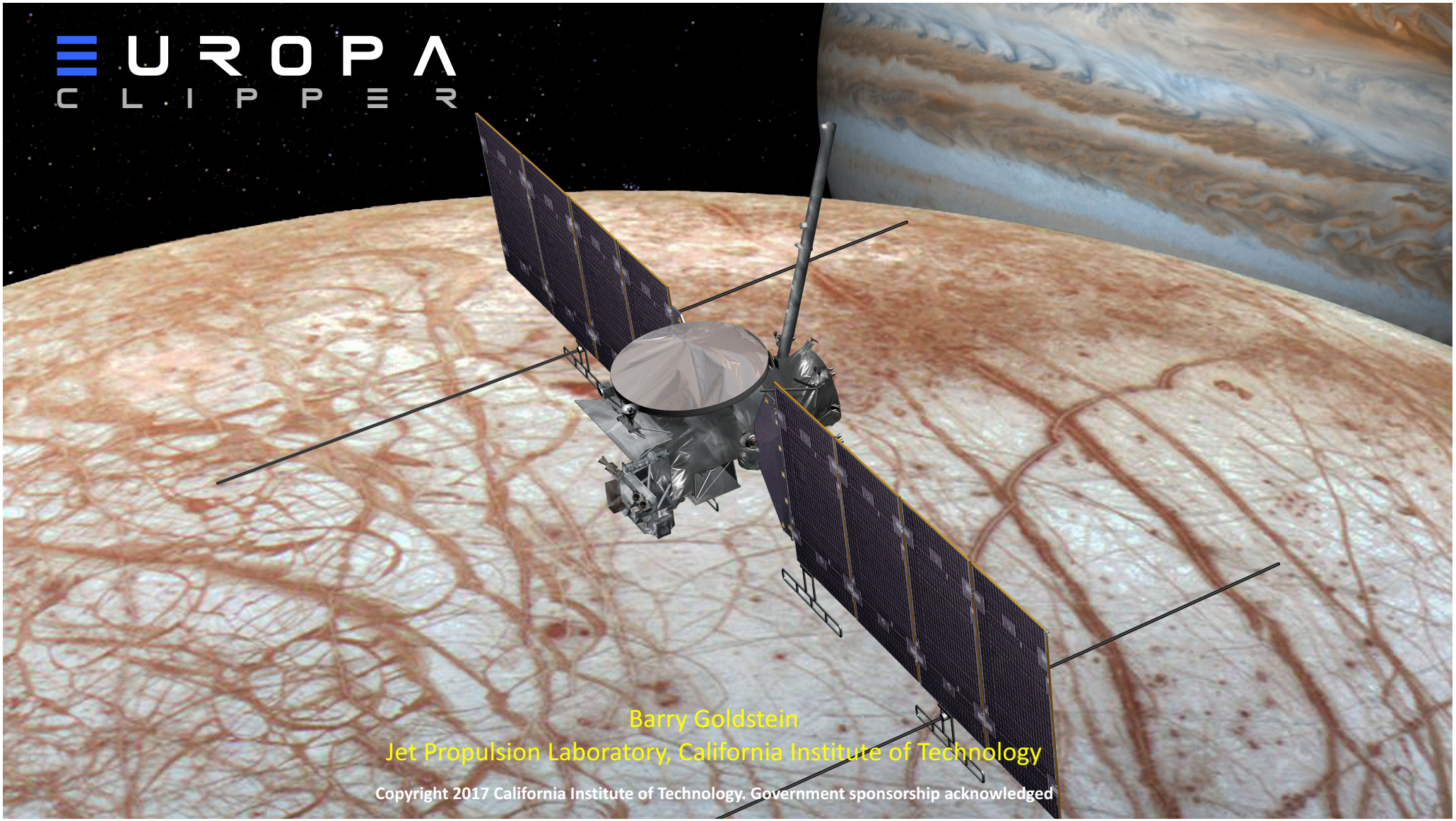

Barry Goldstein
Jet Propulsion Laboratory, California Institute of Technology

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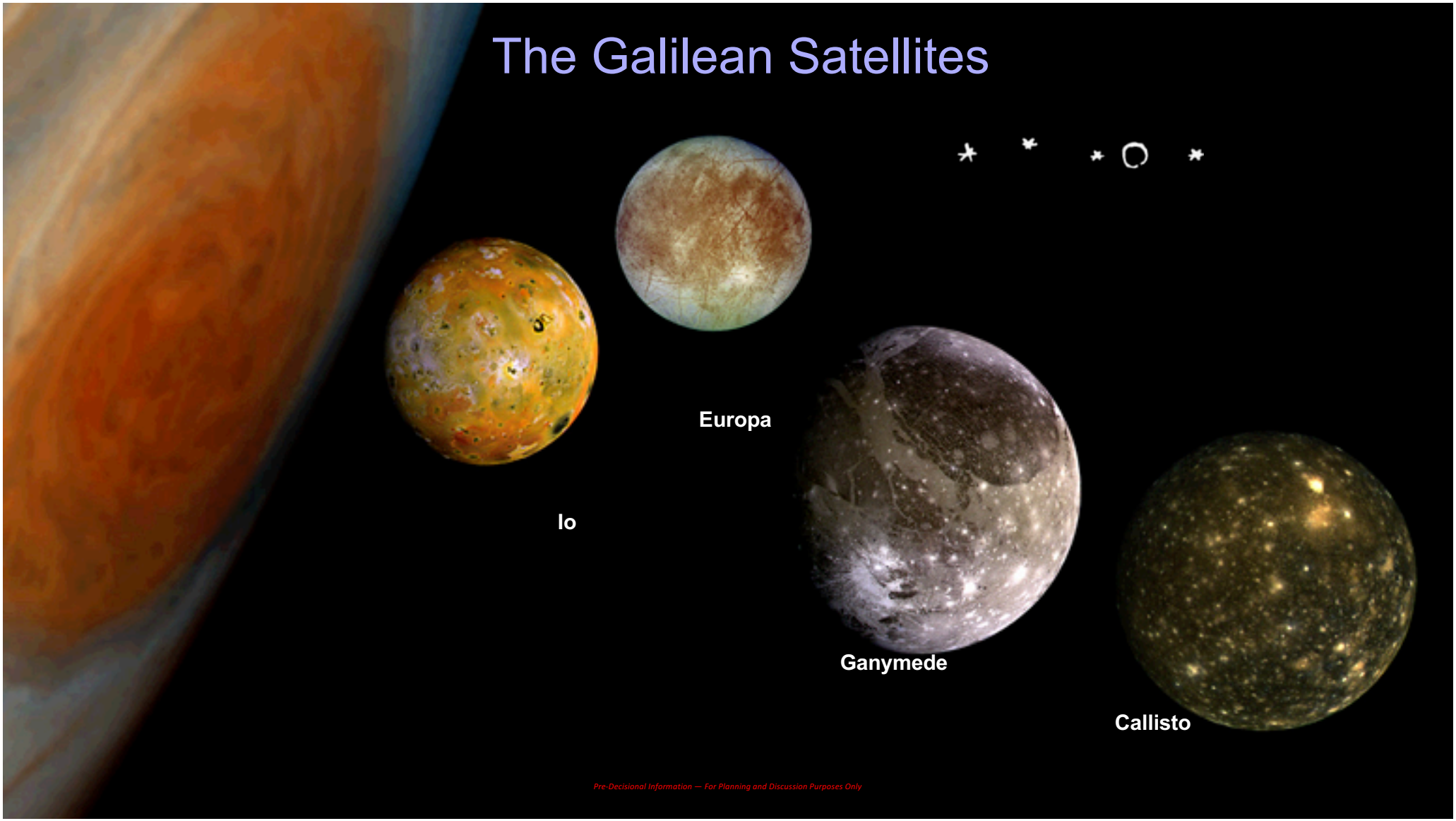
The Galilean Satellites



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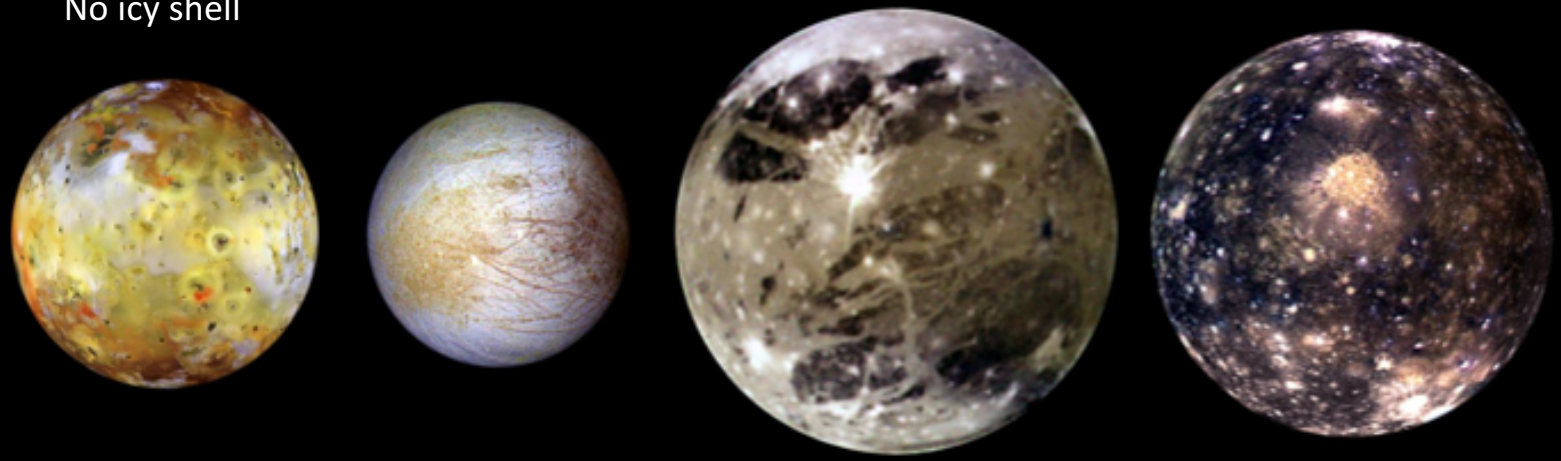
Jupiter's Galilean Satellites

