



The EJSM Mission: Assessment of the Satellite Tour Phase

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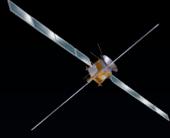
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A Joint NASA-ESA Outer Planet Mission Study



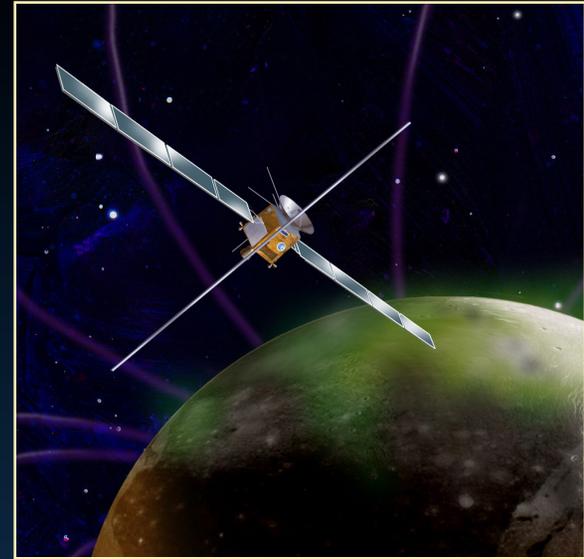
Outline

- Overview of the EJSM Mission
 - Focus on tour phase
- JGO Update
 - Ganymede Orbit
 - Tour Phase, with Focus on Callisto
- JEO Update
 - Observation Opportunities during the tour phase
 - Examples of observation opportunities
 - Summary of EJSM SDT feedback
- OPAG input for observation capabilities

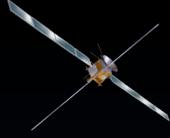


JGO Baseline Mission

- Launch vehicle: Ariane 5
- Power source: Solar Arrays
- Mission timeline:
 - Launch: 2020
 - 6-year Venus-Earth-Earth gravity assist trajectory
 - Jovian system tour phase: ~28 months
 - 9 Ganymede flybys
 - ~15 Callisto flybys
 - Ganymede orbital phase: ~300 days
 - End of prime mission: 2029
 - Spacecraft final disposition: Ganymede impact



| |
|--------------------------------|
| Wide Angle Camera |
| Magnetometer |
| Radio Science |
| Visible-IR Spectrometer |
| Plasma Package & INMS |
| Sub-millimeter wave sounder |
| Radio & Plasma Wave Instrument |
| High Resolution Camera |
| Sub-Surface Radar |
| Laser Altimeter |
| UV Imaging Spectrometer |



Callisto Science return

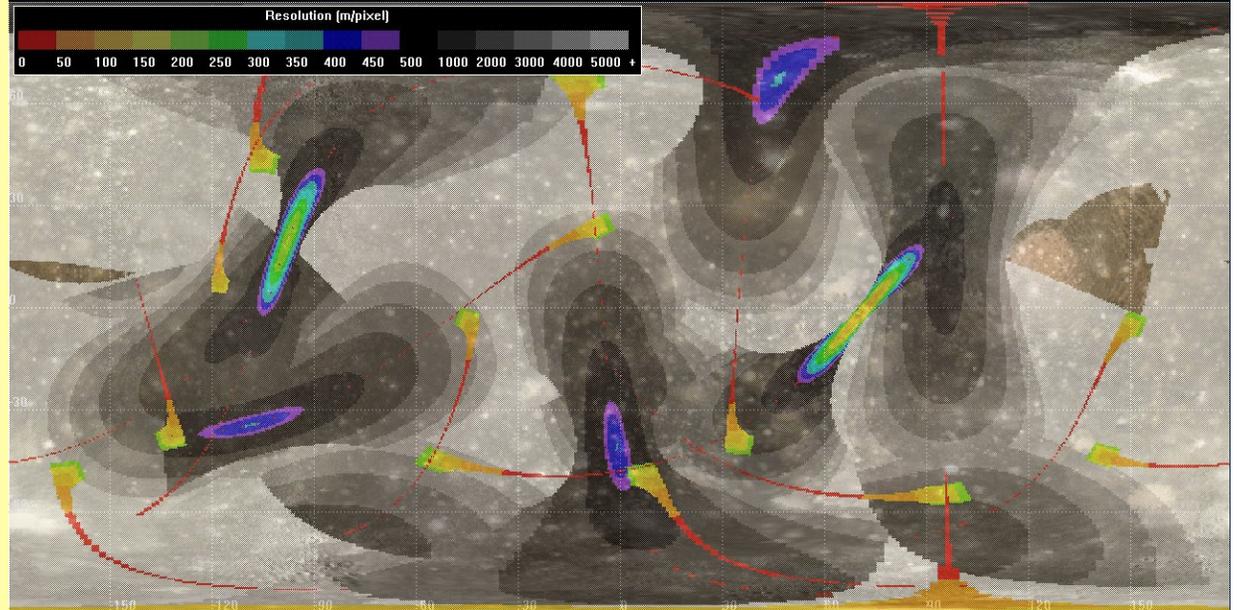
Prioritized list:

The ~15 flybys (more desired) should include ...

1. (near) Polar flyby + (near) equatorial flyby (sub- or anti-Jovian)
- 2a Observations at different true anomalies
- 2b Imaging/spectroscopy Galileo/Voyager gap fills
3. Priority targets
- 4a High latitude observations
- 4b up-stream and down-stream of magnetospheric flow

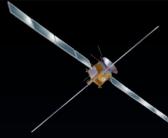
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5. Second near equatorial flyby (leading or trailing side)
 6. Minor priority targets

Science priorities



JGO FOVs (HRC, WAC)

Under study - will be discussed in OPAG WGs.



JEO Model Payload

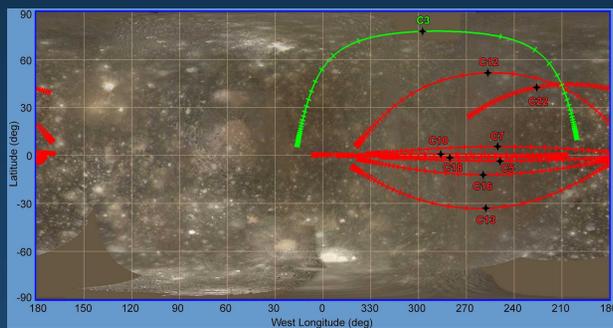
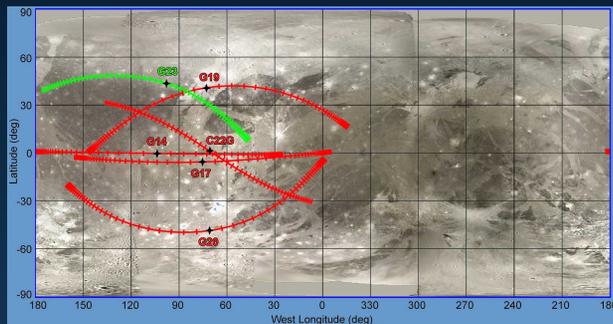
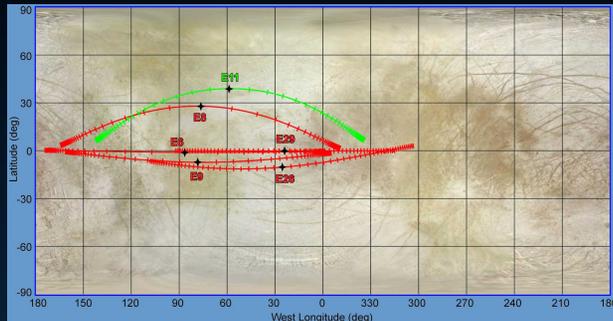
| Ocean | | |
|---|--|-----------|
| Laser Altimeter | | LA |
| Radio Science | | RS |
| Ice | | |
| Ice Penetrating Radar | | IPR |
| Chemistry | | |
| Vis-IR Imaging Spectrometer | | VIRIS |
| UV Spectrometer | | UVS |
| Ion and Neutral Mass Spectrometer | | INMS |
| Geology | | |
| Thermal Instrument | | TI |
| Narrow Angle Camera | | NAC |
| Wide Angle Camera and Medium Angle Camera | | WAC + MAC |
| Fields and Particles | | |
| Magnetometer | | MAG |
| Particle and Plasma Instrument | | PPI |

