



O kosmosie przy kawie: Kosmiczny sok, czyli misja JUICE

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CBK PAN

- Instytut naukowy założony w 1976 roku
- Ponad 70 instrumentów badawczych
- Duże zaangażowanie w misję JUICE – o tym opowiemy sobie dalej



Agenda

1. JUICE – podsumowanie
2. Instrumenty na pokładzie JUICE
3. Launch JUICE – Gujana Francuska
4. Podróż na Jowisza
5. Środowisko Jowisza – ze strony inżynierskiej

JUICE IN A NUTSHELL



Juice is an ESA-led mission

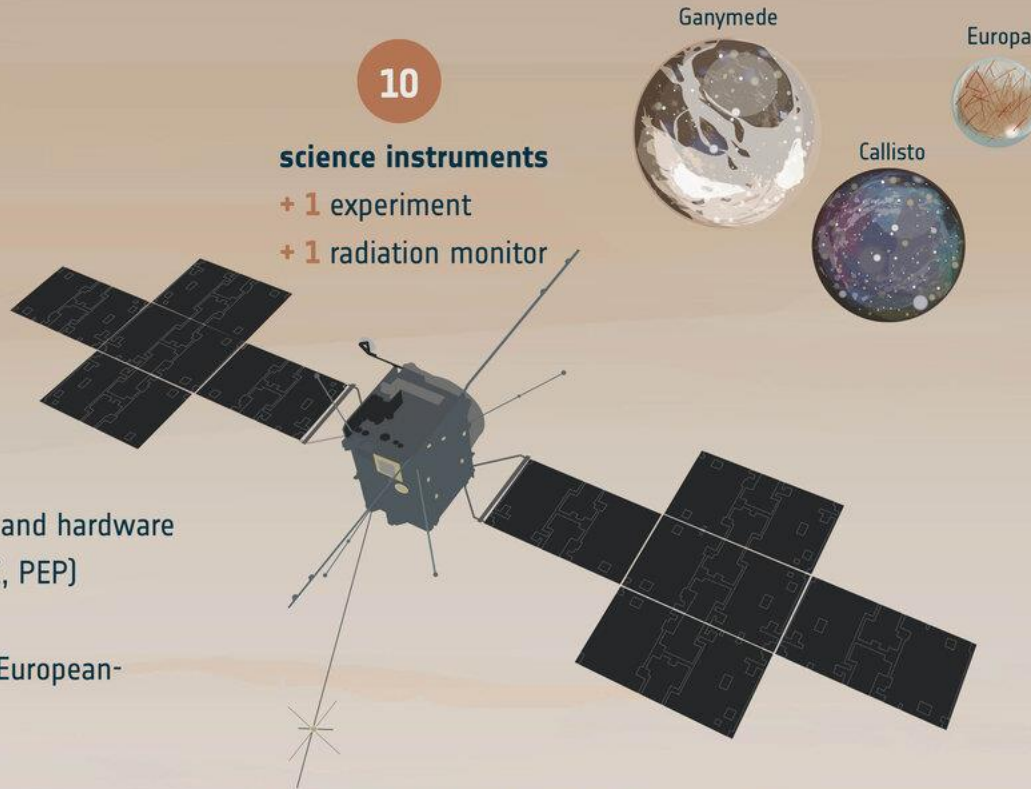
has contributed one instrument (UVS) and hardware for two European-provided instruments (RIME, PEP)

has contributed hardware for various European-provided instruments (RPWI, GALA, PEP)

has contributed hardware for one European-provided instrument (3GM)



Juice will reach space on an **Ariane 5** from Europe's Spaceport in **French Guiana**



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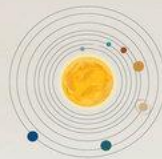
science instruments

- + 1 experiment
- + 1 radiation monitor

Juice will address two key themes of **ESA's Cosmic Vision 2015–2025:**



What are the conditions for planet formation and the emergence of life?



How does the Solar System work?

Juice will:

- Explore Jupiter's icy moons – in particular huge, magnetised, water-rich Ganymede
- Investigate Jupiter's complex environment in depth
- Study the Jupiter system as an archetype for gas giants across the Universe

Juice will be the **first spacecraft** to:



- Perform a lunar-Earth gravity assist
- Change orbit from another planet to one of its moons (Jupiter to Ganymede)
- Orbit a moon other than our own

JUICE'S SCIENCE INSTRUMENTS

Juice will carry ten state-of-the-art instruments, including the most powerful remote sensing, geophysical and in situ payloads ever flown to the outer Solar System. Nine of the instruments are led by European partners, and one by NASA. Juice also includes an experiment called PRIDE, which will perform precise measurements using radio telescopes on Earth.

