Jupiter and its moons.
- J-MAG: a magnetometer to characterise the Jovian magnetic field, its interaction with the internal magnetic field of Ganymede, and to study subsurface oceans of the icy moons.
- **PEP**: a package with sensors to characterise the plasma environment in the Jovian system.
- **RPWI**: a radio plasma wave instrument to characterise the radio emission and plasma environment of Jupiter and its icy moons.
- **PRIDE**: an investigation that will use the standard telecommunication system of the JUICE spacecraft and VLBI Very Long Baseline Interferometry - to perform precise measurements of the spacecraft position and velocity to investigate the position of icy moons.

### Timeline

May 2012: Mission selection **February 2013: Payload selection July 2015: Prime industrial contractor** selection March 2017 to March 2019: Detailed definition phase **Mid-2019 to end-2020: Instrument flight model deliveries** March 2019 to September 2021: **Qualification and production phase** May 2022: Launch from Kourou May 2023: Earth flyby **October 2023: Venus flyby** September 2024: Earth flyby February 2025: Mars flyby November 2026: Earth flyby **October 2029: Jupiter orbit insertion** May to September /2030 : 3 Ganymede and 1 Callisto flyby **October 2030: 2 Europa flybys** November 2030 to June 2031: Jupiter high-latitude phase, 9 Callisto flybys July 2031 to August 2032: Transfer to Ganymede, 8 Ganymede and 3 Callisto flybys August 2032: Ganymede orbit insertion, elliptical orbit, 5000 km circular orbit,

500 km circular orbit June 2033: End of mission

### Challenges of the missions

**Technical: Mission lifetime** Radiations

Thermal (hot and cold cases)

Power

Electromagnetic compatibility

### Links

http://aldata.es/juice/juice.html

http://sci.esa.int/juice/

**Operations:** Navigation **Planetary protection** 

Power & data rate constraints





Launch with Ariane 5 from Kourou (French Guyana)





**Orbits around Jupiter, as seen from the poles (left) and** from the equator (right)

- **3-axis stabilised**
- Mass:
  - Launch mass: 5527 kg
  - Instruments: 285 kg
  - Propellant: 3055 kg
- **Radiation monitor**
- Solar array 85 m<sup>2</sup> [Power ~850 W at Jupiter]
- Fixed High Gain Antenna and Steerable Medium Gain Antenna (X, Ka Bands)
- Data Volume > 1.4 Gb per day





Magnetometer boom under thermal test



# Trajectory

Cruise phase in the solar system, including five planetary flybys. Launch is planned in May 2022. Jupiter orbit insertion (JOI) occurs in October 2029.



**Different types of orbits around** Ganymede. GEO=elliptical; GCO5000: circular at 5000 km; GCO500: circular at 500 km.

## **Spacecraft**



Thermal development test model in the ESTEC Large Space Simulator

### **Solar panel prototypes**



**Spacecraft engineering model** 



Helicopter test of the radar antenna