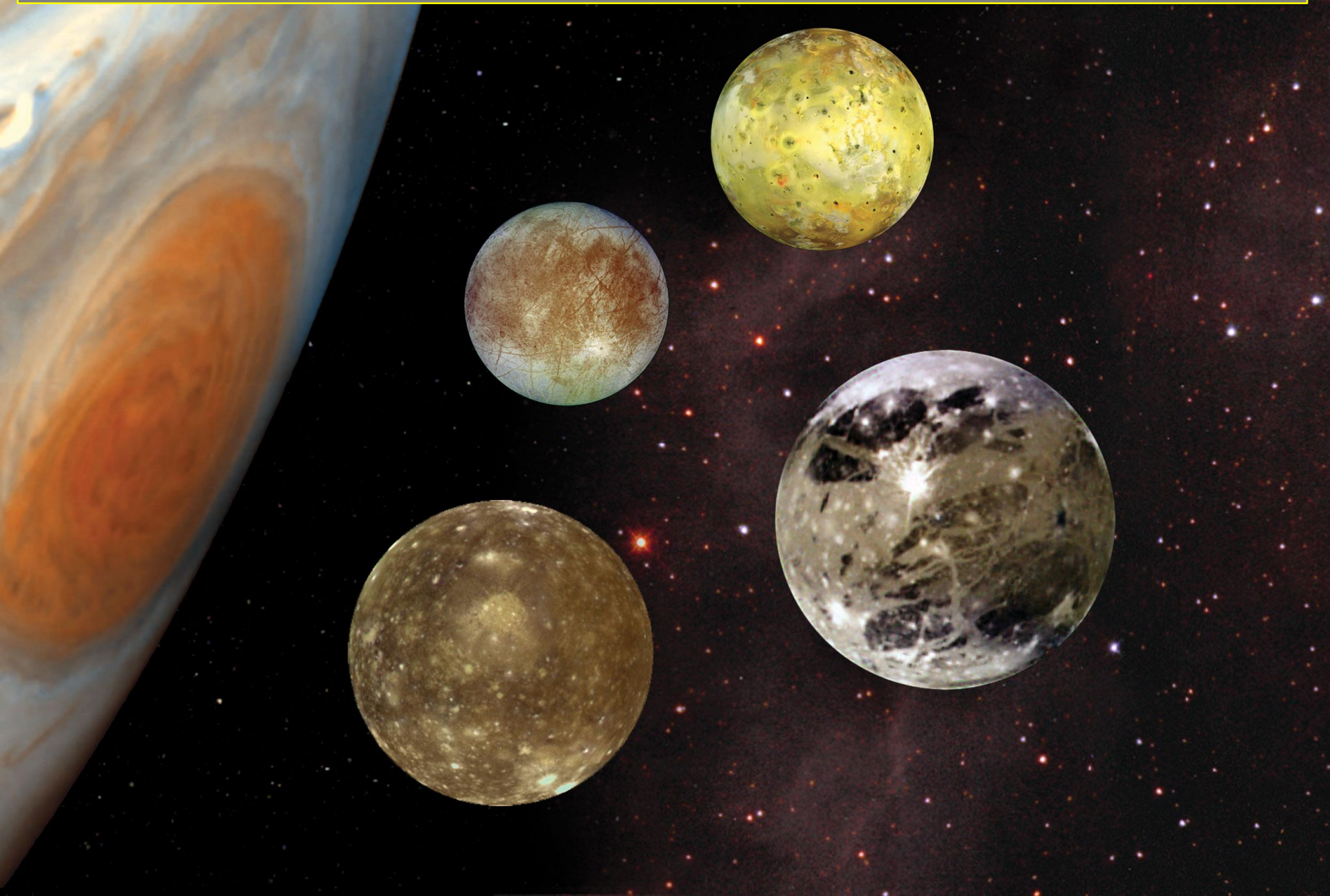
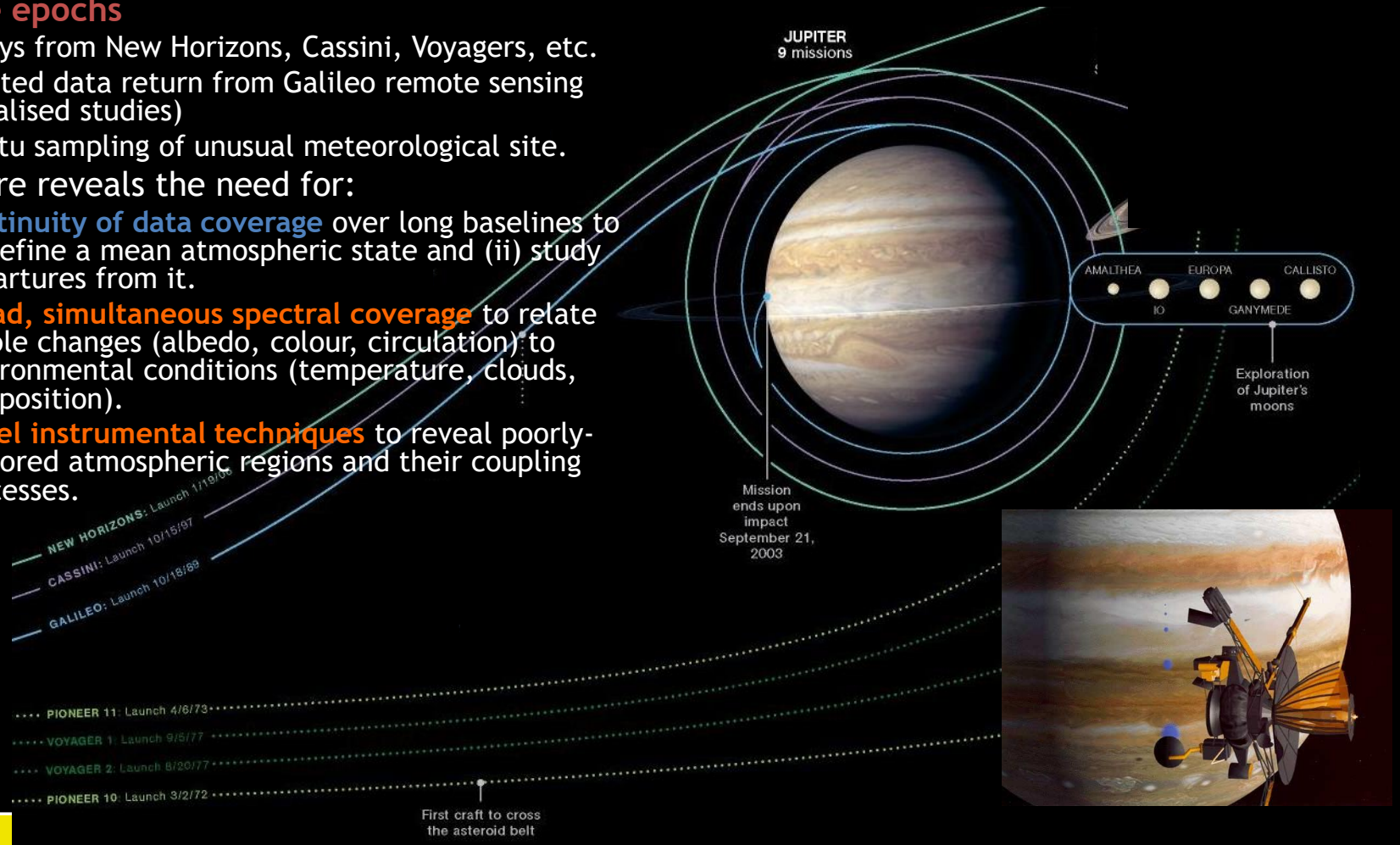
The Jupiter System