● In situ instruments ● Remote sensing instruments ● Geophysical instruments ● Experiment



Optical camera system (JANUS)



Visible and infrared imaging spectrometer (MAJIS)



UV imaging spectrograph (UVS)



Sub-millimetre wave instrument (SWI)

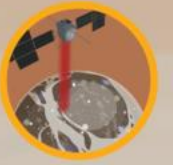
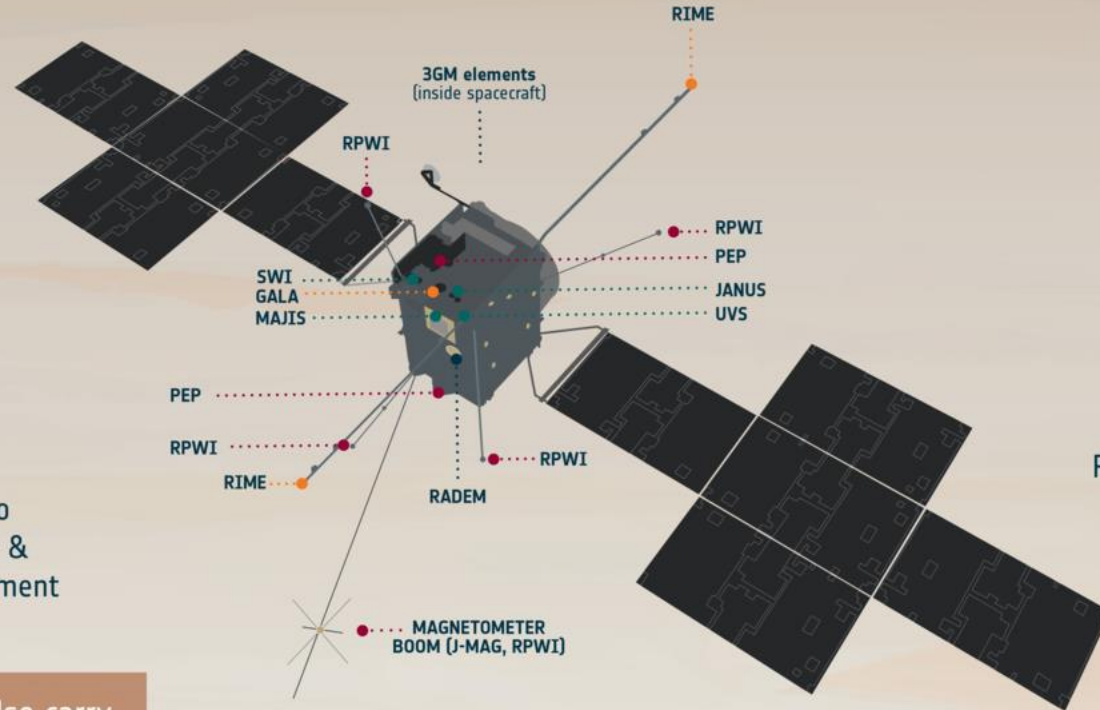


Radar sounder (RIME)



Planetary Radio Interferometer & Doppler Experiment (PRIDE)

Juice will also carry a radiation monitor (RADEM)



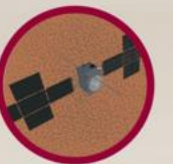
Laser altimeter (GALA)



Radio science experiment (3GM)



Magnetometer (J-MAG)



Particle environment package (PEP)



Radio and plasma wave instrument (RPWI)

EUROPE'S SPACEPORT: AN IDEAL LAUNCH SITE



Speed of Earth's rotation near the equator gives **Ariane 5** an **extra boost** during launch



