STATUS OF THE JUICE MISSION

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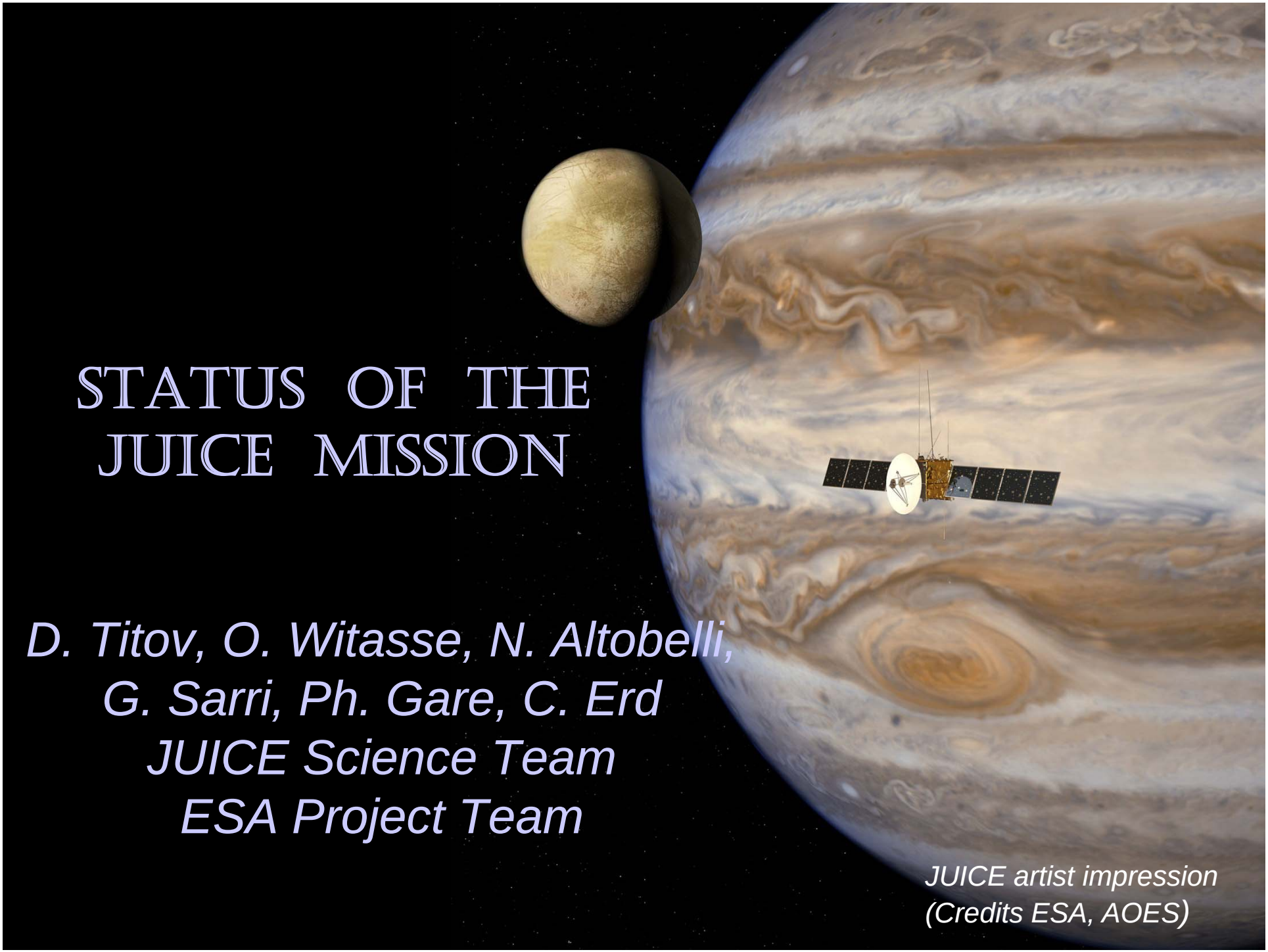
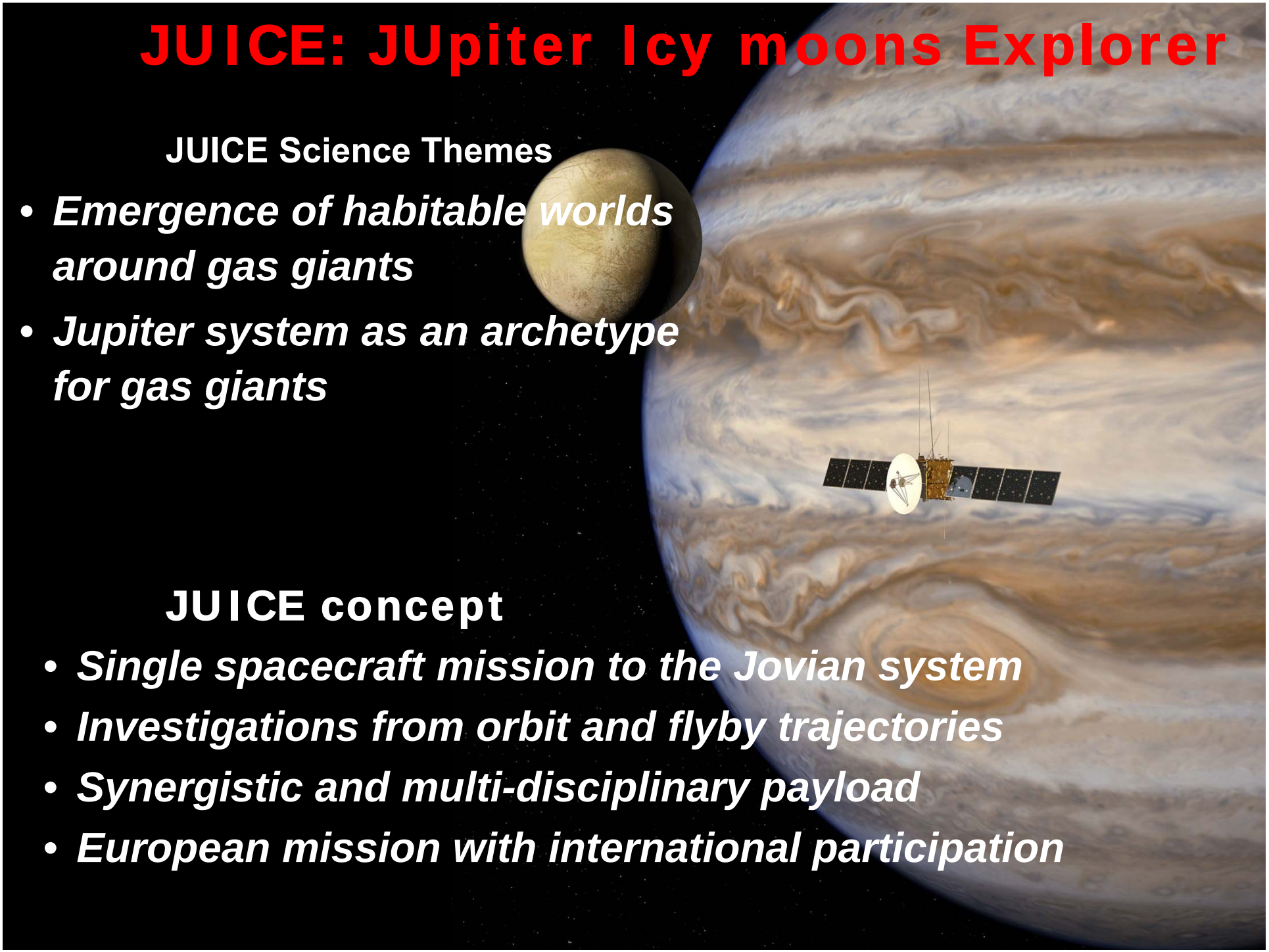
G. Sarri, Ph. Gare, C. Erd
JUICE Science Team
ESA Project Team



