

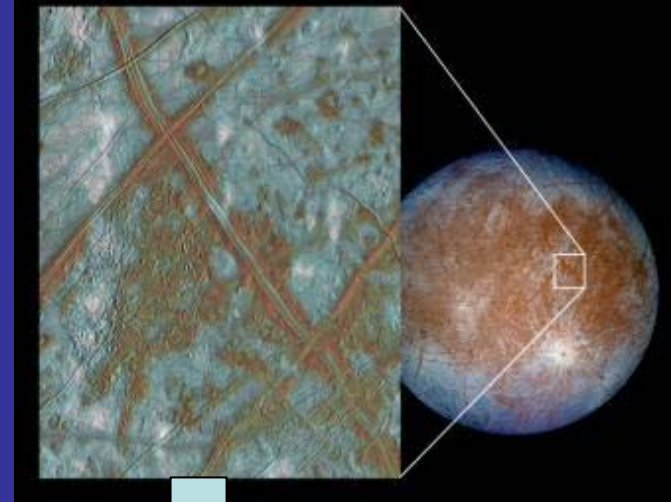
Science rationale for a future mission to Europa and the Jupiter System: Prioritized list of objectives ESA-NASA WG meeting, Paris, April 10-12, 2006

ESA-NASA joint working group on a future mission to Europa
and the Jupiter system

Presentation for WG by G. Schwehm
Head Solar System Missions Division
Directorate of Scientific Programme, ESA

OPAG, 4 May 2006, Pasadena, CA

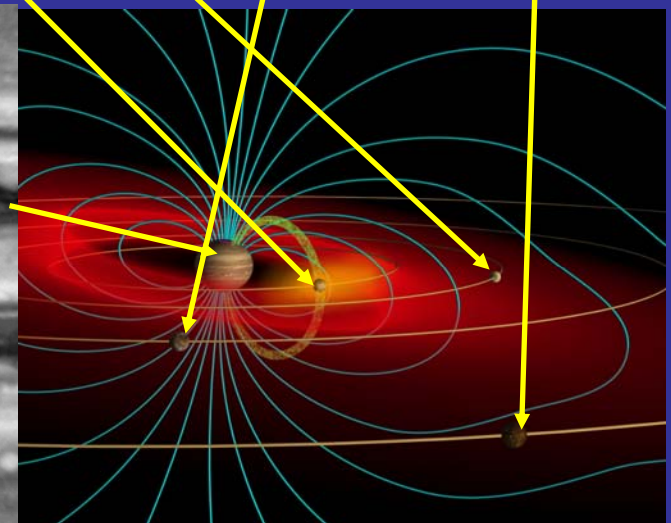
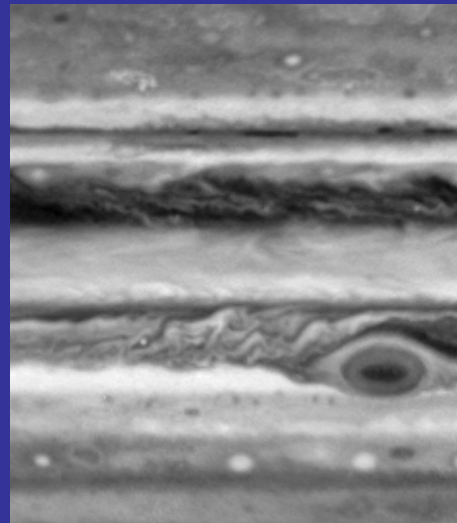
- Theme 1 – Characterize Europa as a planetary object and a potential habitat



- Theme 2 – Study the origin, formation and evolution of the Jovian satellites system