Galileo discovered four moons around Jupiter in January 1610

Volcanic World
No icy shell

Icy Worlds – ice shells on top of Oceans with rocky cores



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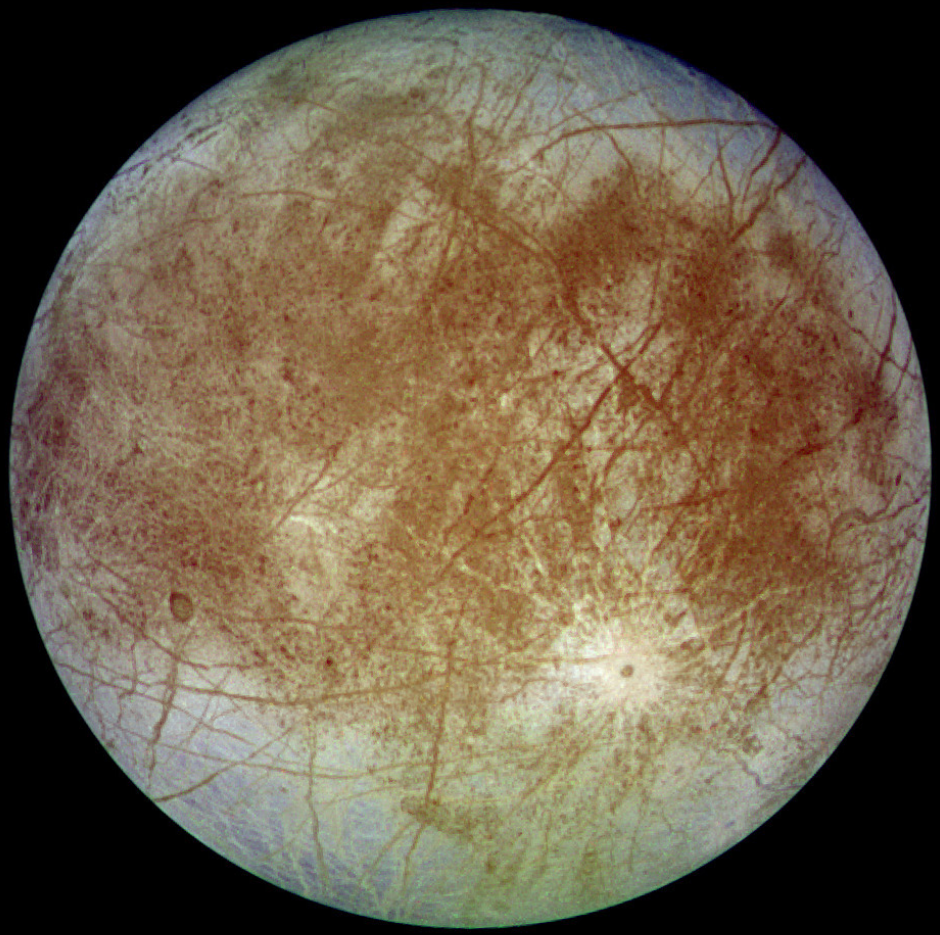
Europa



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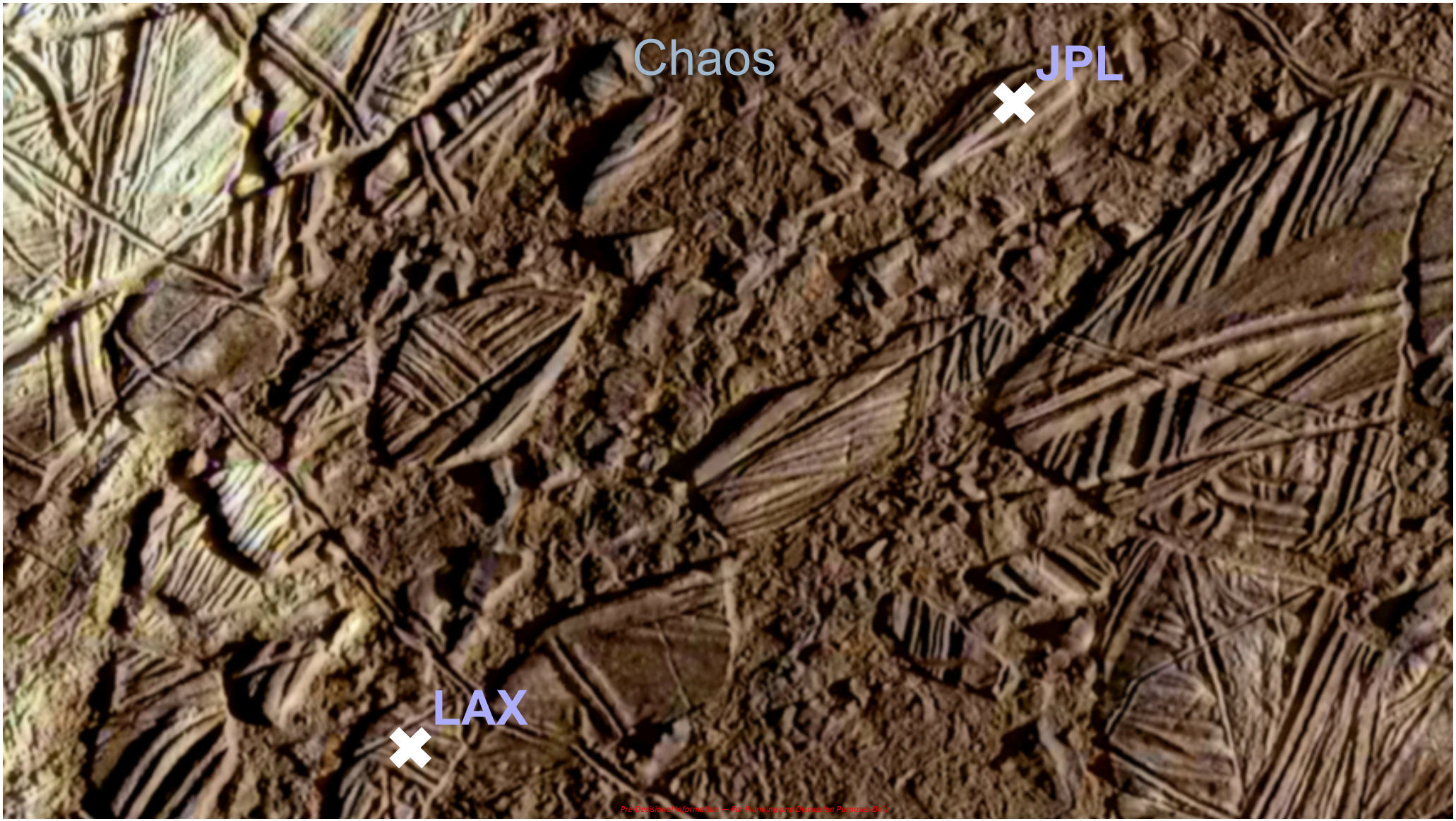
Pre-Decisional Information — For Planning and Discussion Purposes Only



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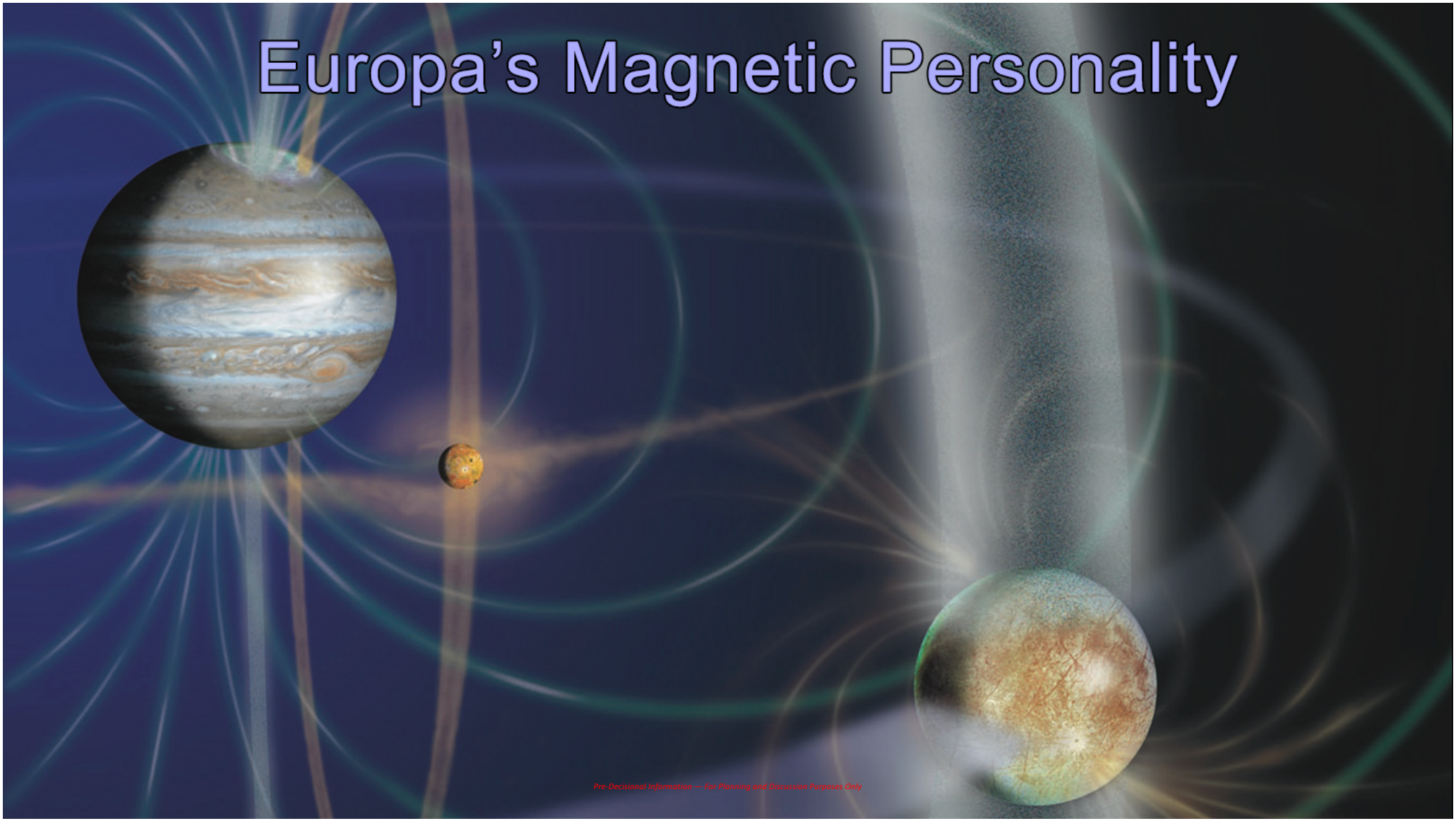
Europa's Magnetic Personality