JUICE artist impression
(Credits ESA, AOES)

JUICE: JUpiter Icy moons Explorer



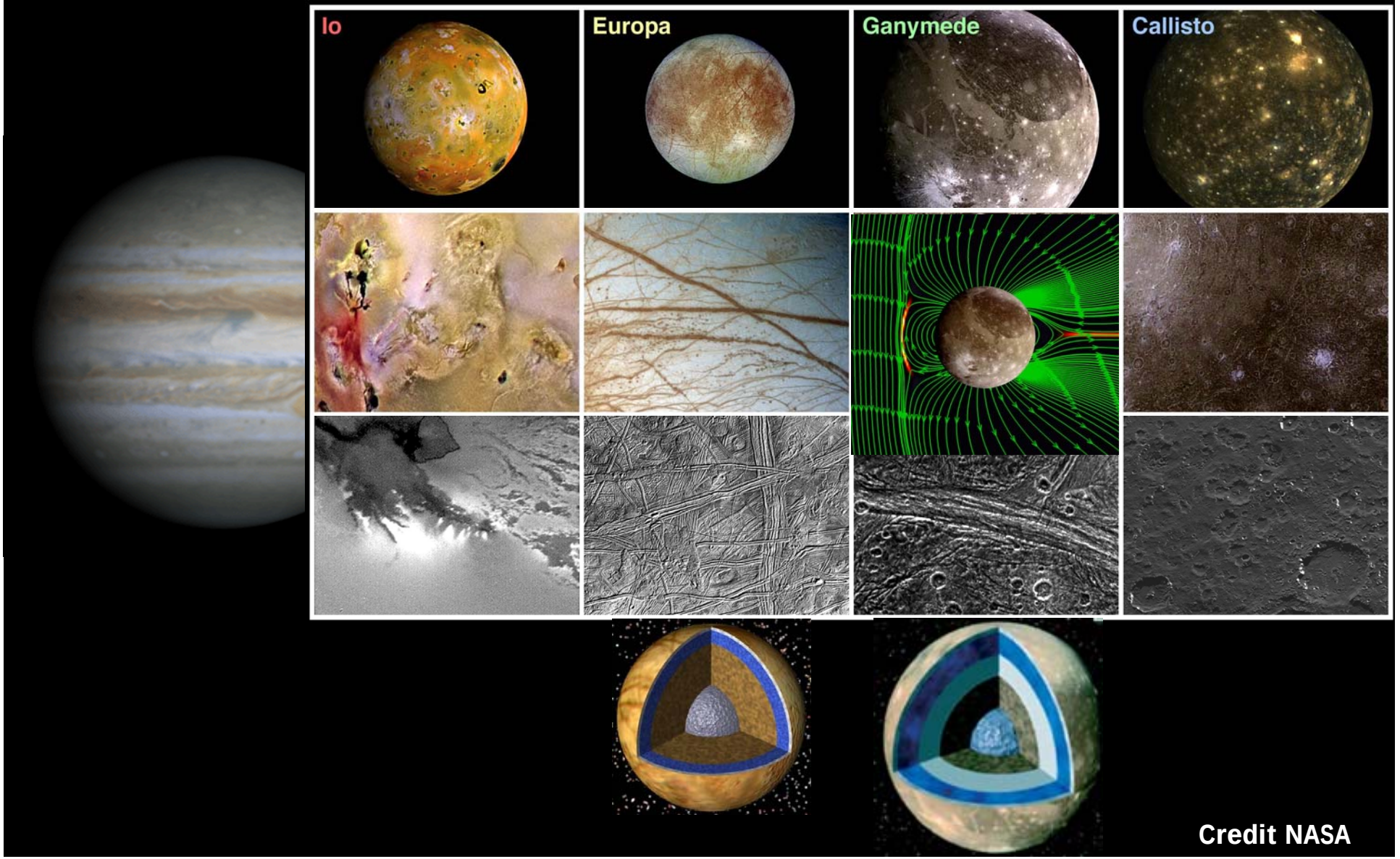
JUICE Science Themes

- *Emergence of habitable worlds around gas giants*
- *Jupiter system as an archetype for gas giants*