- 11 instruments (including radio science)
- Emphasizes Europa investigations
- Robust Jupiter system science
- Cooperative, efficient teaming approach

Capable model payload with a conservative approach

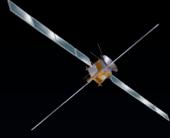


JEO Jupiter System Science

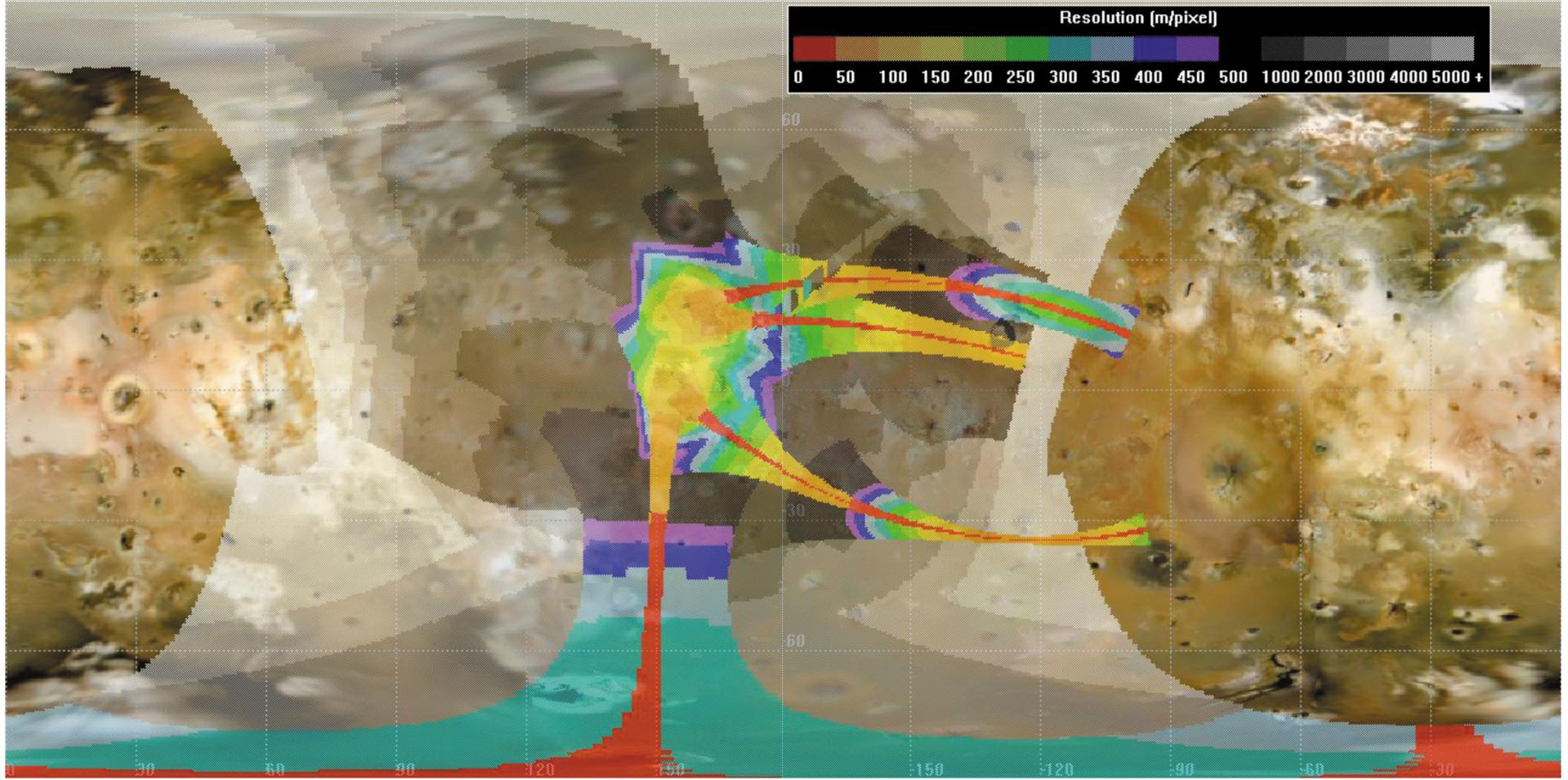


- Jupiter and Io monitoring, atmospheres, magnetospheres, rings, and small bodies
- Io: 3 flybys
 - Opportunities for optical remote sensing , altimetry
 - *In situ* analysis of extended atmosphere with INMS at ~75 km
- Europa: 6 flybys
 - Radar and optical remote sensing characterization and calibration
 - Imaging up to 10-50 m resolution, NIR 250-1250 m
- Ganymede: 6 flybys
 - Radar and optical remote sensing of grooved and dark terrains
 - Range of lats, lons for *in situ* magnetosphere sampling
- Callisto: 9 flybys
 - High-latitude flyby for gravity field determination
 - Ocean characterization with magnetometer

| Satellite | ≤1000m | ≤200m | ≤50m | ≤10m | Length IPR (km) | Length LA (km) |
|-----------|--------|-------|------|-------|-----------------|----------------|
| Io | 30% | 20% | 5% | - | 1000 | 7400 |
| Europa | 60% | 60% | 15% | 0.01% | 6600 | 19000 |
| Ganymede | 50% | 50% | 10% | 0.02% | 17000 | 28000 |
| Callisto | 85% | 75% | 5% | 0.01% | 15000 | 30000 |