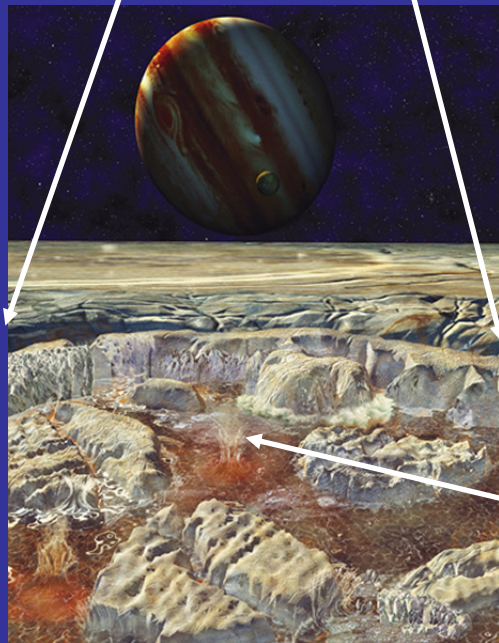
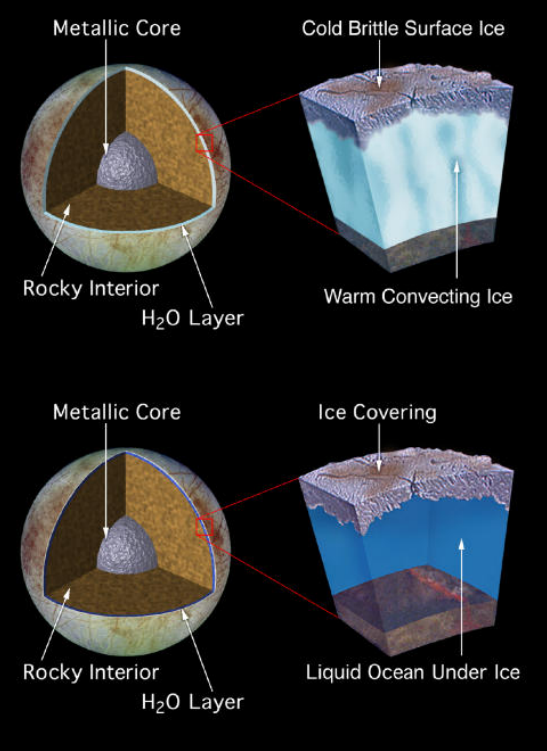
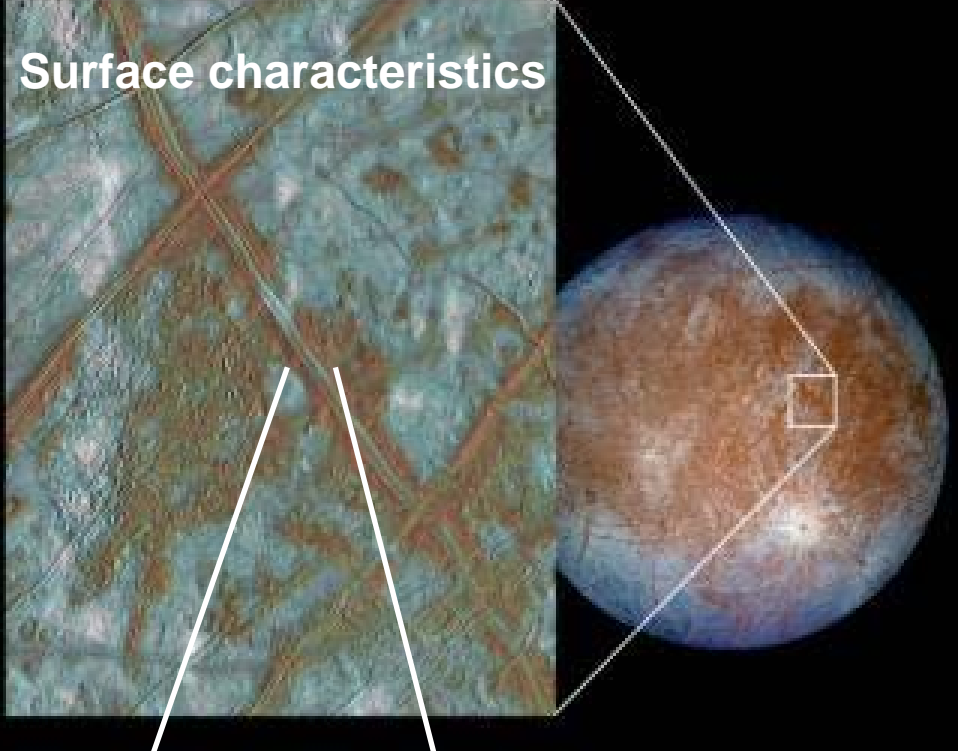
- Theme 3 – Jupiter system science
Atmosphere, magnetosphere, nebula