JUICE concept

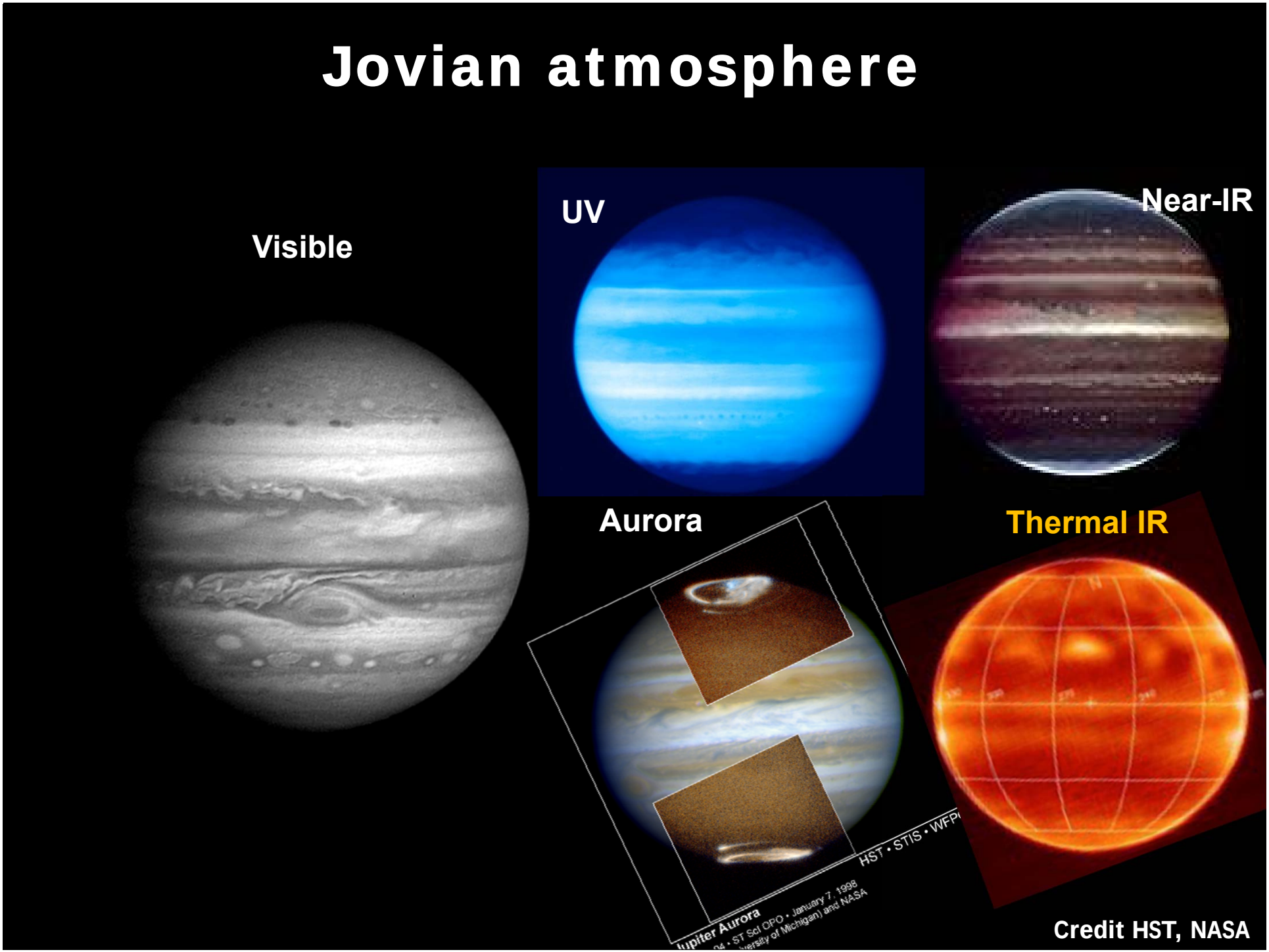
- *Single spacecraft mission to the Jovian system*
- *Investigations from orbit and flyby trajectories*
- *Synergistic and multi-disciplinary payload*
- *European mission with international participation*