A giant planet, a giant magnetosphere, many moons including 4 giants = a mini solar system



Past Exploration

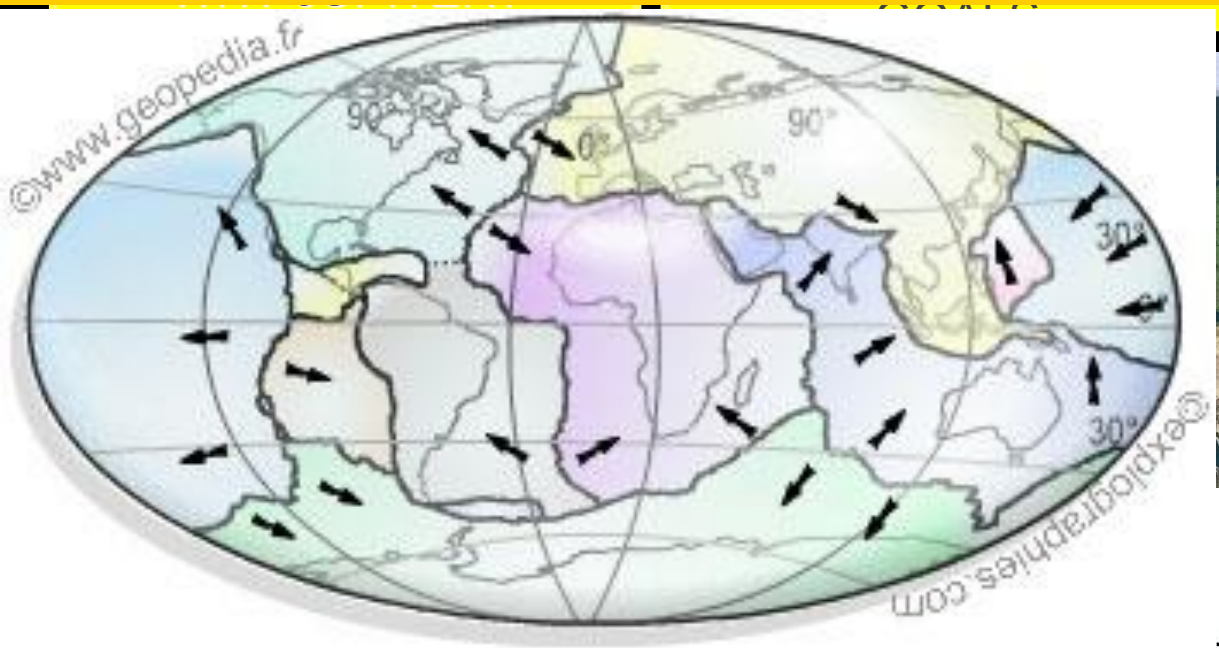
- Previous exploration provided **snapshots of discrete epochs**
  - Flybys from New Horizons, Cassini, Voyagers, etc.
  - Limited data return from Galileo remote sensing (localised studies)
  - In situ sampling of unusual meteorological site.
- Literature reveals the need for:
  - **Continuity of data coverage** over long baselines to (i) define a mean atmospheric state and (ii) study departures from it.
  - **Broad, simultaneous spectral coverage** to relate visible changes (albedo, colour, circulation) to environmental conditions (temperature, clouds, composition).
  - **Novel instrumental techniques** to reveal poorly-explored atmospheric regions and their coupling processes.