Theme 1 – Characterize Europa as a planetary object and a potential habitat

- P0- Existence and main characteristics of a sub-surface ocean,
- P0- Constraints on mantle dynamics and silicate/ocean surface topography
- P1- Global surface morphology and dynamics,
- P2- Surface composition from orbit
- P3- Exosphere and magnetospheric interactions

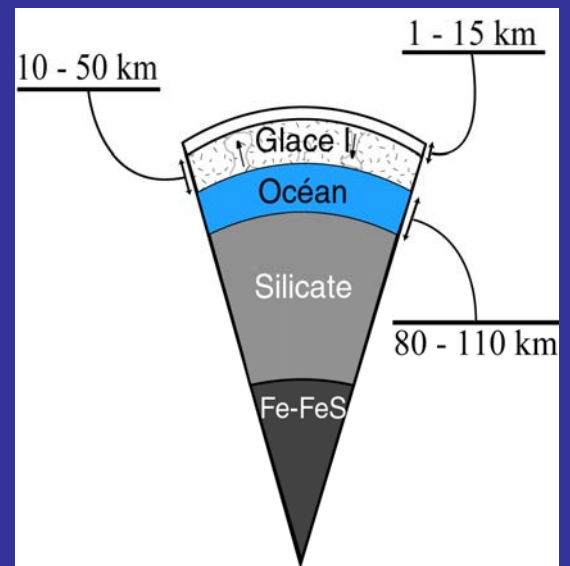
Surface characteristics



Europa

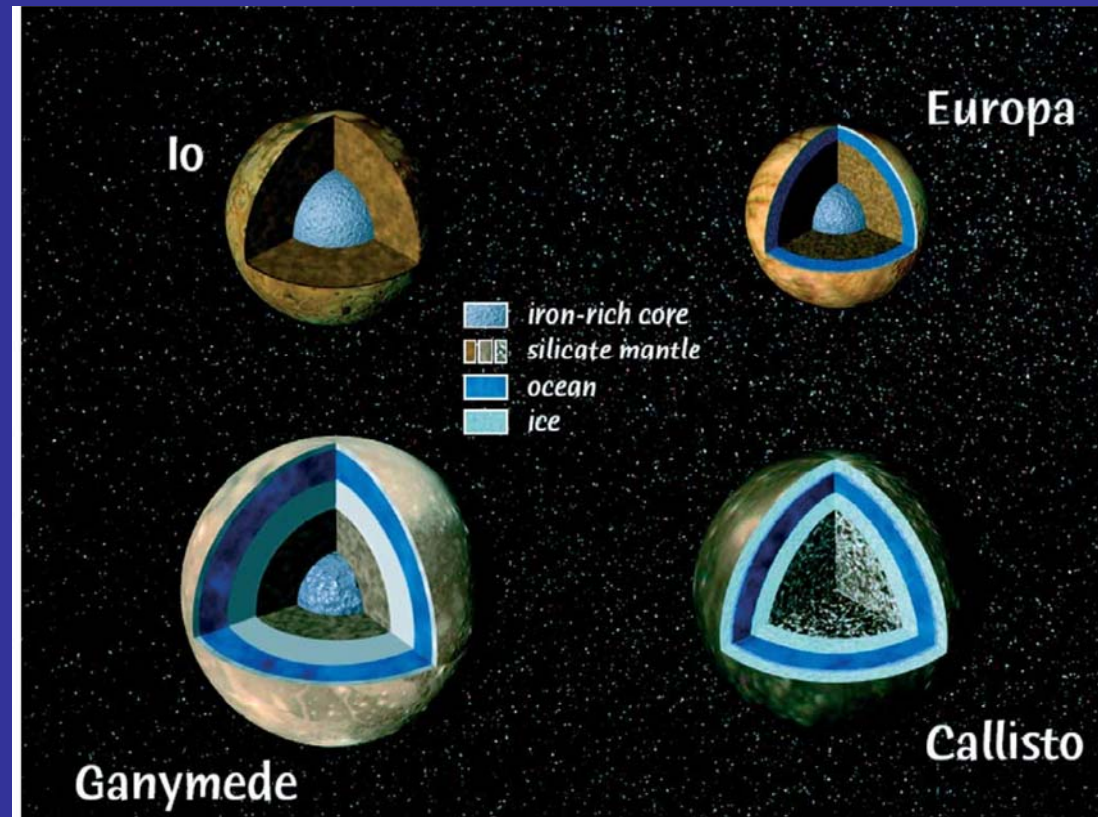
Biosignatures ?