Jupiter family

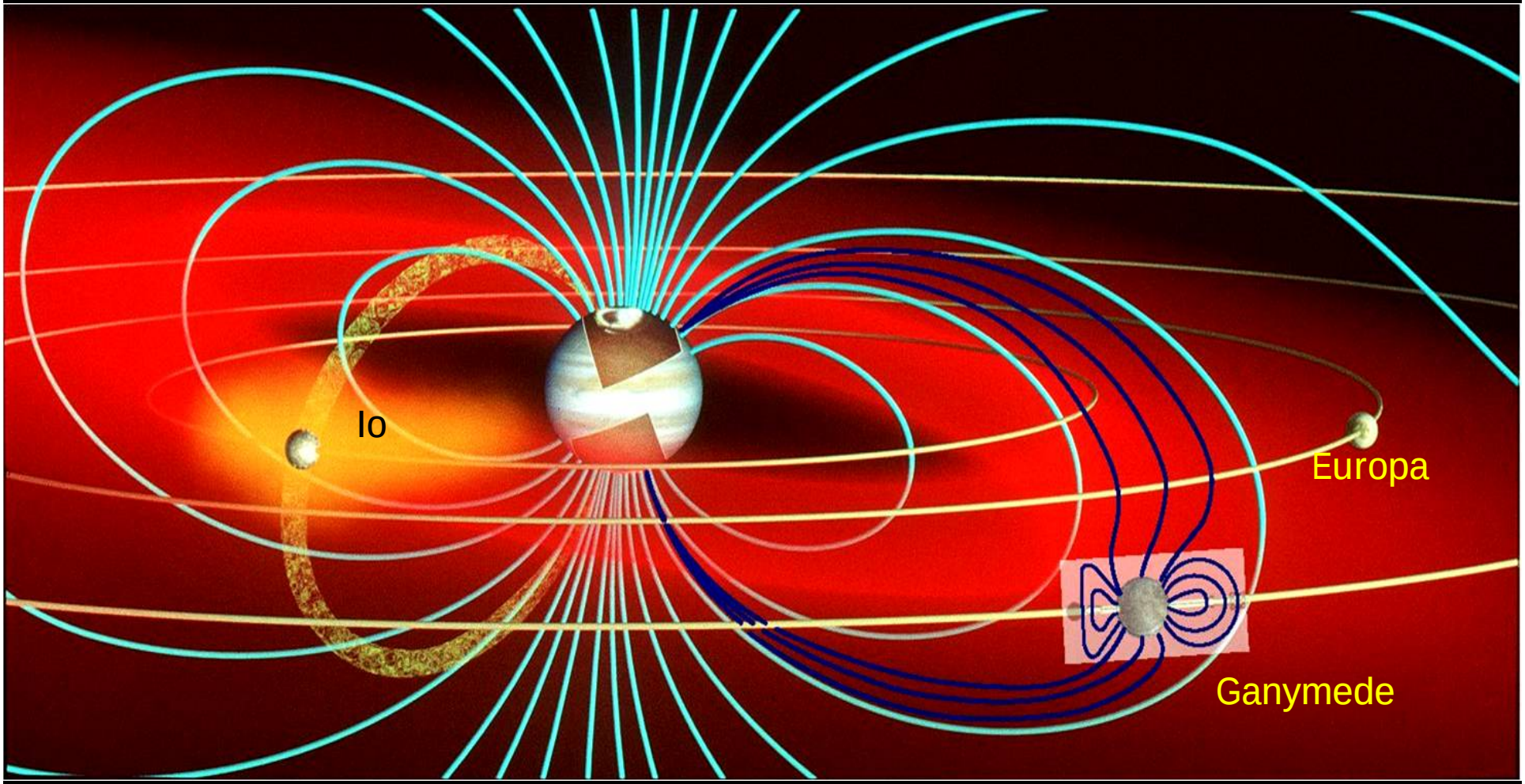


Credit NASA

Jovian atmosphere



Jovian magnetosphere



JUICE Payload

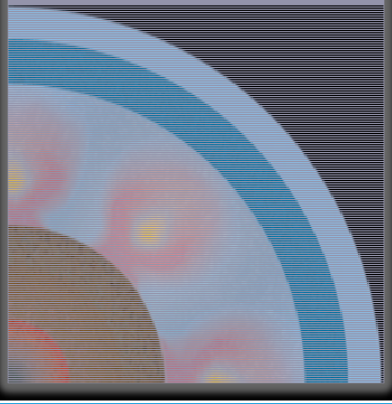
Acronym	PI	LFA	Instrument type
Remote Sensing Suite			
JANUS	P. Palumbo	Italy	Narrow Angle Camera
MAJIS	Y. Langevin	France	Vis-near-IR imaging spectrometer
UVS	R. Gladstone	USA	UV spectrograph
SWI	P. Hartogh	Germany	Sub-mm wave instrument
Geophysical Experiments			
GALA	H. Hussmann	Germany	Laser Altimeter
RIME	L. Bruzzone	Italy	Ice Penetrating Radar
3GM	L. Iess	Italy	Radio science experiment
PRIDE	L. Gurvits	Netherlands	VLBI experiment
Particles and Fields Investigations			
PEP	S. Barabash	Sweden	Plasma Environmental Package
RPWI	J.-E. Wahlund	Sweden	Radio & plasma Wave Instrument
J-MAG	M. Dougherty	UK	Magnetometer

Current Baseline Scenario

- Launch: June 2022 (Ariane 5, Kourou)
- Cruise
- Jupiter Orbit Insertion: January 2030
- Jupiter Tour
  - *2 Europa and ~~13~~ 6 Callisto flybys*
  - *Inclined orbit (up to ~~30~~ 22 degrees)*
  - *Transfer to Ganymede*
- Ganymede Orbit Insertion September 2032
- Ganymede Tour
  - *High/elliptical altitude orbit (5000 km)*
  - *Low altitude orbit (500 km)*
  - *~~200 km altitude orbit~~*
- End of nominal mission: June 2033