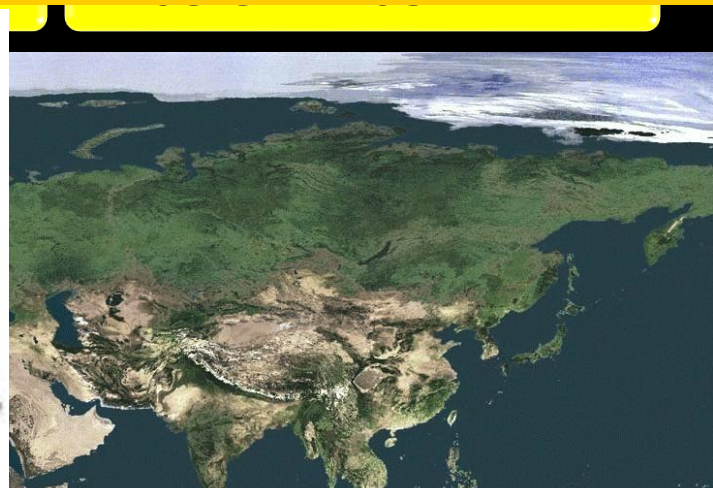


Perijoves				
Year	2030	2031	2032	2033

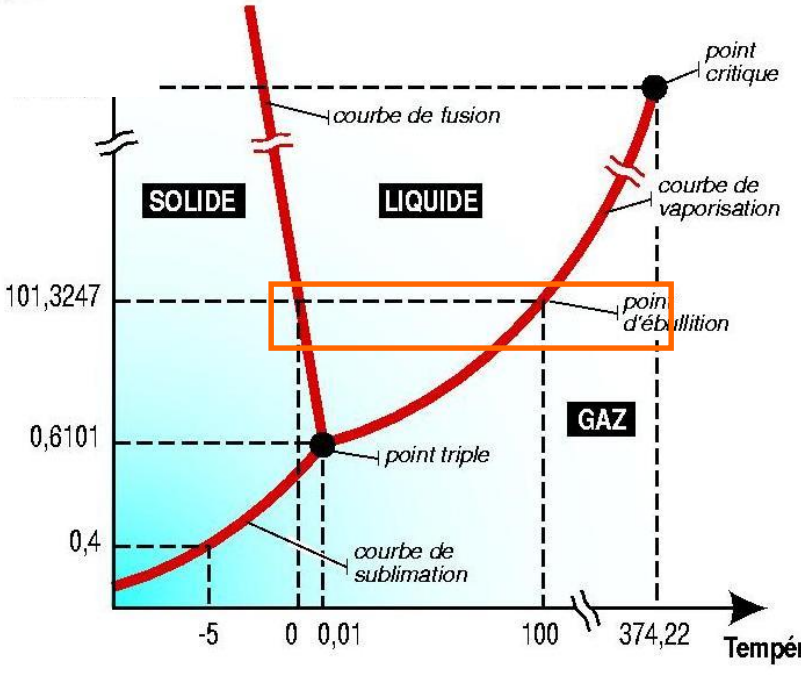
What are the habitable worlds?

Class I – Earth type



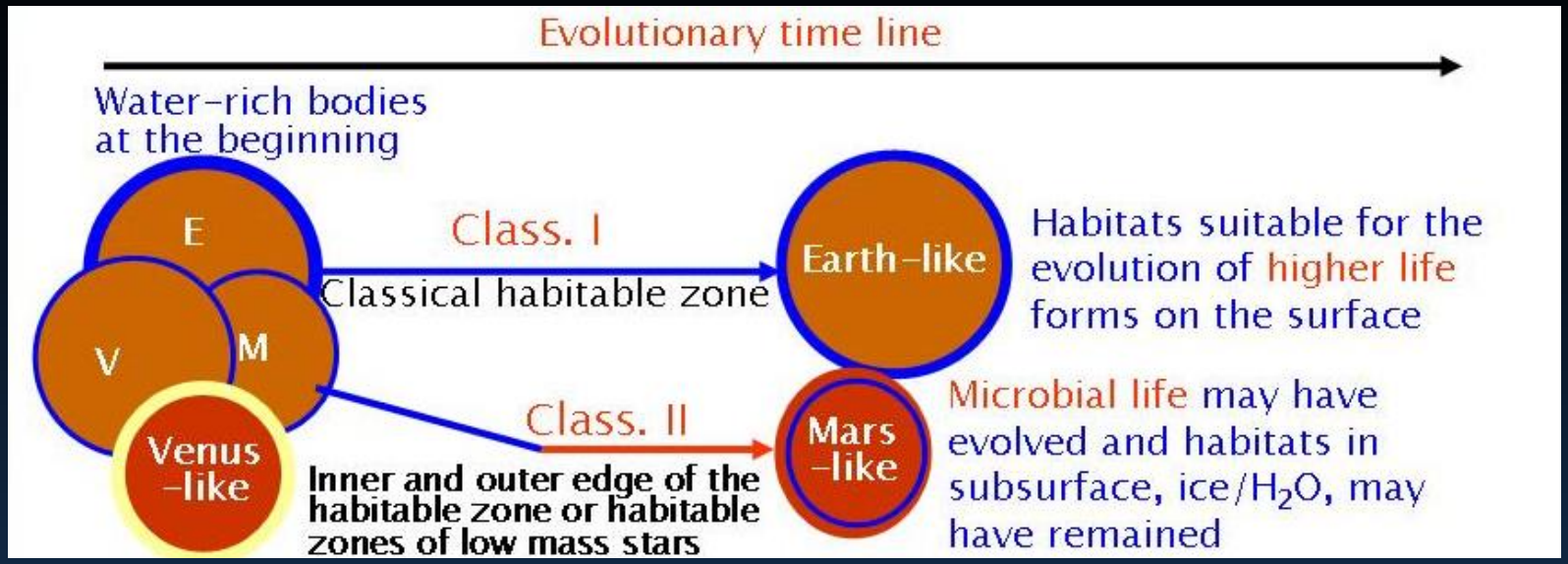


- Plate tectonics
- Water exists in the three states L-S-V
- A small amount of water…(0.01 %wt)
- Dense atmosphere
- Magnetic shielding
- Good stability



What are the habitable worlds?

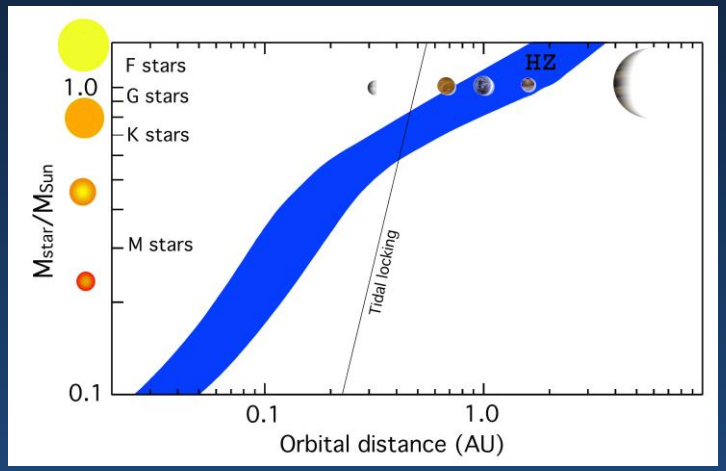
Class II : habitable environnement in the past but evolution from the Earth's case