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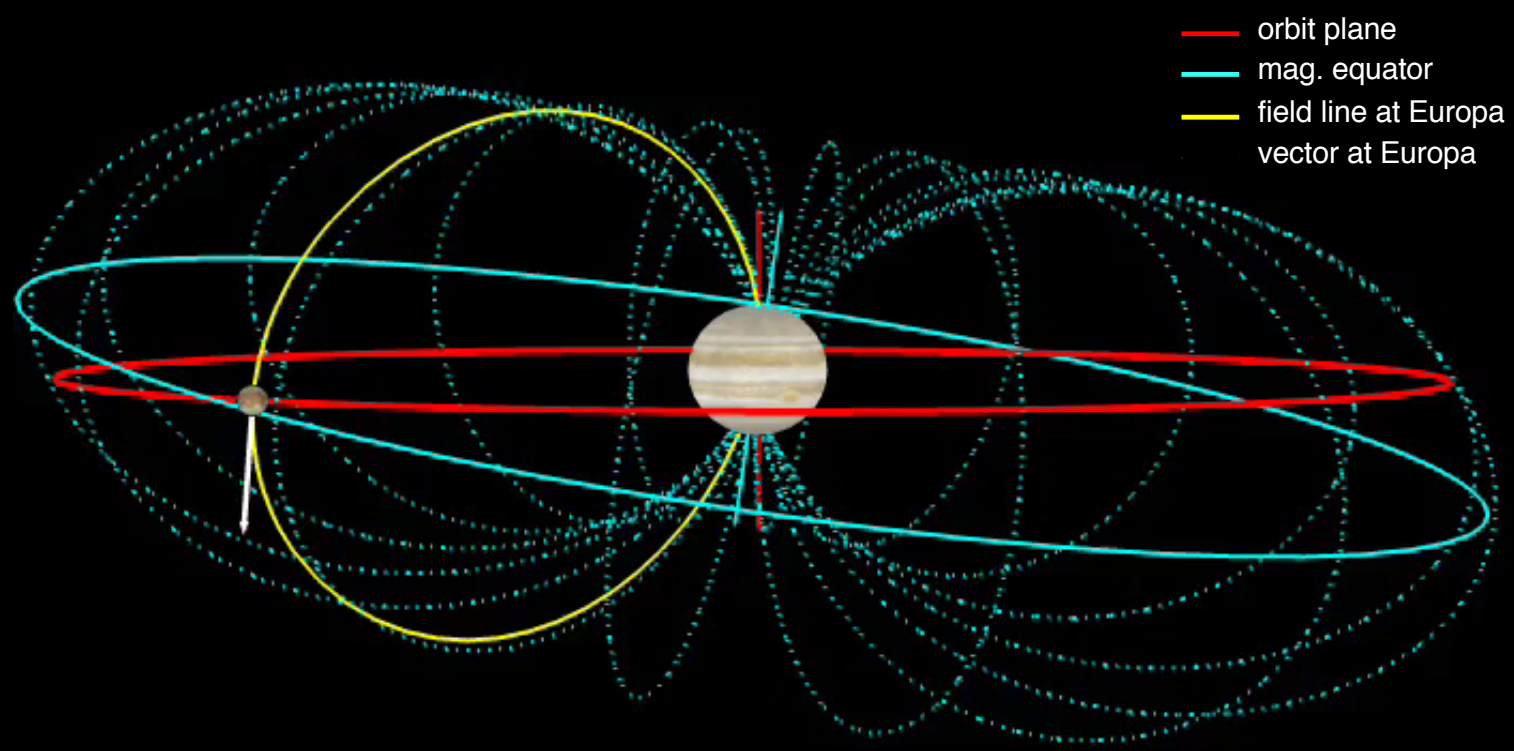
Europa's Induced Magnetic Field



[*animation by E. Sturm using JPL's Jupiter Environment Tool*]

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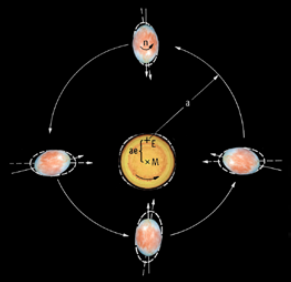
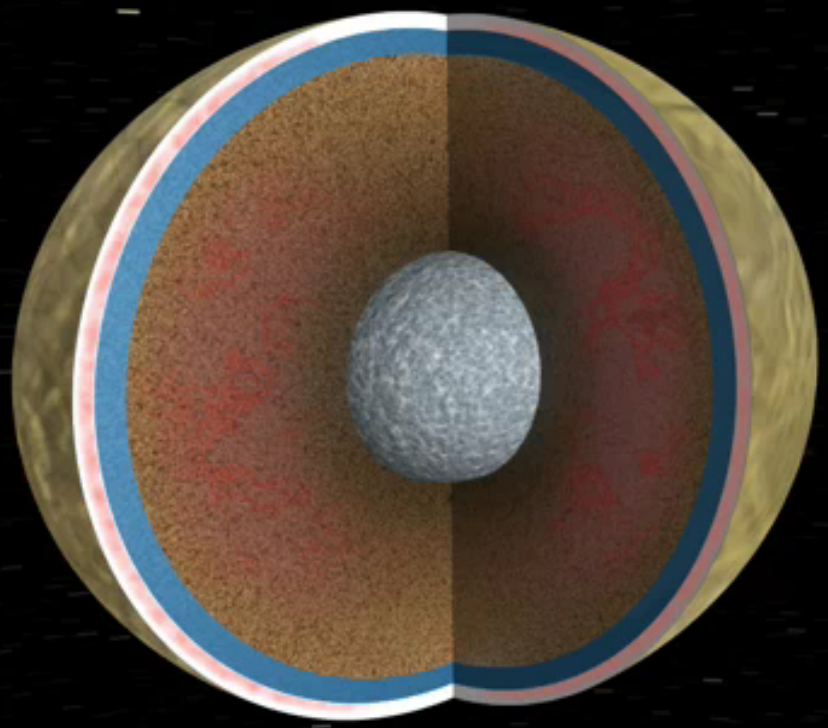
Tidal Flexing → Tidal Heating





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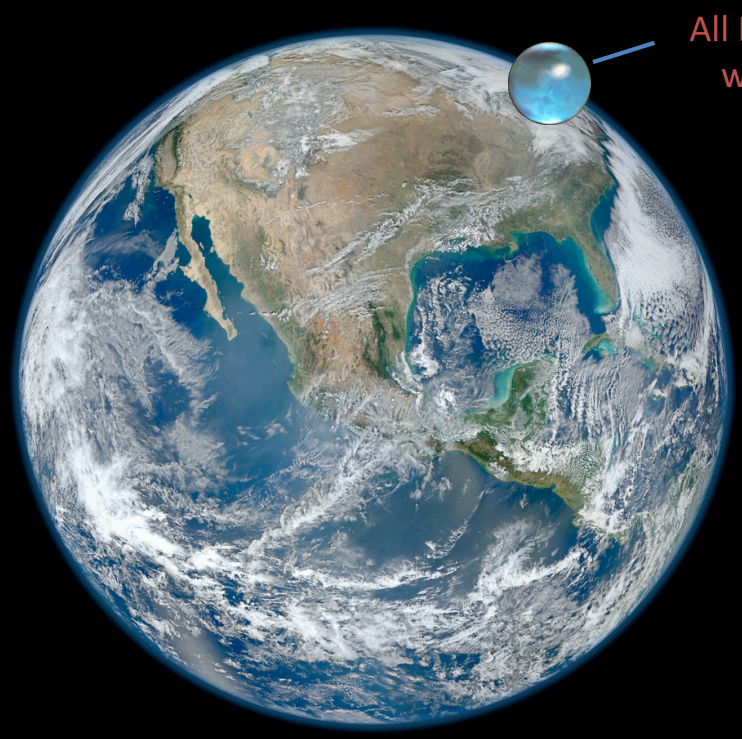
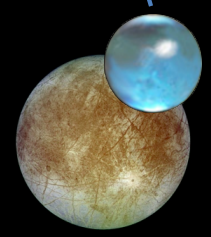
Water World



Earth: Known life

Mars: Past conditions for life



Europa: Present conditions for life?