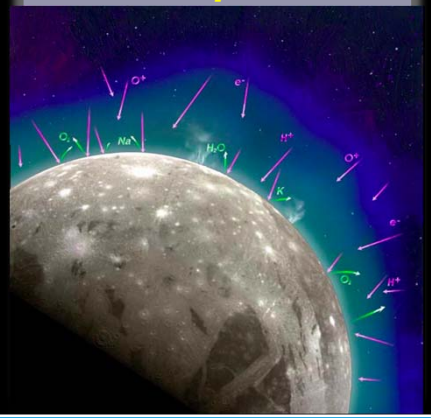
Ganymede: planetary object and potential habitat

Ice shell, ocean, deeper interiors

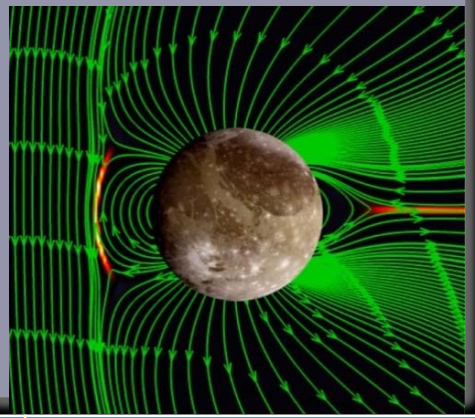


Geology, surface composition

Atmosphere, ionosphere



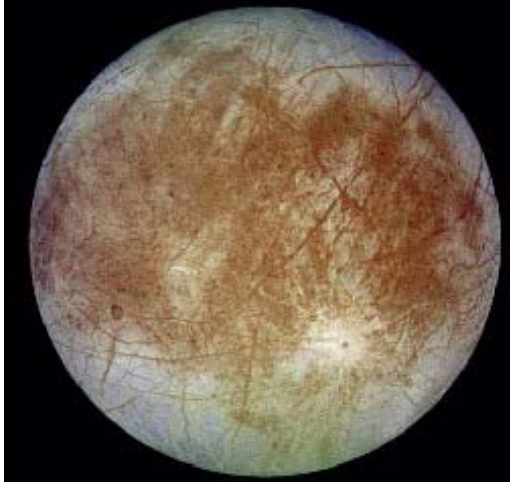
Magnetosphere, plasma environment



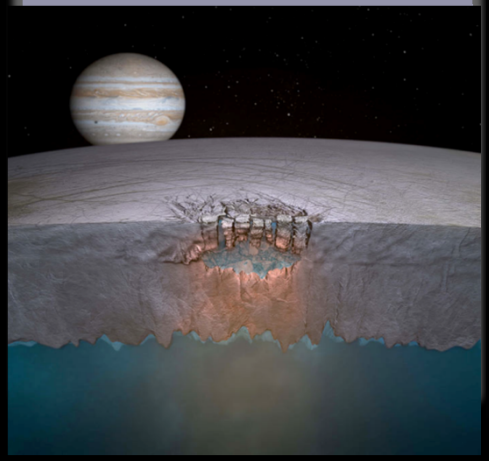
Main investigations	Instruments
Thickness of the icy crust, ocean depth and conductivity	J-MAG, 3GM, GALA, JANUS
Sub-surface sounding down to ~9 km depth	RIME
Imaging: global ~400 m/px, selected targets ~3 m/px	JANUS
Mineralogical mapping (especially of non-ice materials): globally 1-5 km/px , selected targets ~25 m/px	MAJIS, UVS
Composition and dynamics of the atmosphere	PEP, SWI, UVS
Magnetosphere, plasma environment, and interaction with the surface and the Jovian magnetosphere	PEP, RPWI, JMAG, UVS, MAJIS

Europa: study of recently active regions

Composition of non-ice material

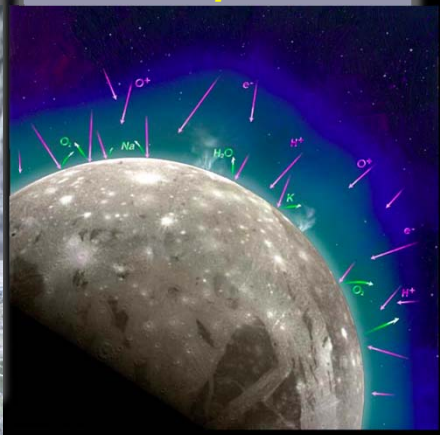


Liquid sub-surface water



Active processes

Atmosphere, ionosphere

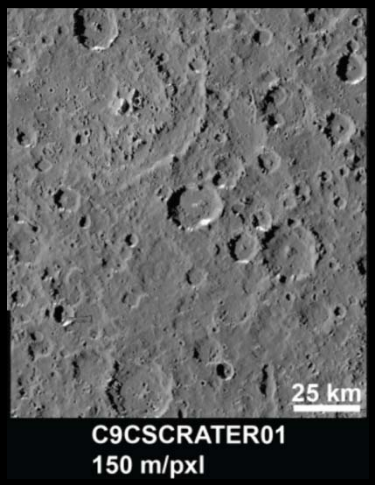


Main investigations	Instruments
Non-ice materials in selected sites mapped at regional (>5 km/px) and local (<500 m/px) scales	MAJIS, UVS
Search for liquid water in the shallow (few km) subsurface	RIME
Processes in active sites	JANUS, MAJIS, UVS
Atmosphere and plasma environment	PEP, RPWI, JMAG, SWI, UVS