Lammer et al., 2009

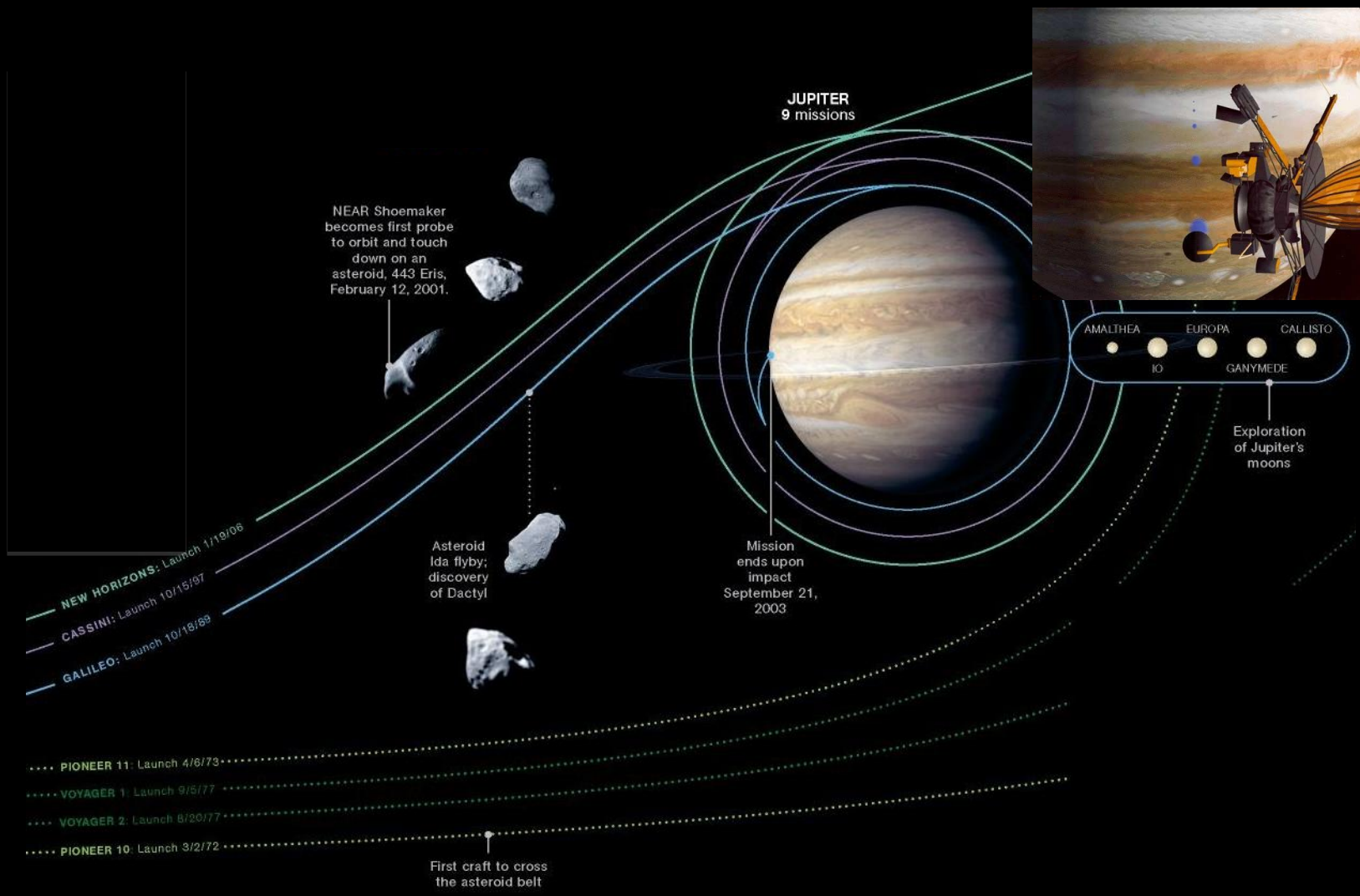
Time dimension is crucial

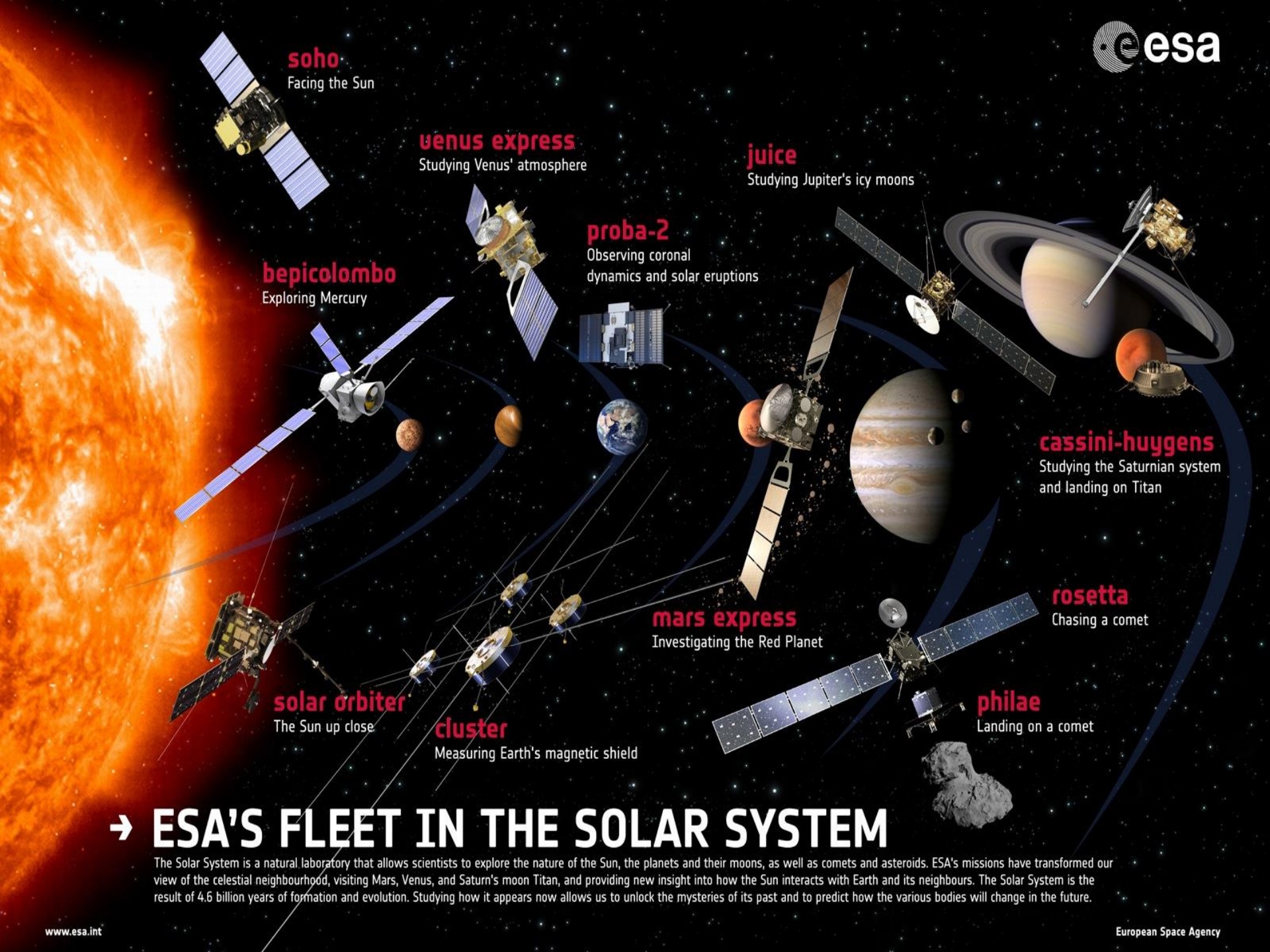
- migration due to star evolution
- Location within the HZ
- Weak magnetic fields
- Dynamical evolution
- Atmospheric loss processes