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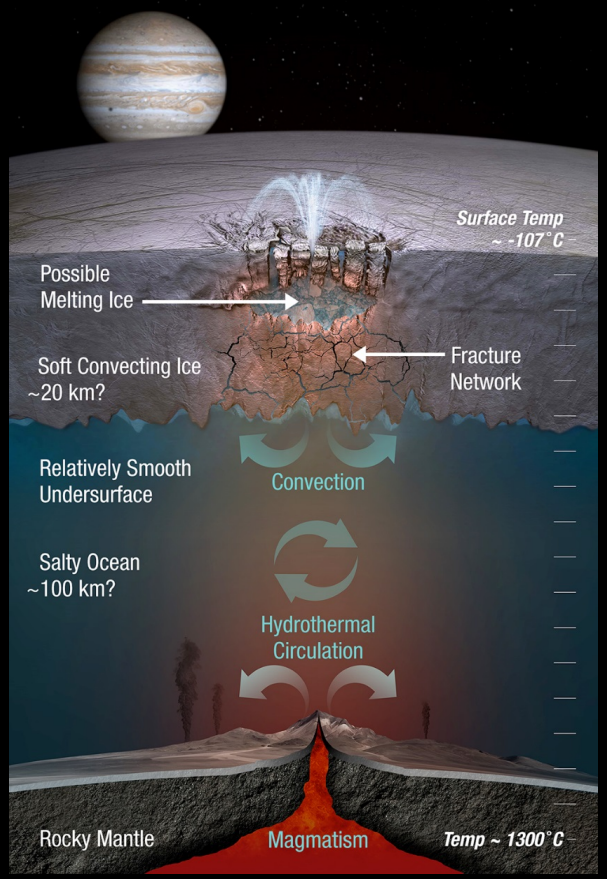
Habitability: Ingredients for Life



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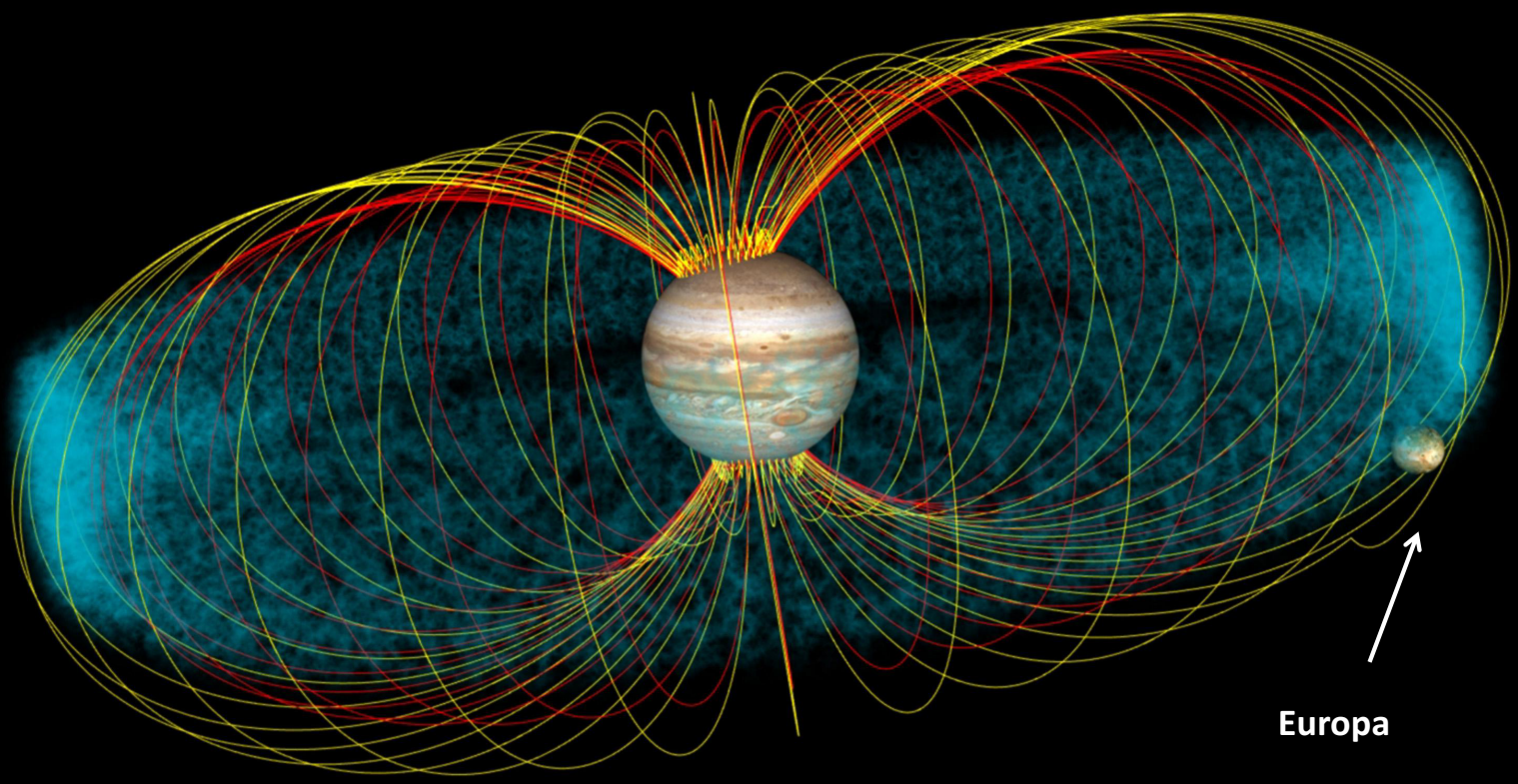
Jupiter's Radiation Belts



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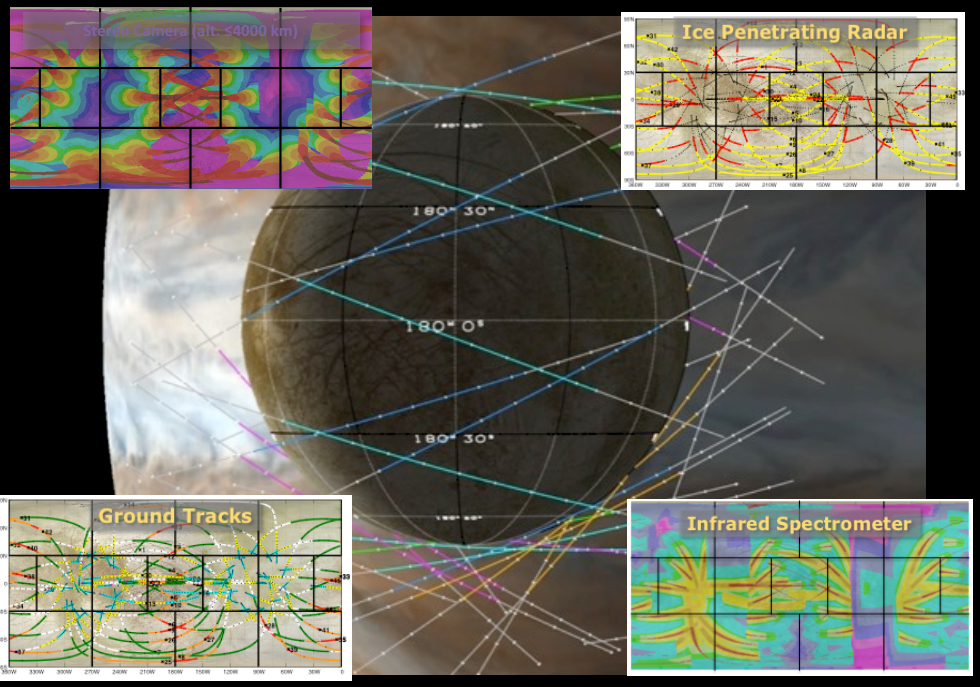
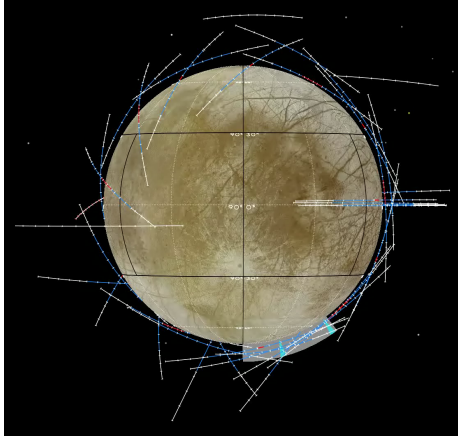
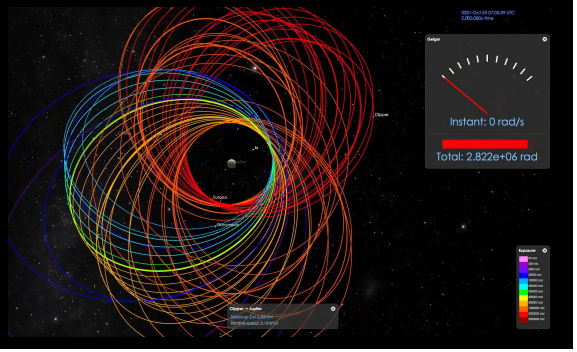
Innovative Mission Concept