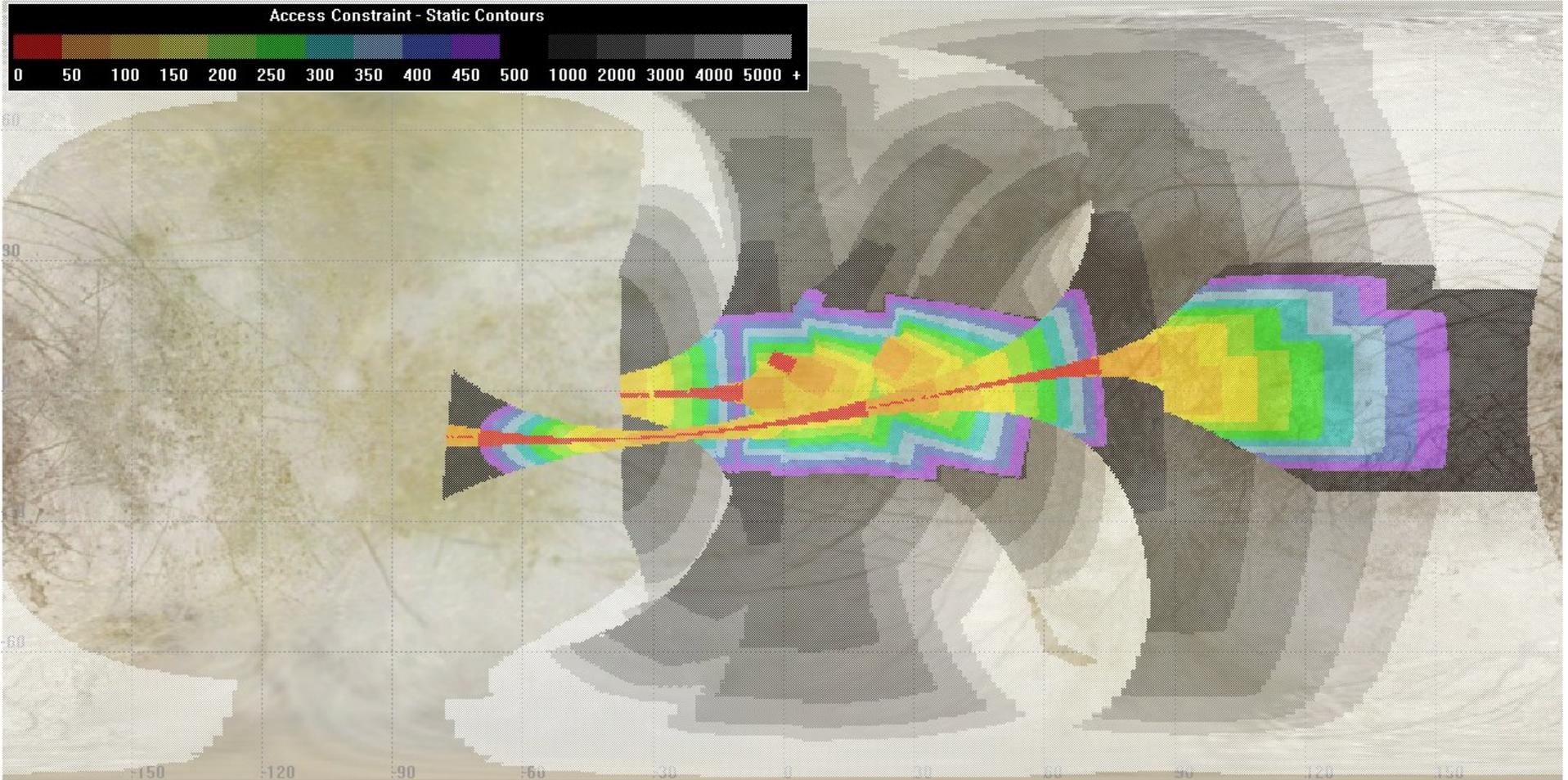


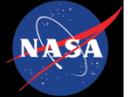
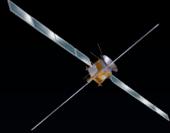
JEO Image Coverage of Io from tour phase