Previous missions

A few flybys and an orbiter (Galileo)

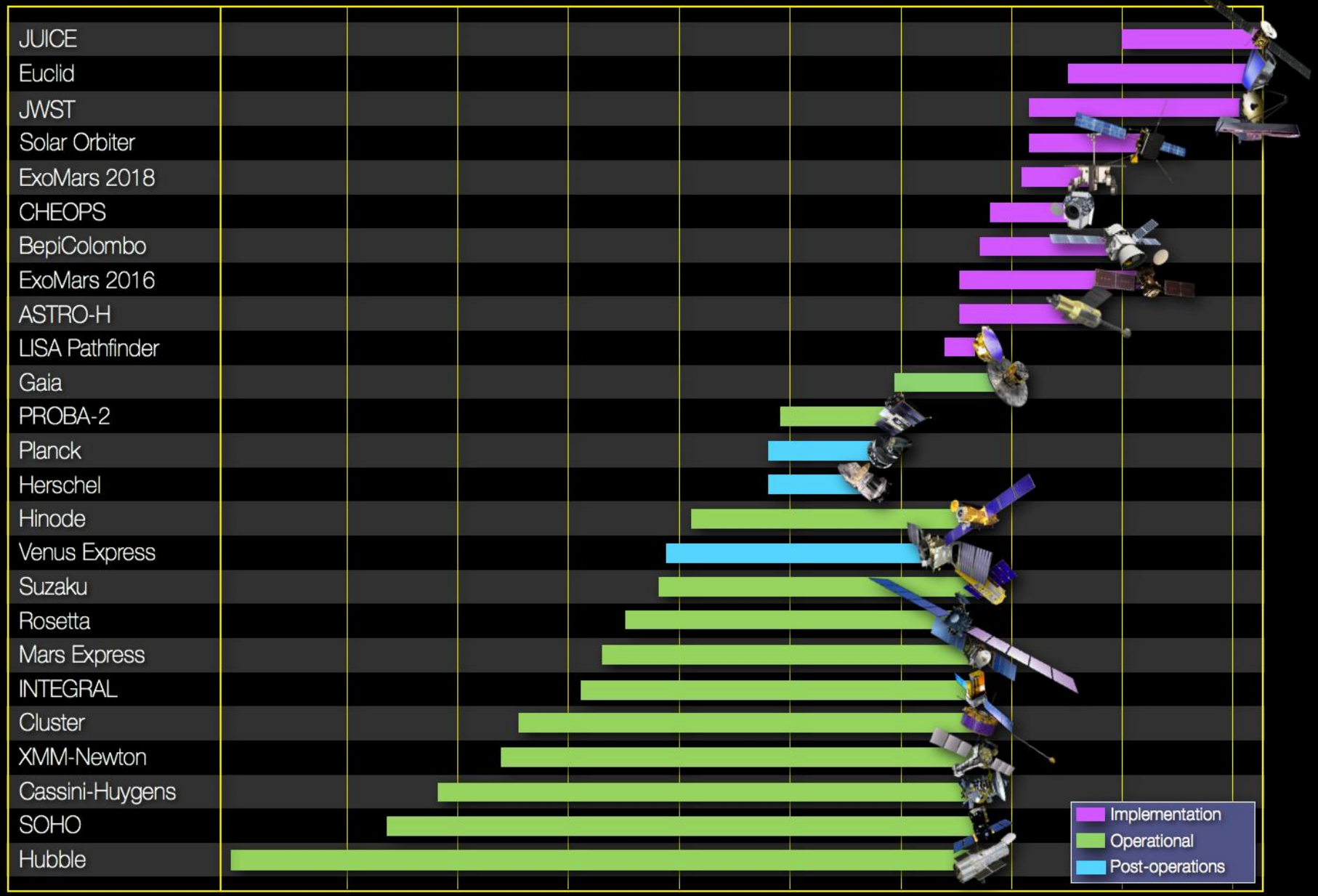




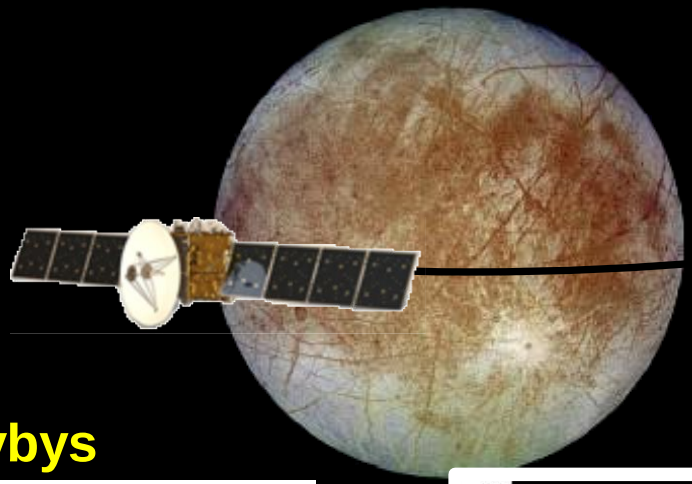
→ ESA'S FLEET IN THE SOLAR SYSTEM

The Solar System is a natural laboratory that allows scientists to explore the nature of the Sun, the planets and their moons, as well as comets and asteroids. ESA's missions have transformed our view of the celestial neighbourhood, visiting Mars, Venus, and Saturn's moon Titan, and providing new insight into how the Sun interacts with Earth and its neighbours. The Solar System is the result of 4.6 billion years of formation and evolution. Studying how it appears now allows us to unlock the mysteries of its past and to predict how the various bodies will change in the future.