Radiation Accumulation



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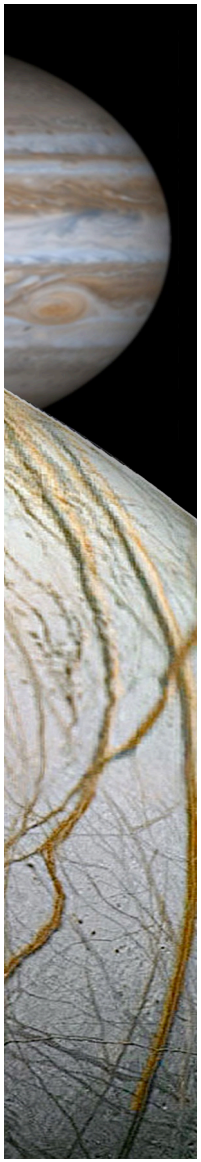
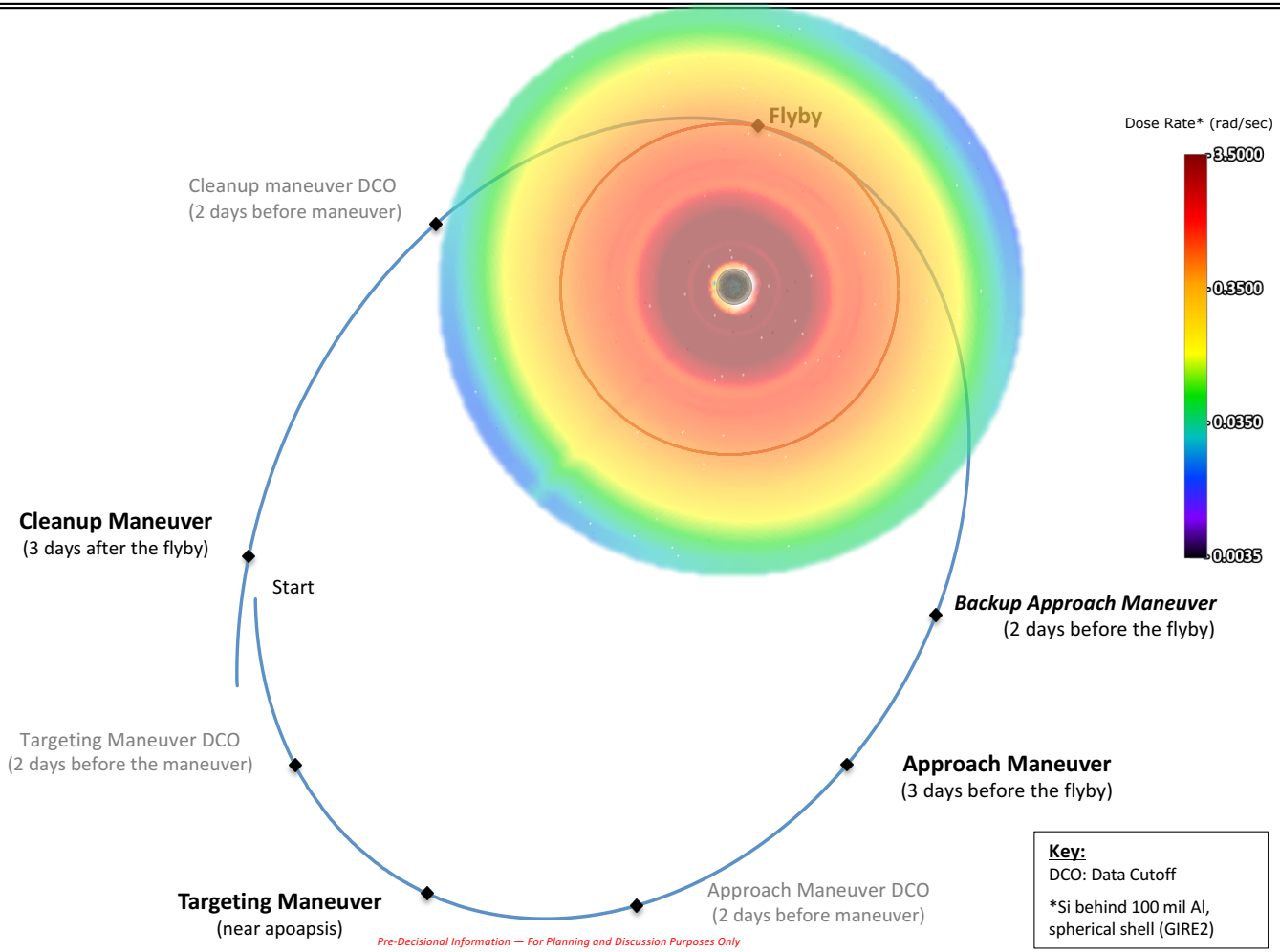


Europa Pedal- Jovian Orbit



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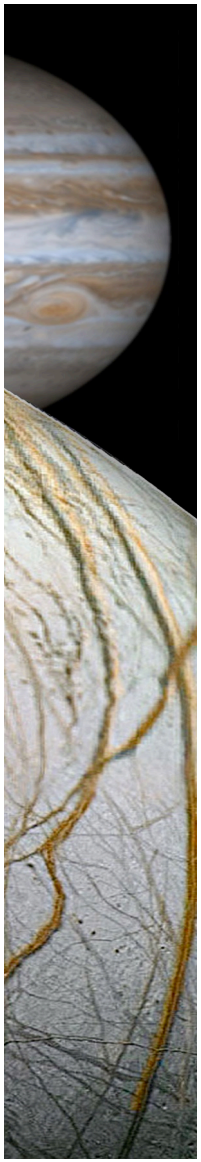
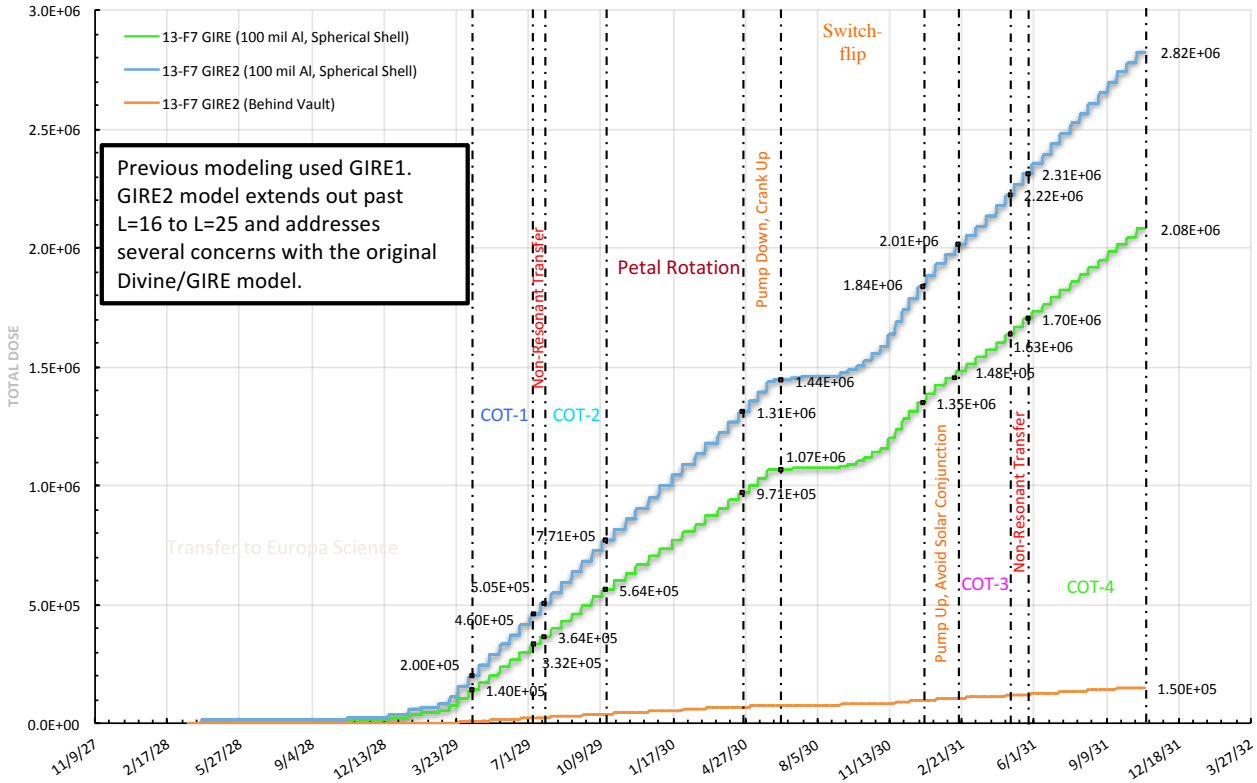