Internal structure



Theme 2 – Study the origin and formation of the Jovian satellites system

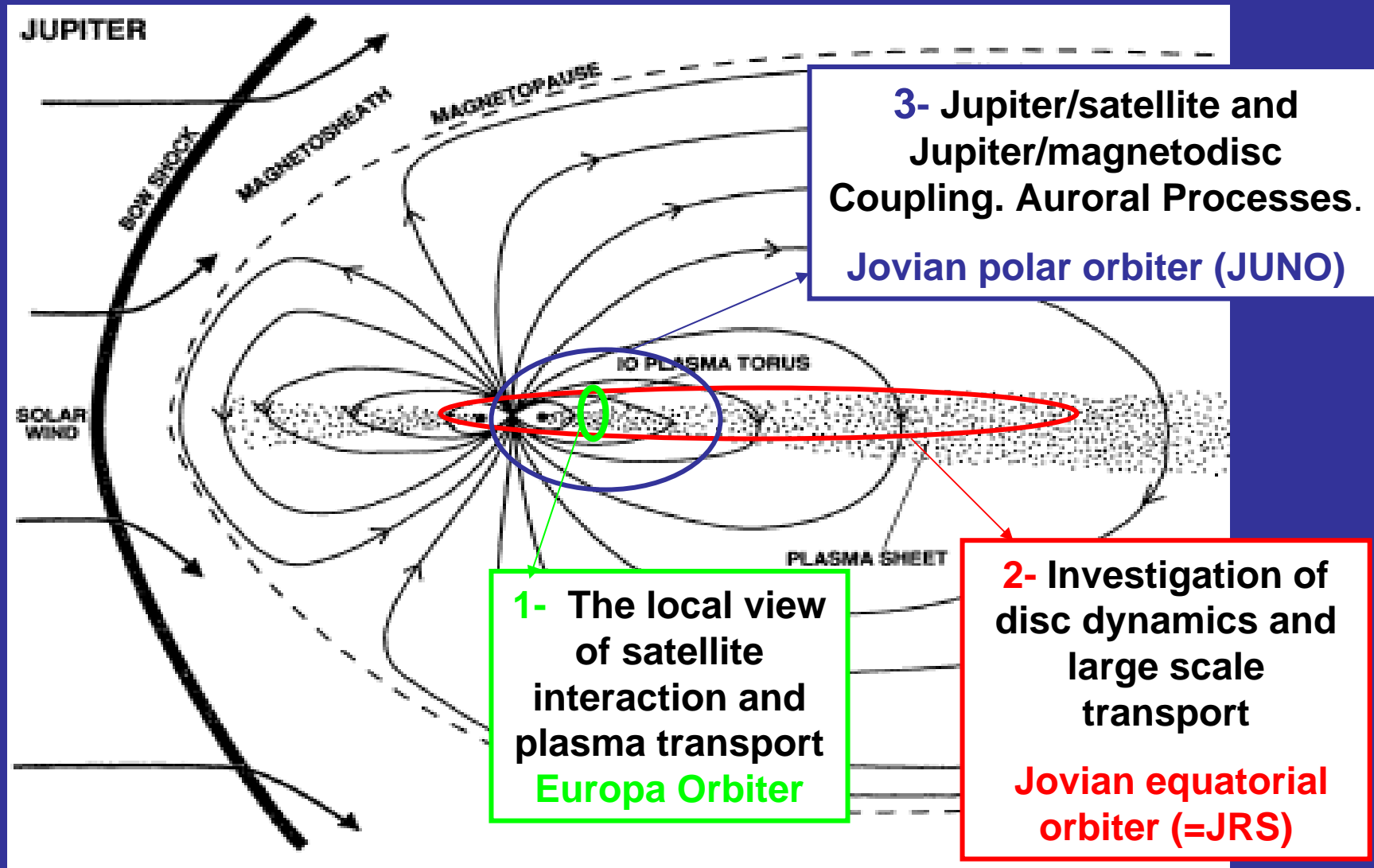
- Characterize Callisto and Ganymede in terms of internal structure and evolution, energy sources, internal ocean, surface state...
- Origin, formation and evolution of Callisto and Ganymede
- Origin of the irregular satellites
- How do these origins connect to the origin and formation scenario of Jupiter itself, and ultimately to the formation scenarios of the outer planets?