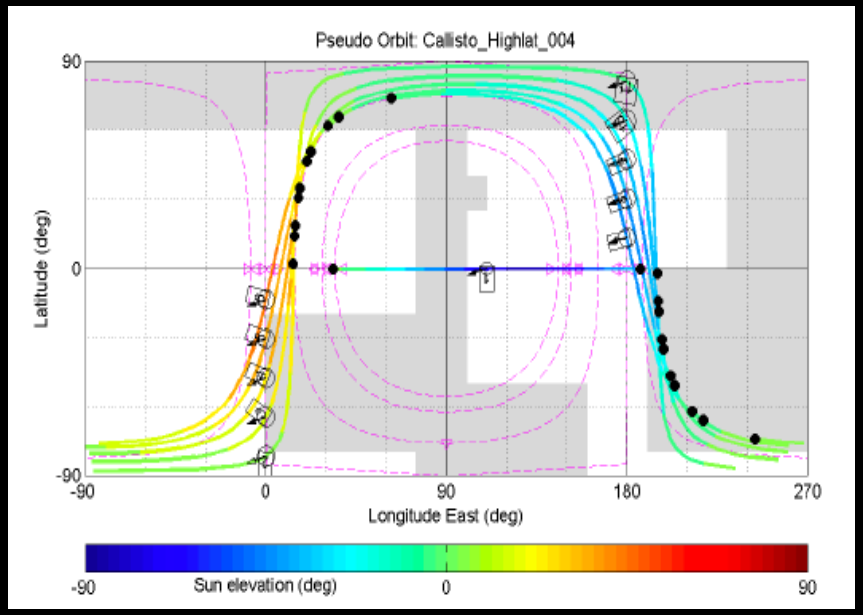
ESA science & robotic exploration missions