Radiation Modeling: GIRE2



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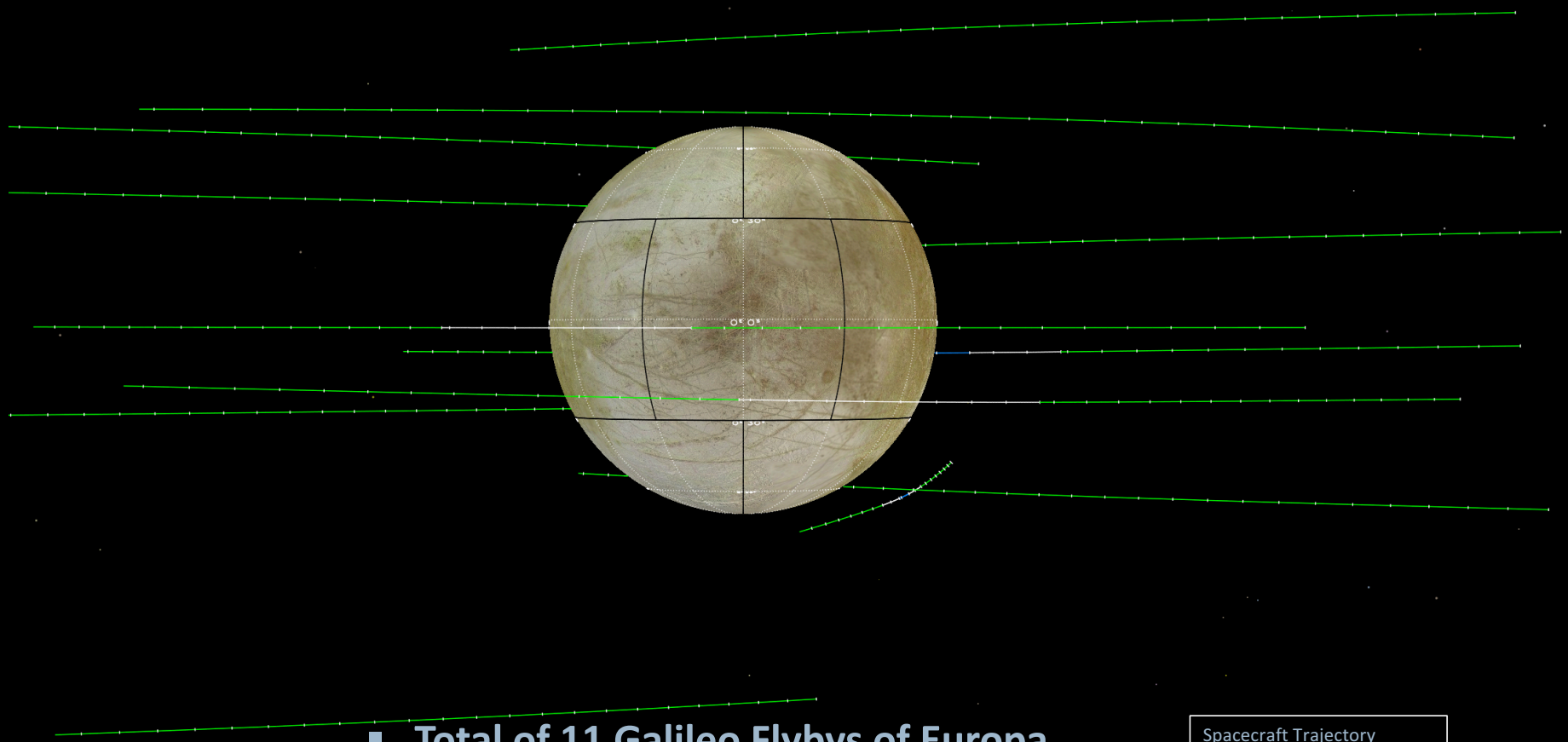
Galileo Flybys Of Europa



- **Total of 11 Galileo Flybys of Europa**
- Instrumentation 1970's Technology

Spacecraft Trajectory

- 25 km ≤ r_{alt} ≤ 50 km
- 50 km < r_{alt} ≤ 400 km
- 400 km < r_{alt} ≤ 1000 km
- 1000 km < r_{alt} ≤ 4000 km

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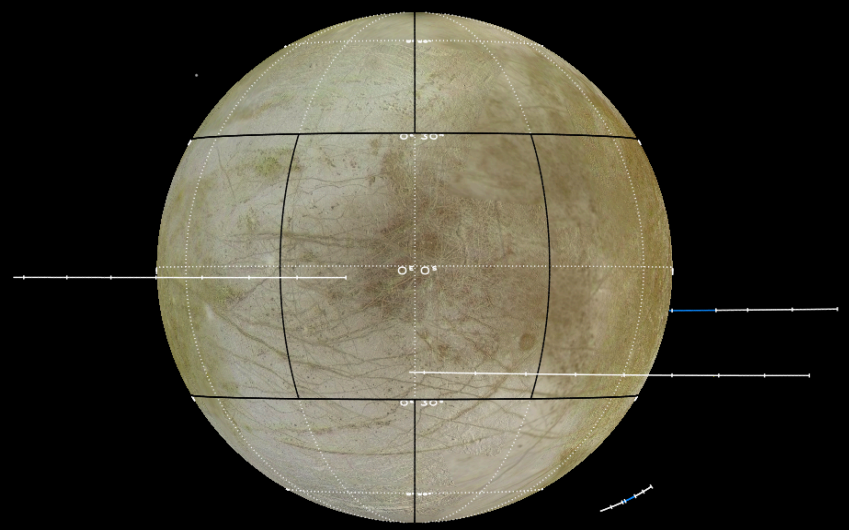
Galileo Flybys Under 1,000 km



- Only 4 **Galileo Flybys under 1,000 km**
- 692 km, 586 km, 351 km & 201 km

Spacecraft Trajectory

25 km ≤ r_{alt} ≤ 50 km

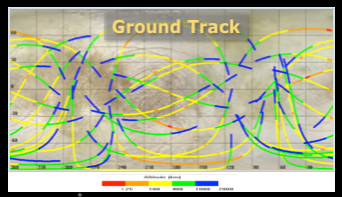
50 km < r_{alt} ≤ 400 km

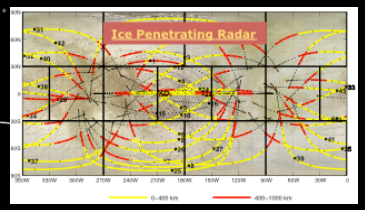
400 km < r_{alt} ≤ 1000 km

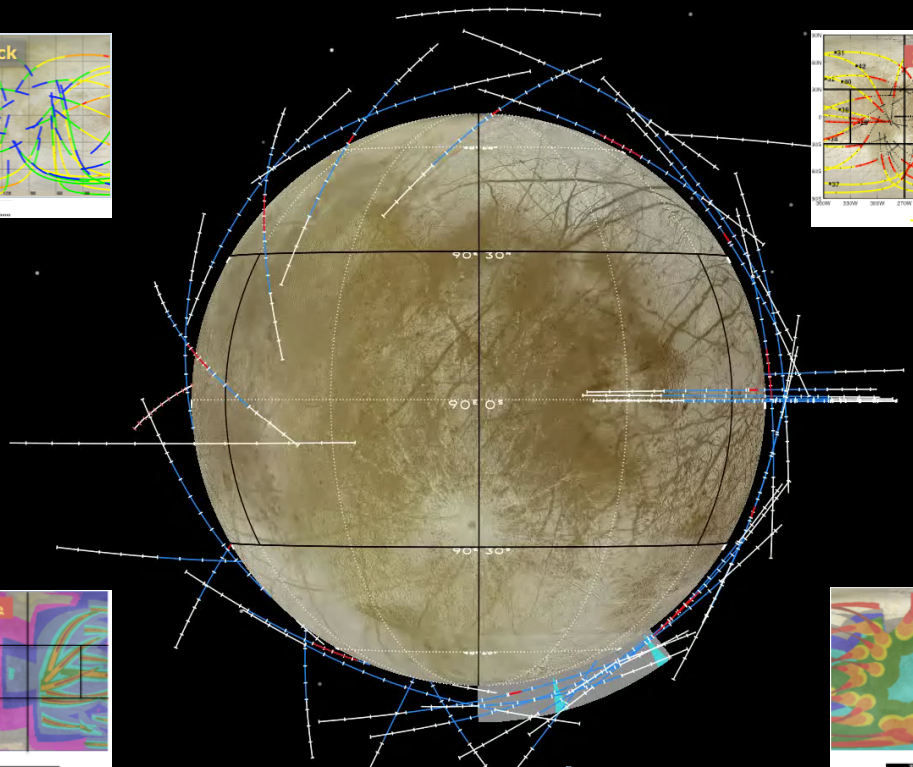
1000 km < r_{alt} ≤ 4000 km

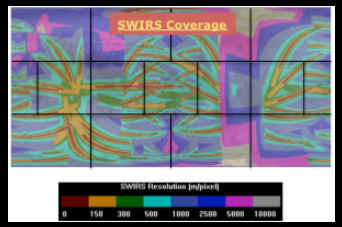
Pre-Decisional Information — For Planning and Discussion Purposes Only