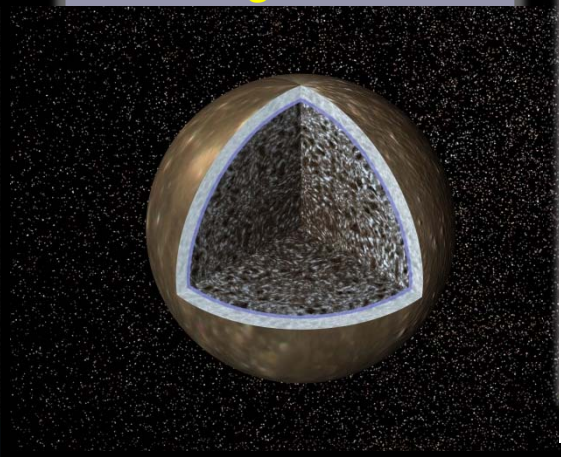
Callisto: a witness of the early Solar System

Geological history and past activity

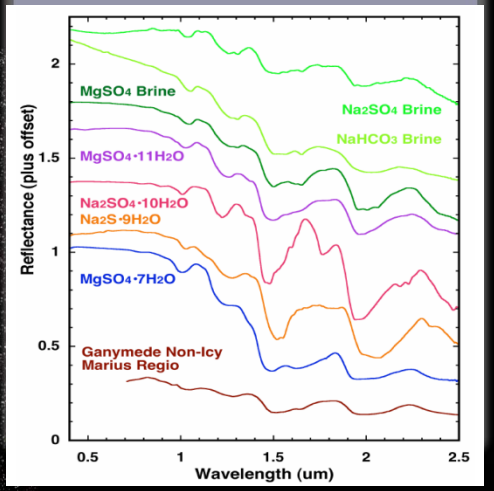
Credit NASA



Outer shell including ocean



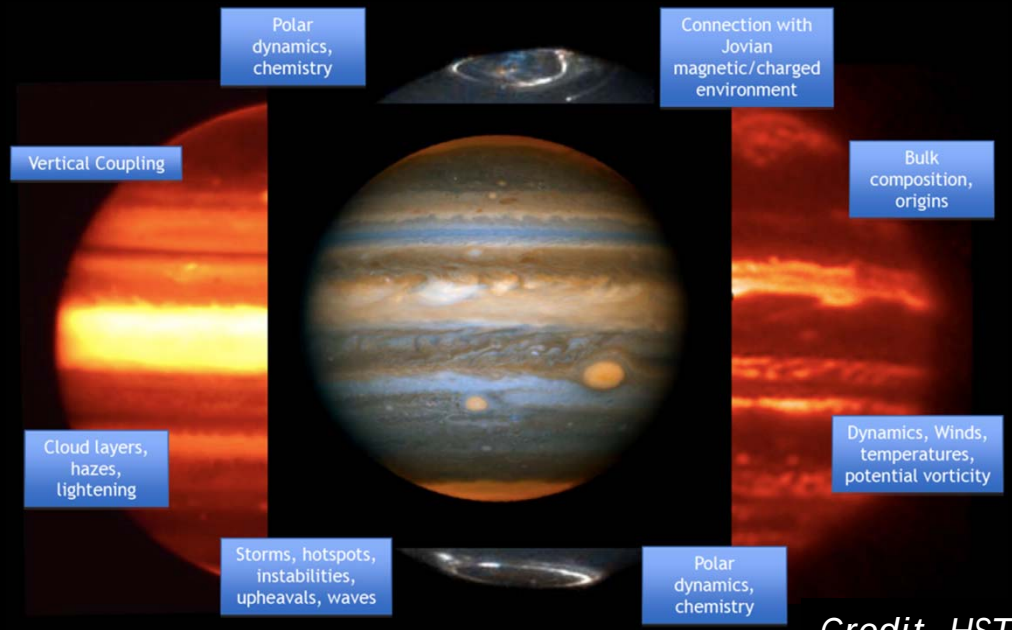
Non-ice material



Main investigations	Instruments
Medium resolution imaging (<400 m/px)	JANUS
Regional mineralogical mapping (~5 km/px)	MAJIS
Outer shell including ocean	3GM, JMAG
Subsurface down to few km	RIME
Exosphere and weathering processes	PEP, SWI, UVS, MAJIS, RPWI