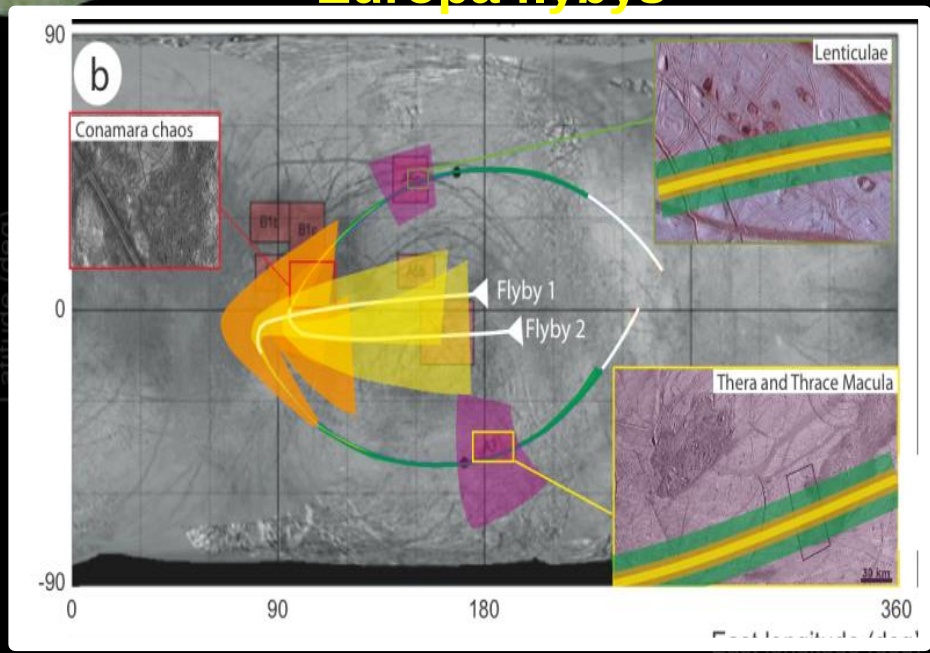
Moons' flybys



Callisto flybys



Europa flybys



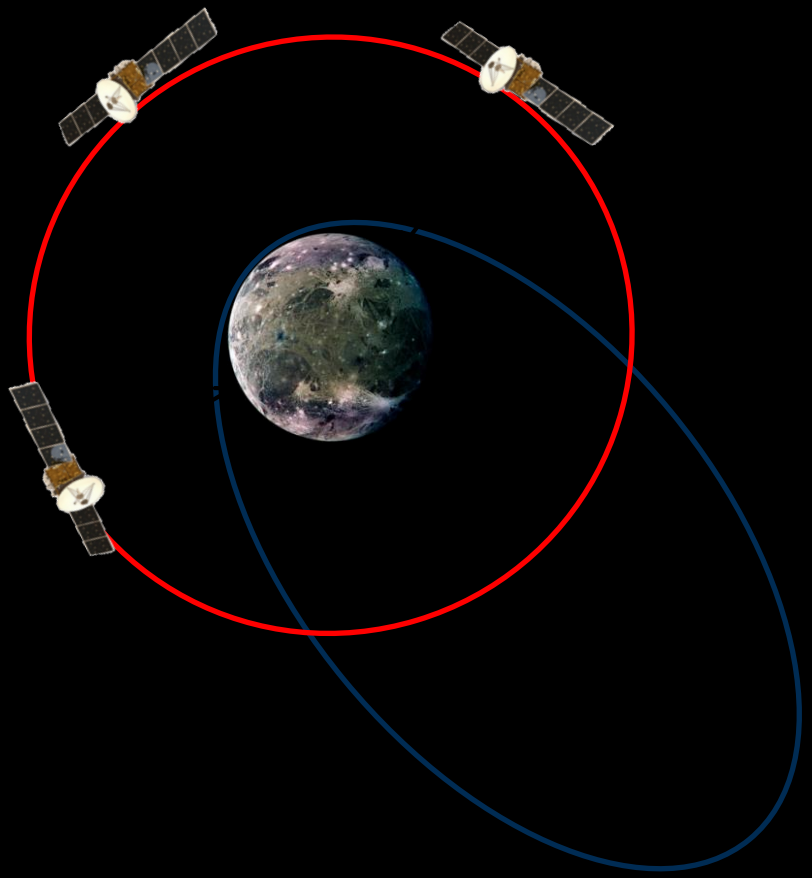
Europa Flyby

13 February 2031 03:48:44

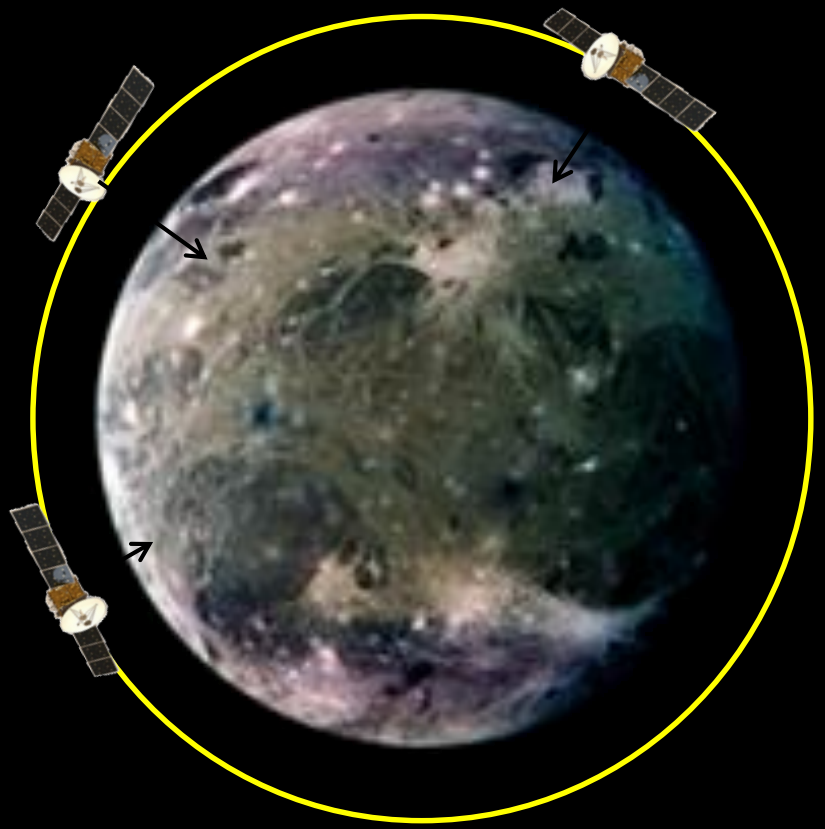
Credit C.S. Arridge (UCL/Royal Society)