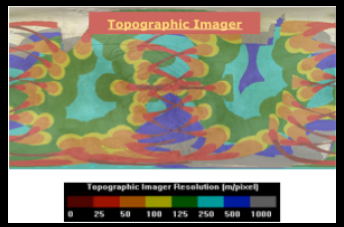
Coverage in Potential Plume Region











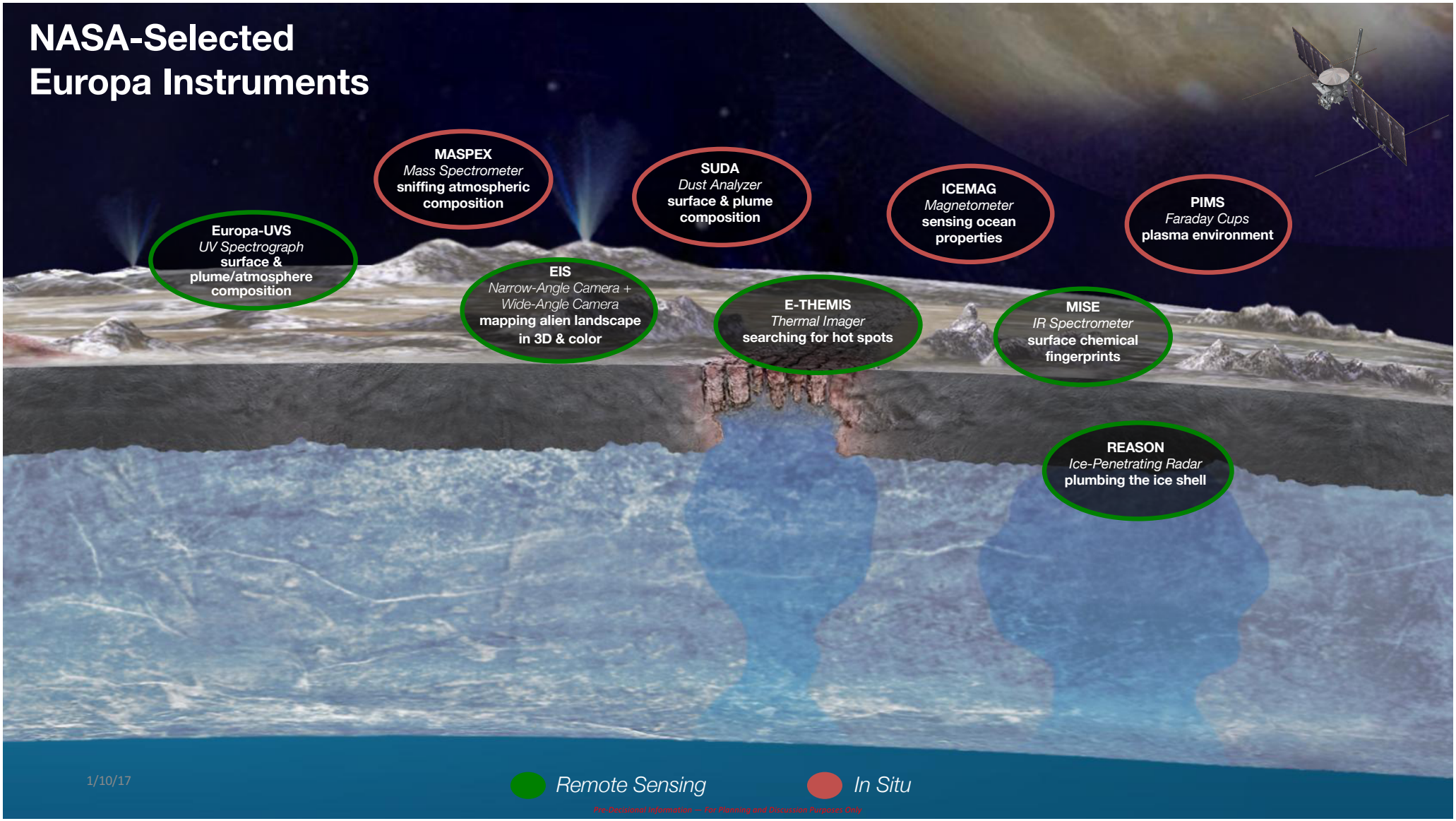
- **Above 1,000 km → 2**
- 250 km to 750 km → 6
- 80 **km to 100 km → 9**
- 50 km → 18
- **25 km → 10**

Spacecraft Trajectory

- 25 km ≤ r_{alt} ≤ 50 km
- 50 km < r_{alt} ≤ 400 km
- 400 km < r_{alt} ≤ 1000 km
- 1000 km < r_{alt} ≤ 4000 km

Pre-Decisional Information — For Planning and Discussion Purposes Only

NASA-Selected Europa Instruments



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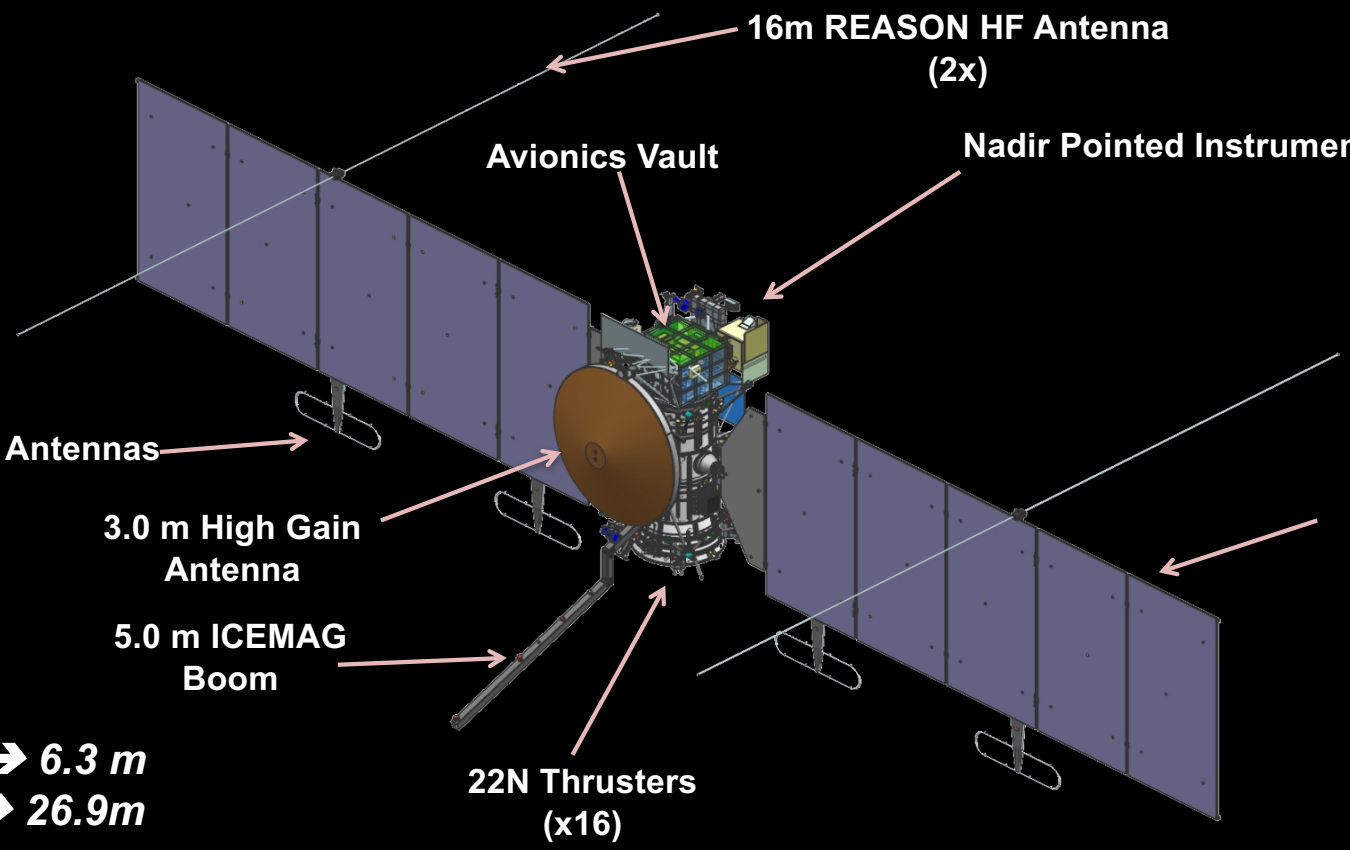
Baseline Flight System Configuration



S/C Height ➔ 6.3 m
S/C Width ➔ 26.9m

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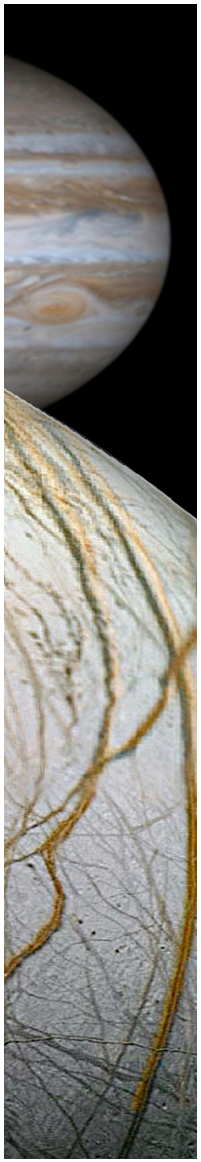
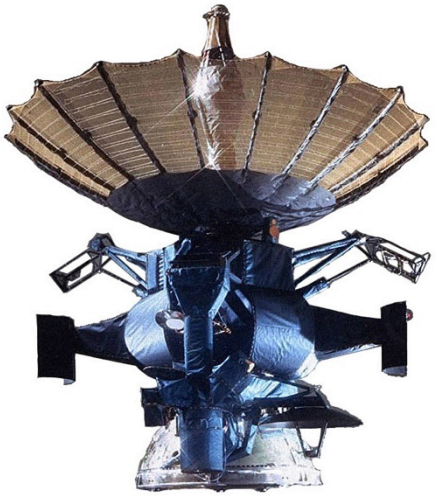
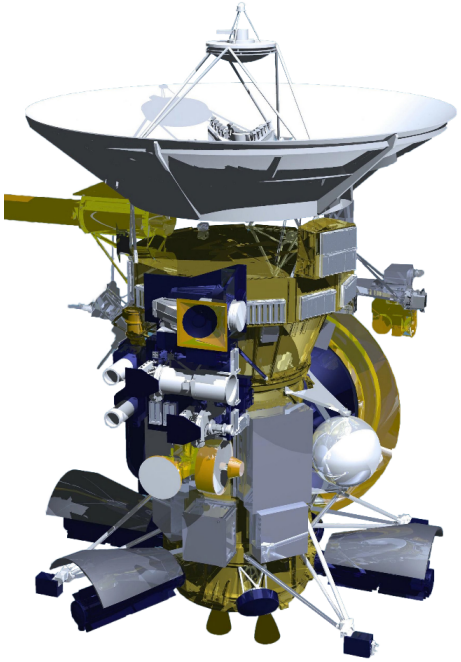