Theme 3 – Jupiter system science

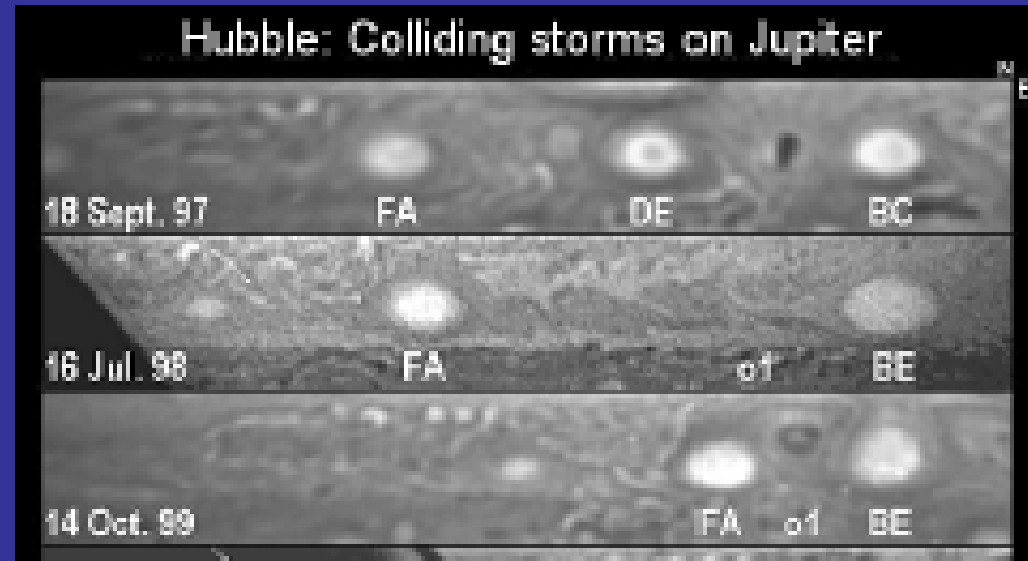
- 3a- Magnetospheres in the Jovian system:
 - satellite-magnetosphere coupling processes, with emphasis on Europa and Ganymede
 - structure, dynamics and radial transport in the Jovian magneto-disk
 - Coupling mechanisms to Jupiter's fast rotation.