JEO Image Coverage of Europa from tour phase





JEO Image Coverage of Ganymede from tour phase

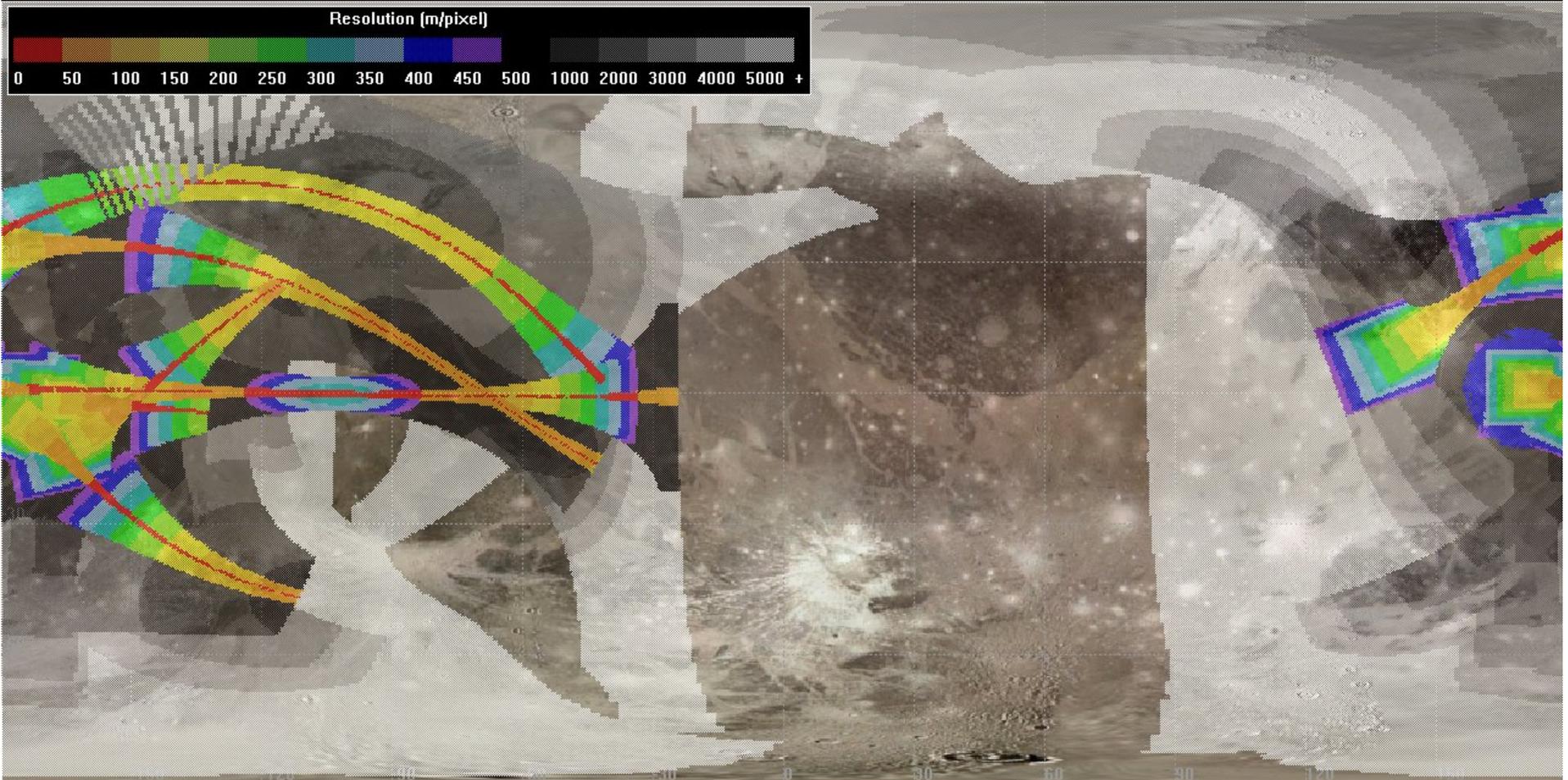
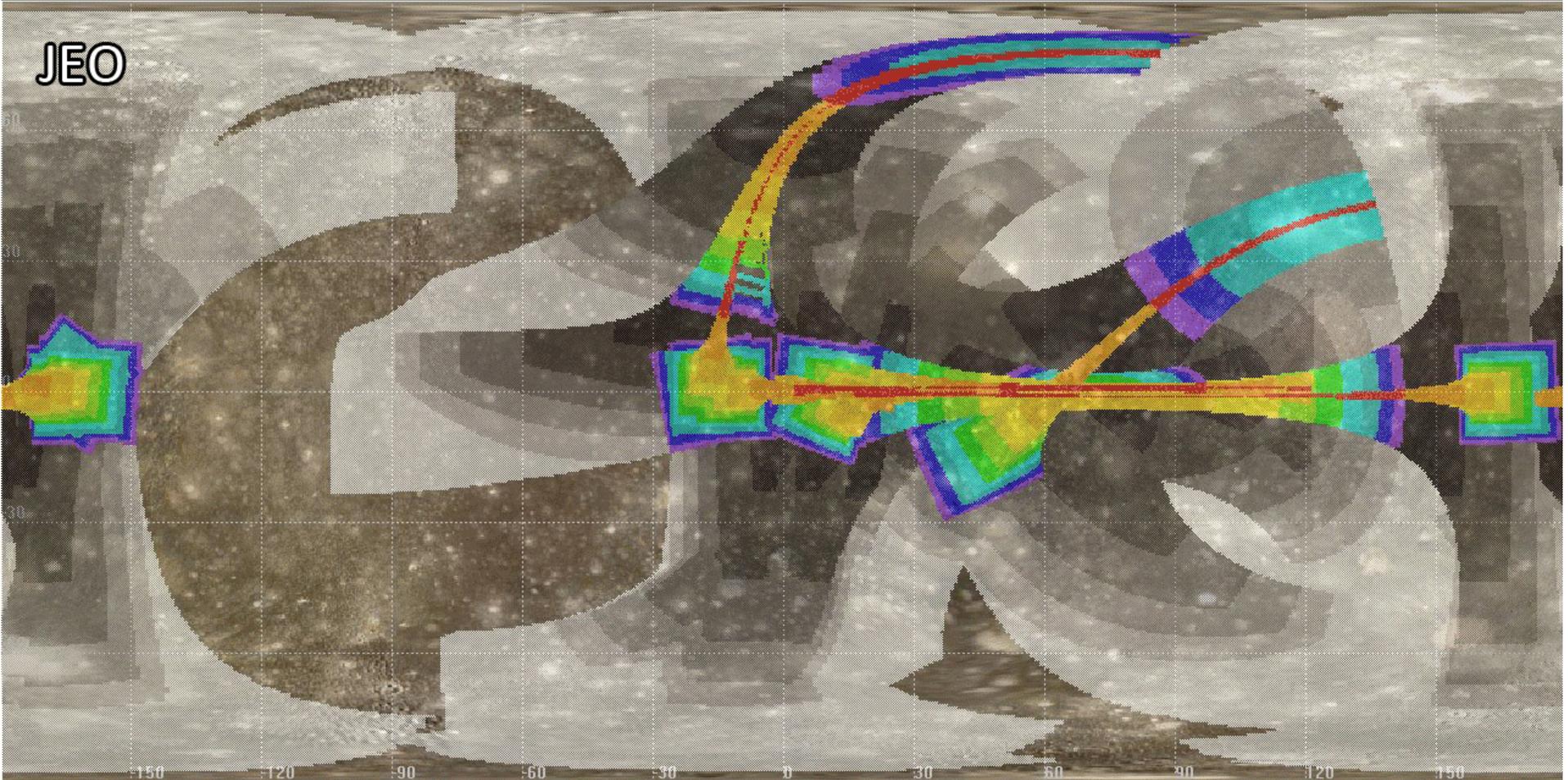
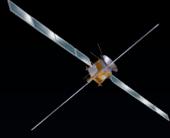