Customers from **all over the world**

250+ Ariane launches from French Guiana



High efficiency, safety and reliability through European teamwork



Open sea to the north and east means **maximum launch safety**



No risk of cyclones or earthquakes



Working towards **90% renewable energy sources** by the end of 2025



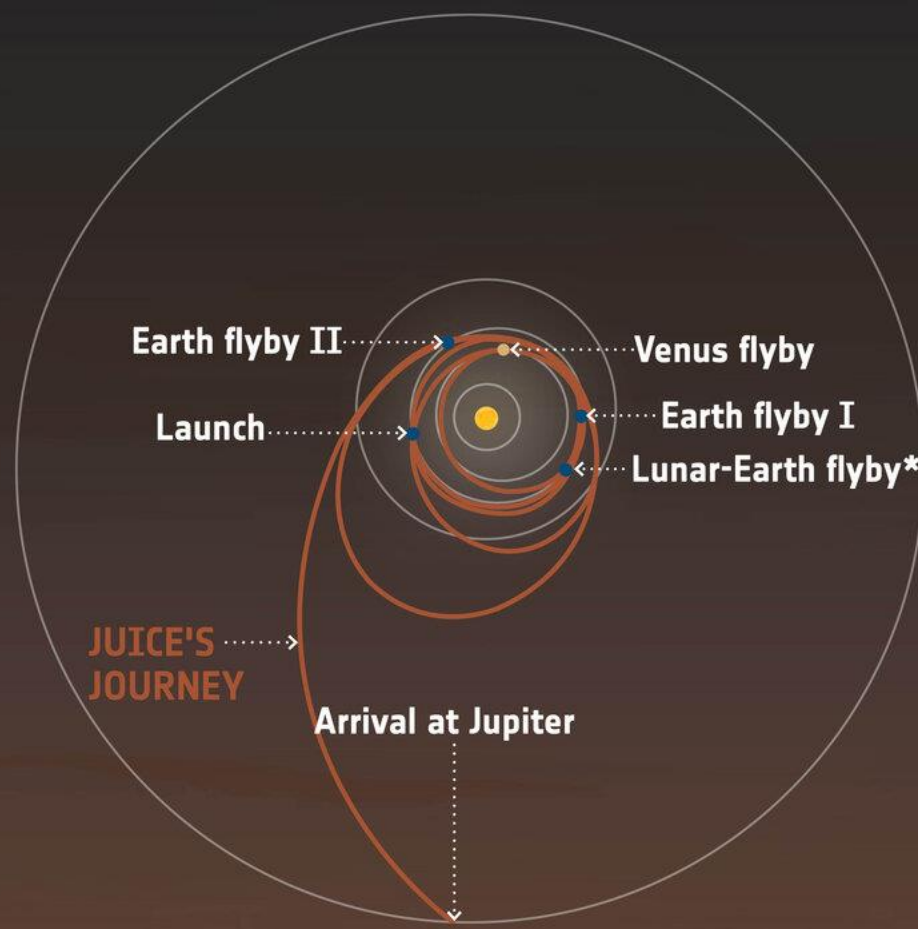
Operational since 1968 with several launch complexes

With **690 km²** jungle, the Spaceport is a large natural area hosting an abundance of wildlife and plants

JOURNEY TO JUPITER



Juice will be operated by mission controllers at ESA ESOC (Germany)



A treacherous trip

Gravity will be a fickle friend, giving regular helping pushes along the way yet threatening derailment at any time. After Juice completes a record 35 flybys of Europa, Ganymede and Callisto, mission controllers will ingeniously make use of Jupiter's tremendous gravity to steer the spacecraft into orbit around the largest moon in the Solar System, planet-sized Ganymede.



*To be replaced by an Earth flyby if Juice launches after 18 April 2023

OPERATING IN AN EXTREME ENVIRONMENT

Engineers have devised advanced technological solutions so that Juice can operate in extreme environments. To help keep the spacecraft safe during these challenging situations, **mission controllers** will constantly monitor it during its journey to and around Jupiter.

HIGH RADIATION

Challenge: One of the most intense radiation environments in the Solar System

Solution: Shields to protect sensitive electronics



SHIELDS



LOW POWER

Challenge: Sunlight 25 times weaker than on Earth

Solution: Solar panels with an area of 85 m² to collect lots of light

SOLAR PANELS

MLI



HARSH TEMPERATURES

Challenge: +250°C during Venus flyby, -230°C at Jupiter

Solution: A blanket of novel Multi-Layer Insulation (MLI) to keep the internal temperature stable

ANTENNA



LONG DISTANCE

Challenge: Hundreds of millions of kilometres from Earth

Solution: A 2.5-m antenna to send data back home, and a powerful onboard computer that solves some problems independently