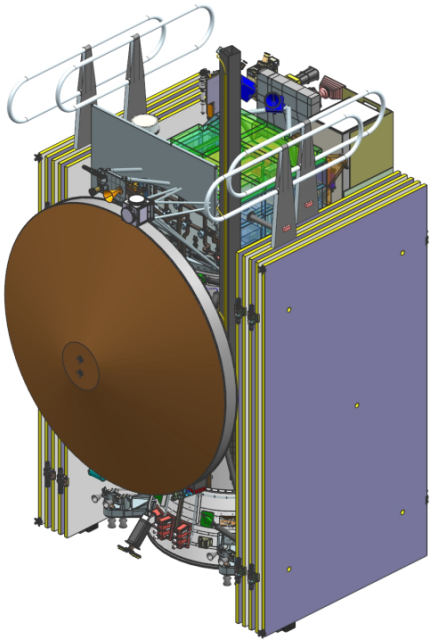
Outer Planet S/C



Galileo
Launch Mass: 2,562 kg



Cassini
Launch Mass: 5,655 kg



Planned Europa Clipper
Launch Mass: 6,000 kg

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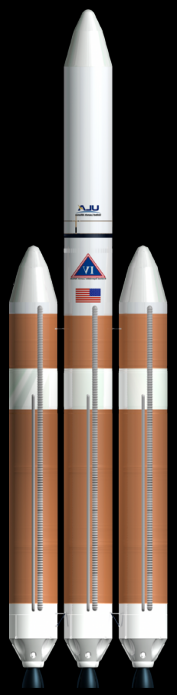
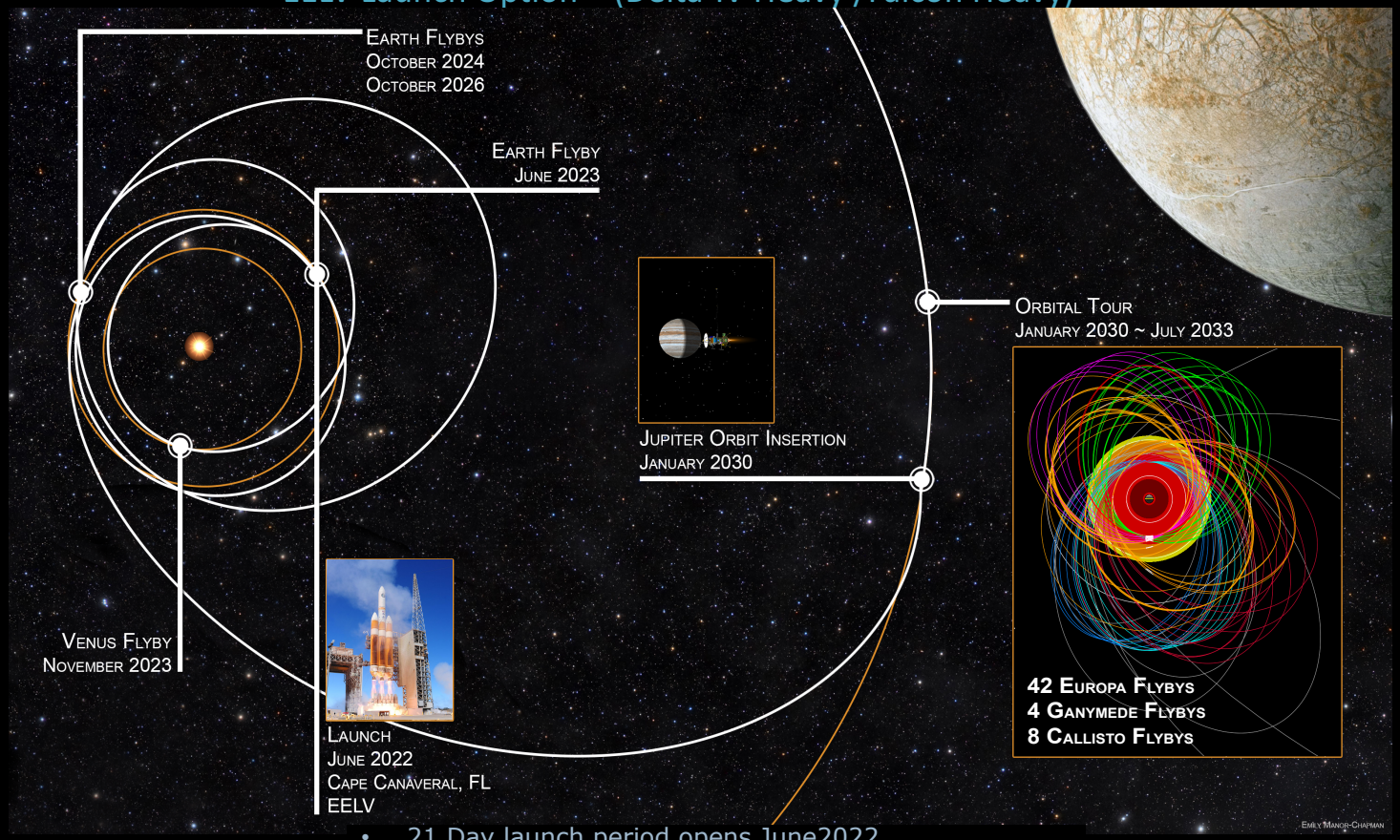
EVEEGA Interplanetary Trajectory

EELV Launch Option – (Delta-IV Heavy /Falcon Heavy)





- 21 Day launch period opens June2022
- Earth/Venus/Earth/Earth Gravity Assist
- Arrive Jovian System January, 2030 (7.5 Years)

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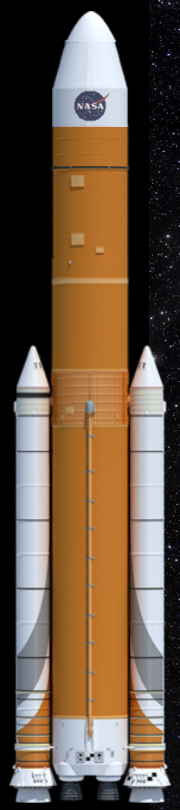
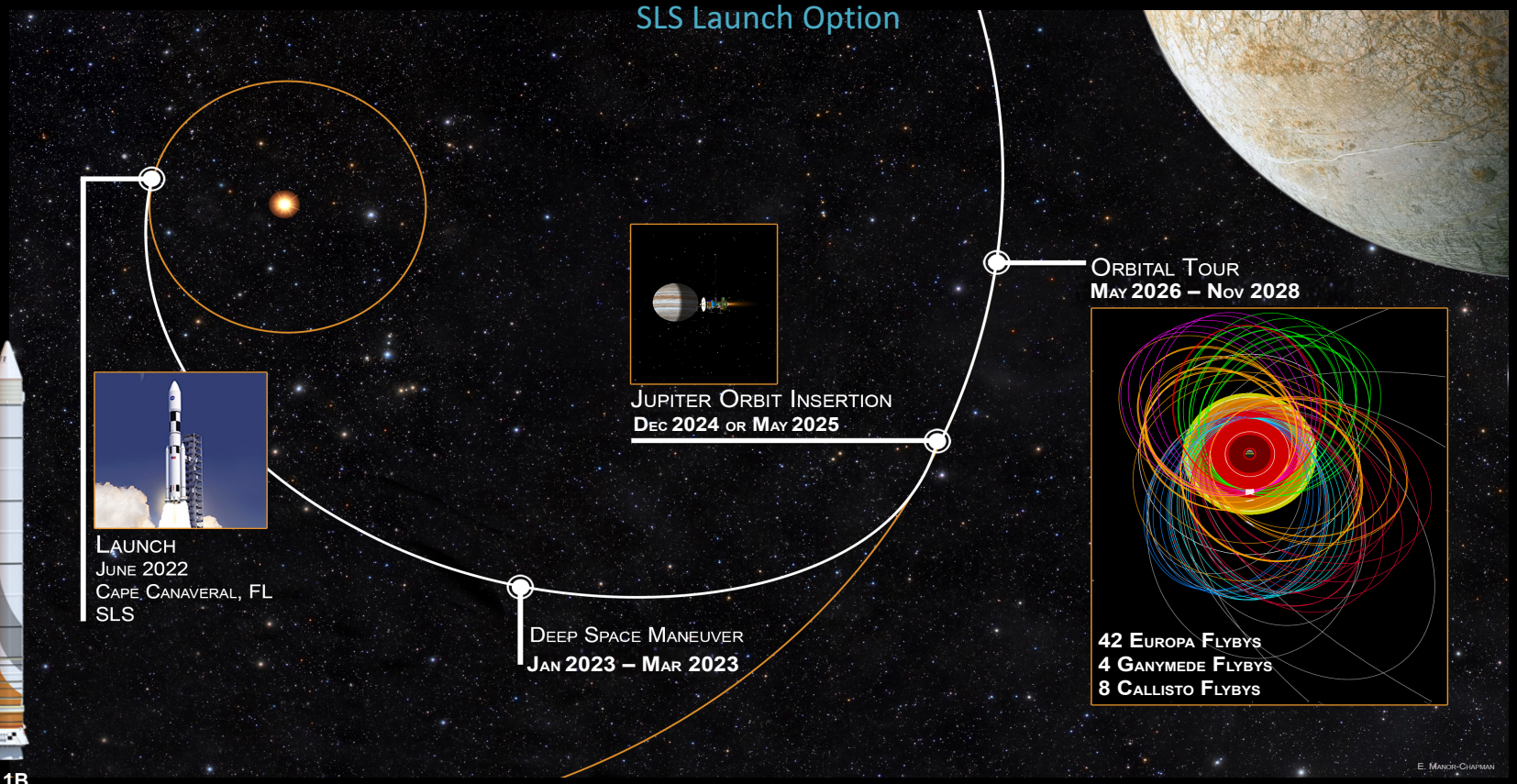
Direct to Jupiter Trajectory

SLS Launch Option



SLS Block 1B



- 21 Day launch period opens June 2022
- Arrive Jovian System March, 2025 (2.7 Years)

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