Image Coverage of Callisto from tour phase





EJSM Open Science Workshop 17 – 19 May 2010

Event Details:

From: 17 May 2010
To: 19 May 2010
Address: ESTEC, Noordwijk
Country: The Netherlands
More info: <http://jakal.sp.ph.ic.ac.uk/EJSM/>

The ESA-NASA Europa Jupiter System Mission (EJSM) consists of two primary flight elements operating in the Jovian system: the ESA-led Jupiter Ganymede Orbiter (JGO) and the NASA-led Jupiter Europa Orbiter (JEO). JGO and JEO will execute an extended choreographed exploration of the Jupiter System before settling into orbit around Ganymede and Europa, respectively. The overarching goal of EJSM is the study of the emergence of habitable worlds around gas giants. JGO and JEO will carry complementary instruments to achieve the following science objectives: characterize Ganymede and Europa as planetary objects and potential habitats, study Ganymede, Europa, Callisto and Io in the broader context of the system of Galilean satellites and focus on Jupiter science including the planet, its atmosphere and the magnetosphere as a coupled system.

During this workshop it is planned to:

- Update the community on the status of the EJSM mission following on-going studies in Europe and the pre-project implementation activities in the US
- Review/(update where necessary) the science goals of EJSM
- Review latest science results at Jupiter and gather any further science topics that could be addressed by EJSM within the current payloadbaseline
- Discuss synergies offered by two spacecraft operating simultaneously in the Jupiter System
- Review the status of the instrument studies performed under the ESA DOI activities
- Discuss potential contribution to the exploration of the Jupiter system by the JAXA Jupiter Magnetospheric Orbiter and the RSA Europa Lander, both of which are under consideration
- Discuss the timetable for presenting EJSM to the Cosmic Vision down selection process and ensuring feedback from the community to support EJSM through mission selection

Please register your interest in attendance at this workshop, as well as your intent to submit an abstract via <http://jakal.sp.ph.ic.ac.uk/EJSM/>

The deadline for receipt of abstracts covering both the instrument Declaration of Interest studies, as well as new scientific results will be 31st March 2010.

Example Satellite Observations