Jupiter atmosphere

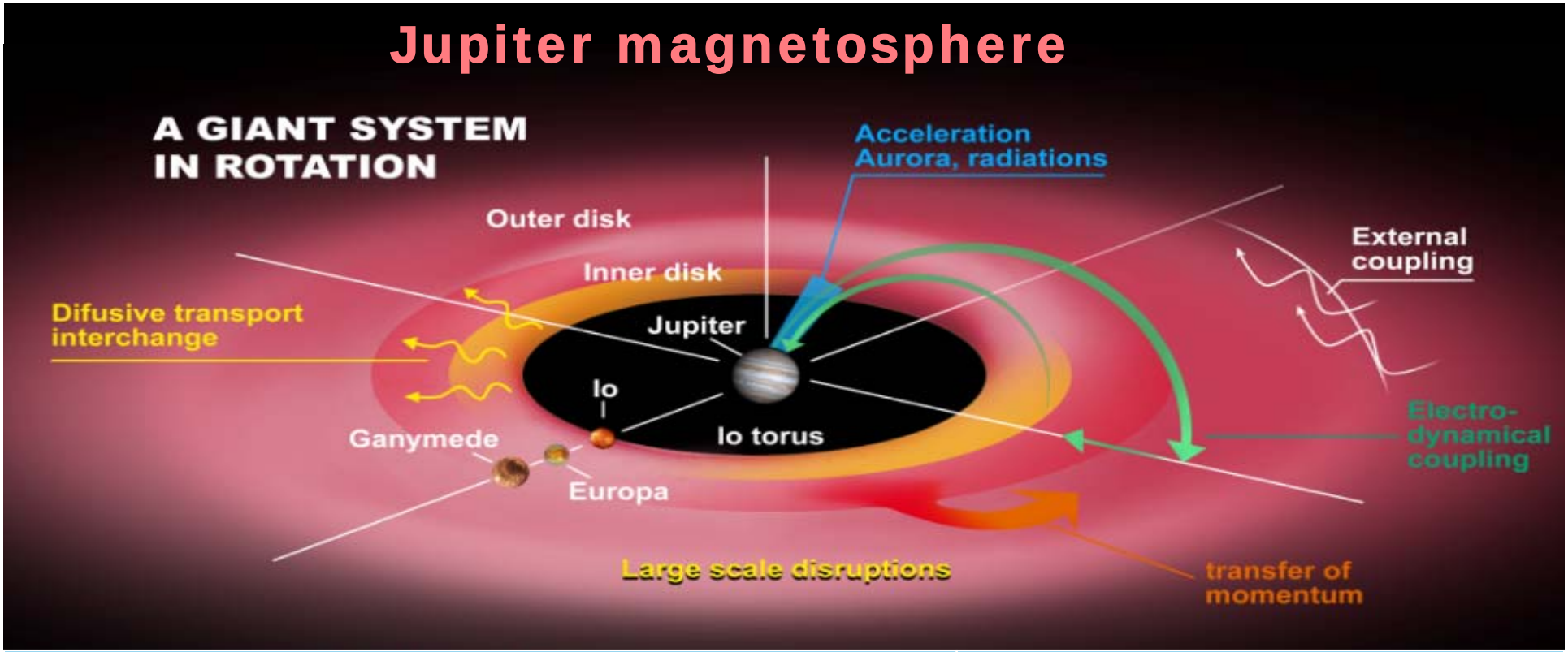
- ***Atmospheric structure, composition and dynamics***
- ***Coupling between troposphere, stratosphere and thermosphere***



Credit HST

Main investigations	Instruments
Structure of the atmosphere	UVS, 3GM, SWI, MAJIS, PRIDE
Composition and chemistry	MAJIS, UVS, SWI
Dynamics and meteorology	SWI, JANUS, MAJIS

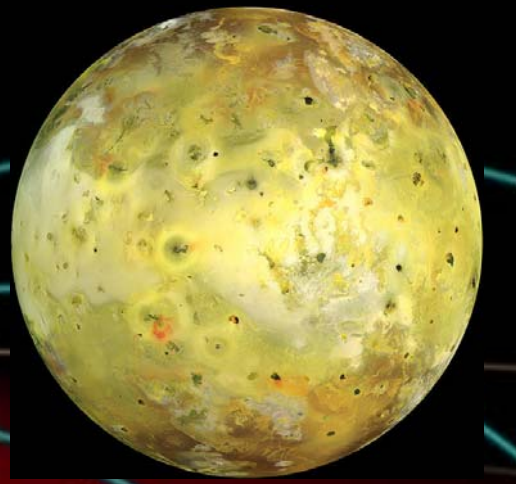
Jupiter magnetosphere

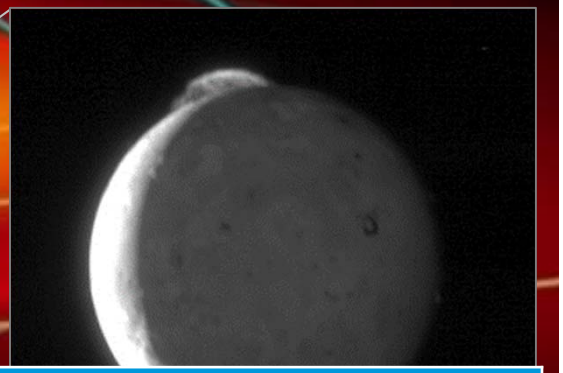


Main investigations	Instruments
Magnetosphere as a fast magnetic rotator	JMAG, RPWI, PEP
Magnetosphere as a giant particle accelerator	PEP, RPWI, JMAG
Moons as sources of magnetospheric plasma	UVS, PEP, MAJIS, JANUS

Credit ESA/ NASA

Jovian satellite and ring system

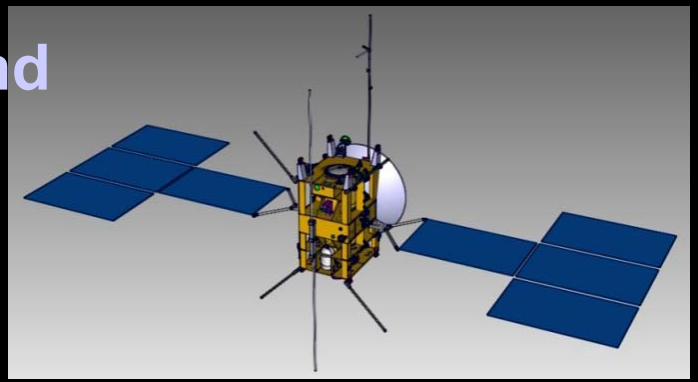




Main investigations	Instruments
Io activity and surface composition	JMAG, RPWI, PEP
Rings and moons	PEP, RPWI, JMAG
Ephemerides in the Jovian system	PRIDE, 3GM