Magnetospheres Mission Requirements



Theme 3: Jupiter system science

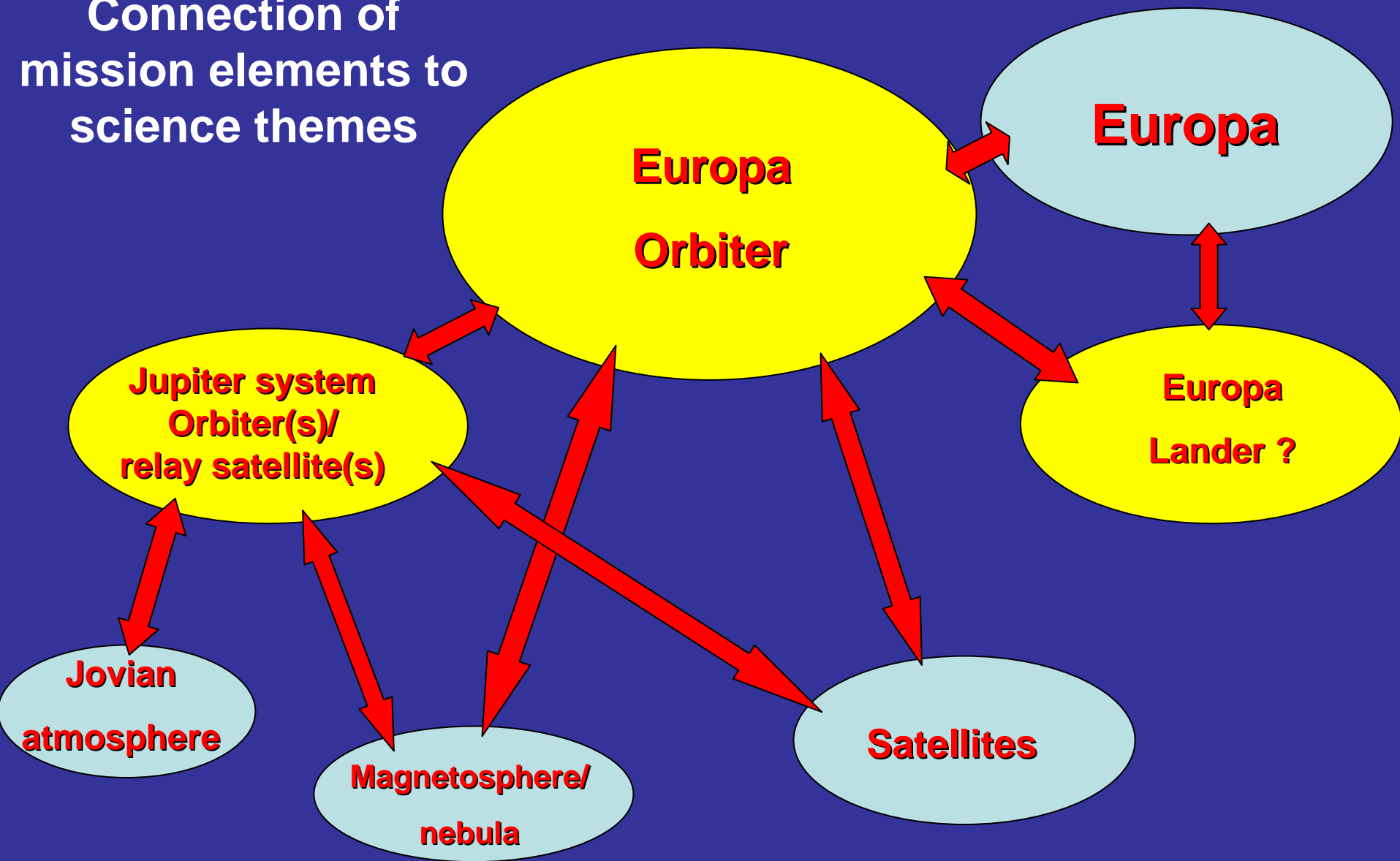
- 3b- Atmosphere of Jupiter:
 - wave activity in the atmosphere and mixing processes
 - chemical structure of the Jovian atmosphere (gas and clouds),
 - meteorology and circulation features at small to large scales, from the deep atmosphere to the stratosphere



Summary – science aspects

- **Tentative priorities:**
 - **P 1 – Europa as a planetary object and a potential habitat**
 - **P 2 - Magnetospheres in the Jovian system**
 - **P 3 – Origin and formation of the Jovian satellites system**
 - **P4 - Atmosphere of Jupiter**
- **Complementarity to JUNO**
 - **JUNO focuses on Jupiter itself**
 - **The Europa mission focuses on the satellites (P1 and P3)**
 - **The two missions address the magnetospheres (P2) and atmosphere (P4) themes in an ideally complementary way**
- **Mission architecture**
 - **The four themes can be addressed by the combination of a Europa Orbiter and a Jupiter Orbiter-Relay Satellite**
 - **A lander element was considered but is not currently foreseen as feasible within the expected budgetary envelope**

Connection of mission elements to science themes



Next steps

- ESA will release an AO for mission ideas to implement the Cosmic Vision Programme, with responses due for mid October this year. [Pending on approval by ESA's SPC week after next – however, very likely]
- The ESA-NASA working group plans to form the core of a broad international team which will propose a mission to Europa and the Jovian system. The large number of scientists who already contributed to the definition of the science objectives at the successive meetings (ESA-NASA meetings and Paris workshop of dec. 12-14, 2005) will be invited to join and contribute
- OPAG's contribution is more than welcome.
- If the proposal is selected for an Assessment Study, we hope that NASA will be able to commit to a Joint ESA/NASA Study Team.
- JUNO and the newly proposed ESA-led Europa mission will form two ideally complementary components of an International Jupiter System Exploration Programme. Close communication between the two mission teams and the two Agencies will be maintained at all steps to maximize synergies and overall science return.

Mission scenario

(Peter Falkner)