Ganymede Tour

GCO-5000 & GEO

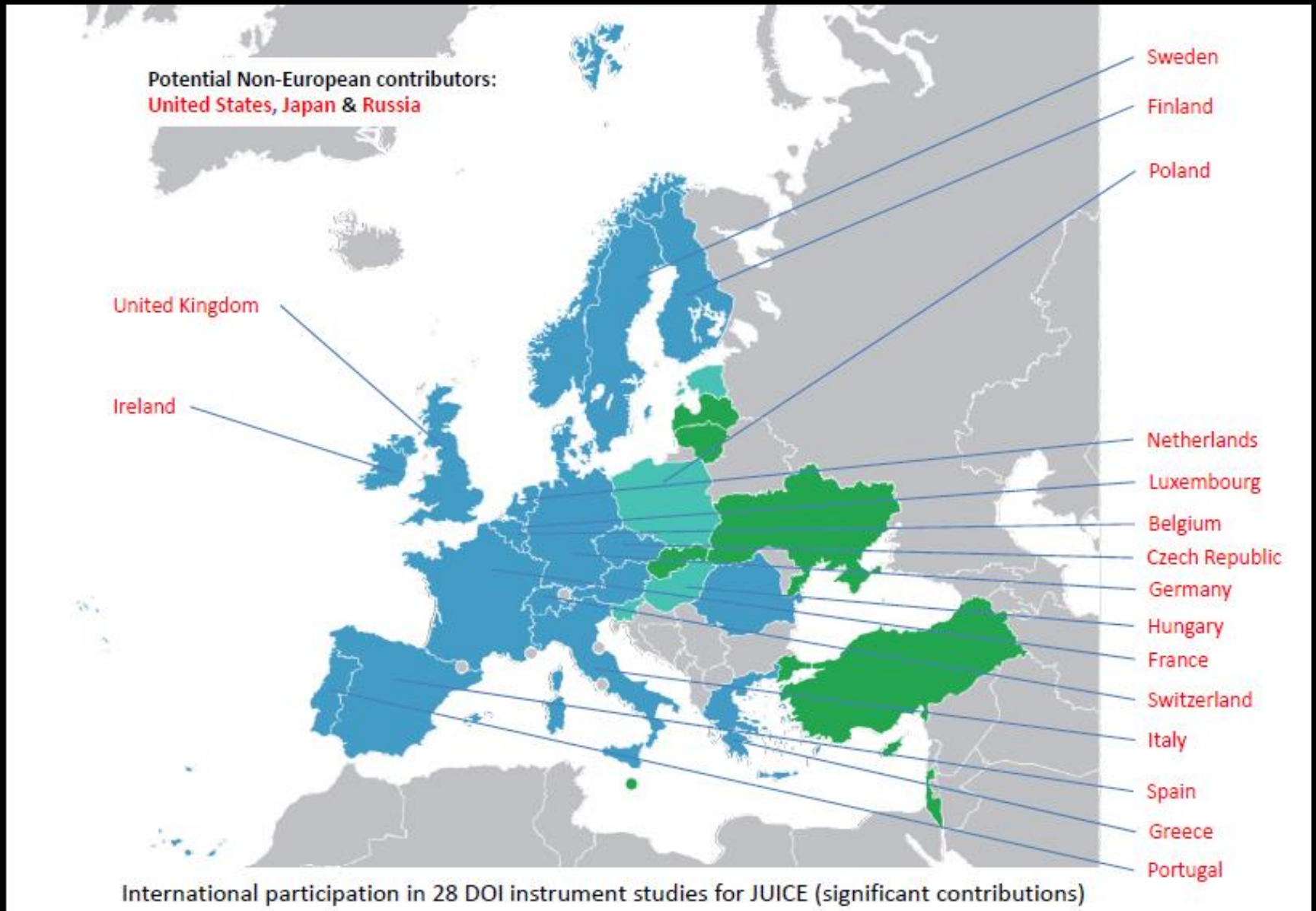


GCO-500

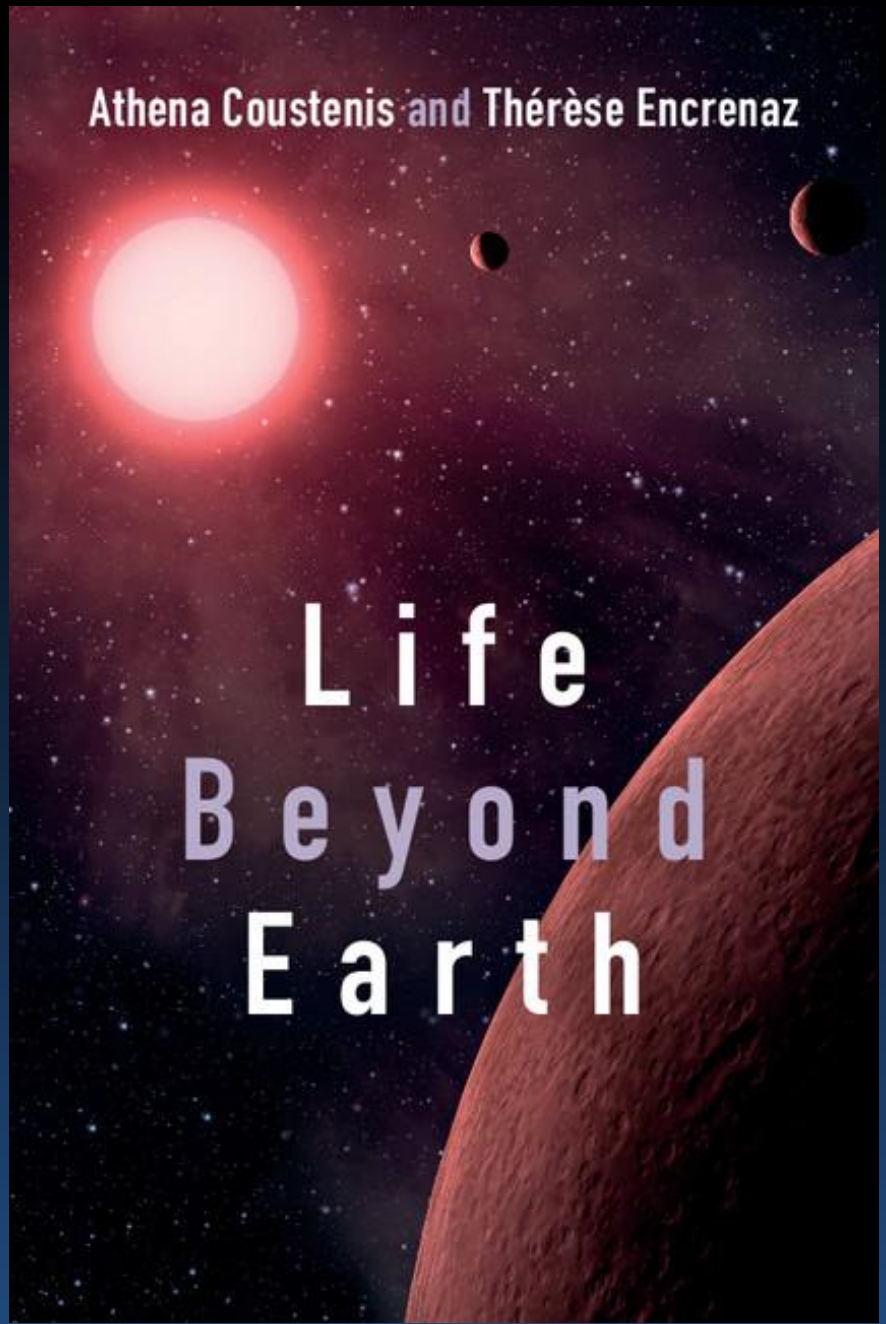


The Saturnian system:
A Post-Cassini mission

Conclusions



International participation in 28 DOI instrument studies for JUICE (significant contributions)



A book about habitability conditions in the Solar System

Cambridge University Press, 2013

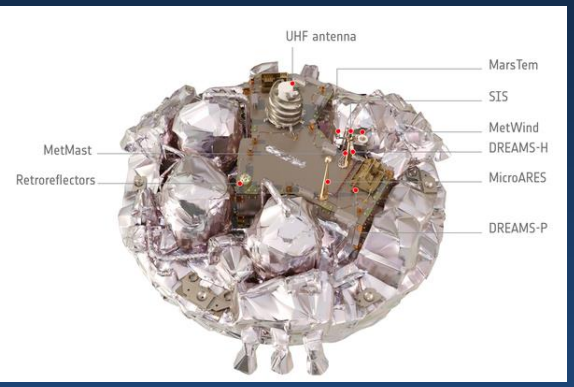
In summary, JUICE is

- **Highly capable spacecraft with synergistic and multi-disciplinary payload**
- **Detailed study of two classes of planetary objects**
  - *a gas giant*
  - *several icy moons with focus on Ganymede*
- **Comparative study of the icy moons family**
- **Investigations of two classes of planetary atmospheres**
  - *well developed atmosphere of the gas giant*
  - *tenuous exospheres of the icy moons*
- **Magnetosphere and plasma environment of the gas giant and its interaction with its moons**
- **Couplings within the Jovian system**
- **Conjunction with ground-based support**
- **Precursor for future missions**

ExoMars 2016: an orbiter and a descent module: Schiaparelli

MARS and EXOMARS

Launch : 14 March 2016 at around 10:30 CET



- Mission from December 2017 until end of 2022. Orbiter will serve as relay for the 2018 rover mission
  - will study the Maritan atmosphere for evidence of biological gases (CH4, etc)
- The EDLM will provide technology for controled landing on Mars (orientation and velocity)
  - will maximise use of technologies like material for thermal protection, parachute, radar Doppler altimeter system, braking system with liquid propulsion