Main resources and features of the s/c

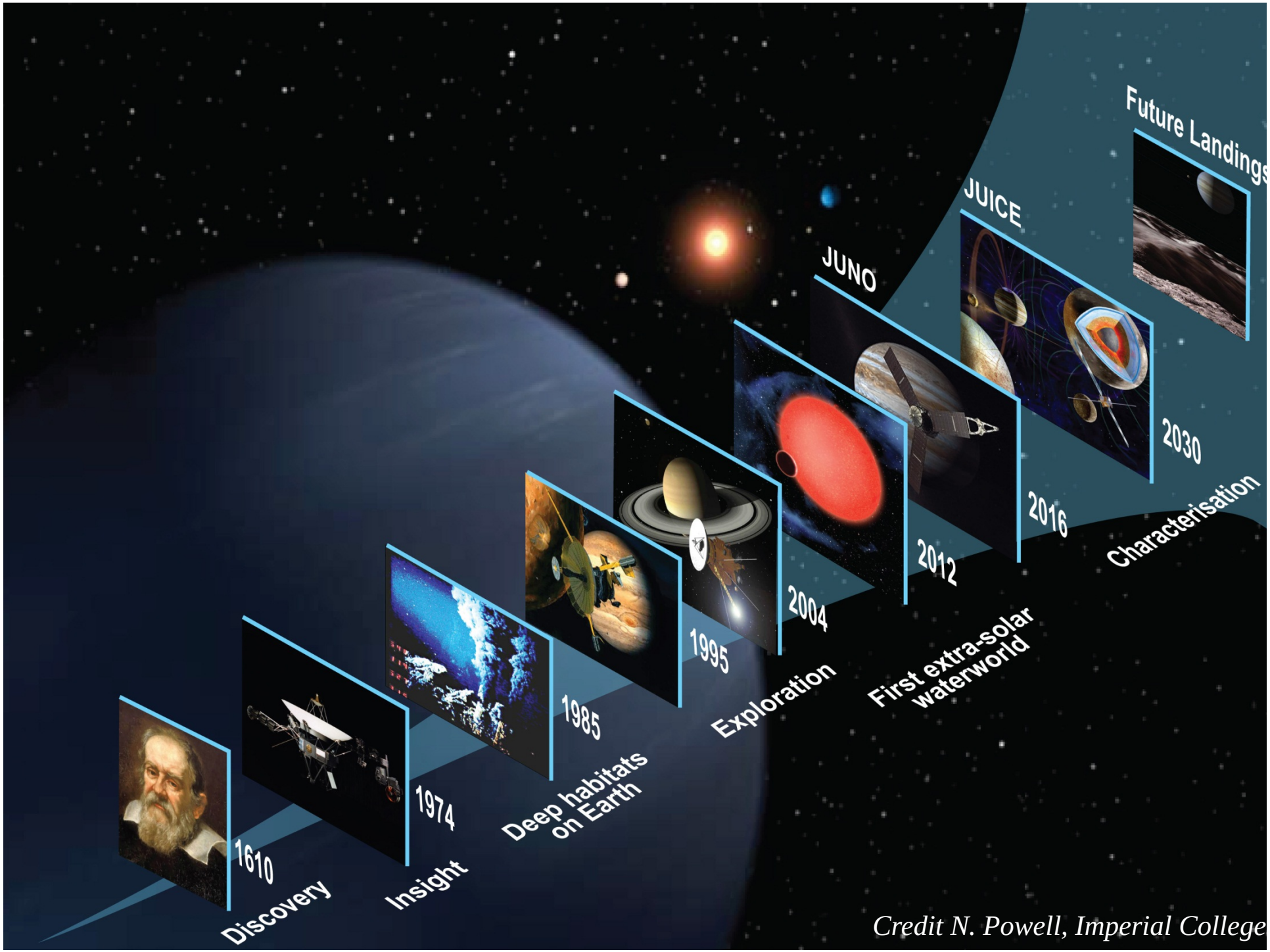
- **3-axis stabilized s/c**
- **Mass**
  - *Dry ~2200 kg*
  - *Propellant ~2900 kg*
  - *Total > 5000 kg*
  - *Payload: 218 kg*
- **Power**
  - *Total < 1000 W*
  - *Payload in GCO-500 =180 W*
  - *Payload during fly-bys = 230 W (360 W for ½ h)*
- **High Δv requirement ~2700 m/s**
- **Body-fixed HGA: ~3 m, X & Ka-band**
- **Steerable MGA, X & Ka-band**
- **Memory = 500 Gbit (EoL)**
- **Data downlink: 1.4 Gb/ 24h**



General Status of JUICE

Definition phase → Implementation phase

- **Definition Phase (A/B1) carried out by 2 consortia**
  - *Airbus DS (F) with Airbus GmbH (D) and Ltd (UK)*
  - *Thales-Alenia (F) with TAS-I and OHB (D)*
- **Juice Definition Study Report released: September 2014 (http://sci.esa.int/juice/)**
- **Instruments Consolidation Review: September-October 2014**
- **System Requirements Review: Oct –Nov 2014**
- **Mission adopted by ESA: November 2014**
- **Industrial prime:**
  - *Invitation to Tender: mid-December 2014*
  - *Deadline for proposal: 31 March 2015*
  - *Expected Kick-Off with the selected prime: September 2015*


Future Landings
JUICE
JUNO
1610
Discovery
1974
Insight
1985
Deep habitats on Earth
1995
2004
Exploration
2012
First extra-solar waterworld
2016
2030
Characterisation
Credit N. Powell, Imperial College