

Workshop proposal to ISSI

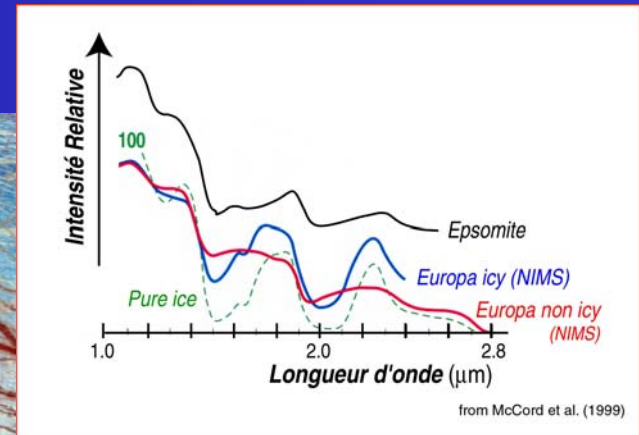
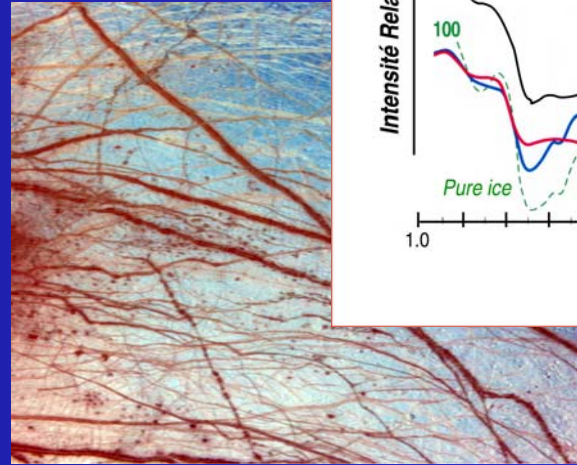
Exchange processes from the deep
interior to the surface of icy moons

WS General Theme

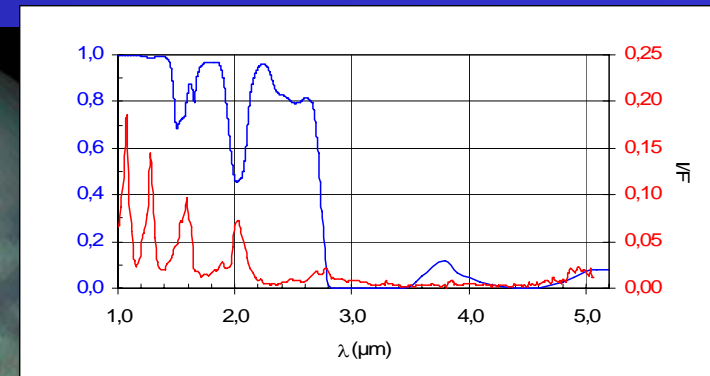
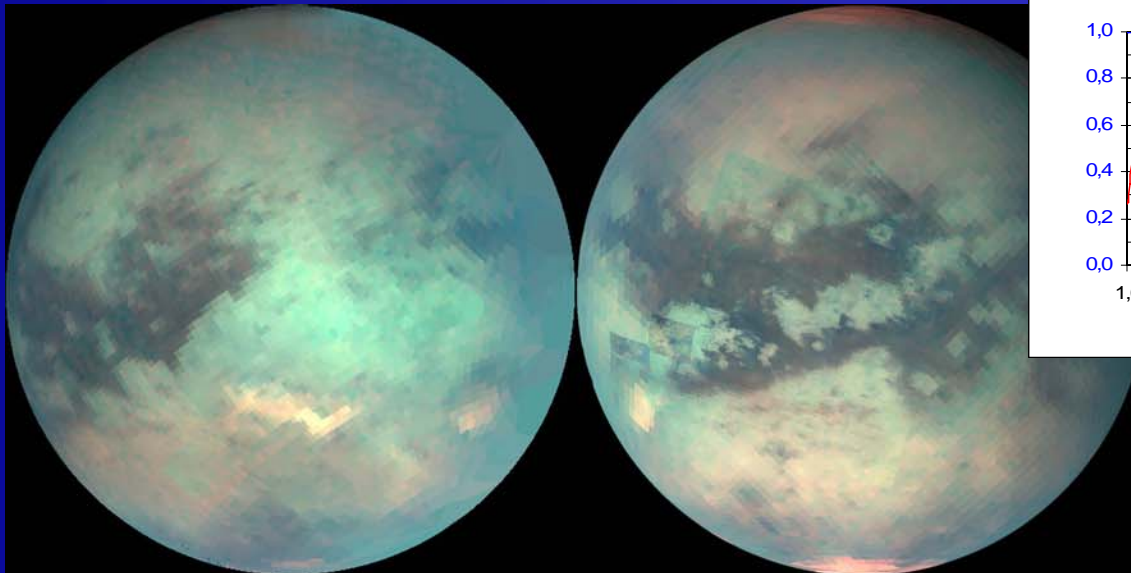
- Surface compositions: Interpretation of mapping spectrometer data
- Past and present dynamics of icy surfaces: erosion, tectonism and cryovolcanism
- Internal processes: dynamics of icy mantles
- Physics and chemistry of ices: experimental constraints on hydrates, clathrates and organics
- Earth analogs: a tool for understanding surface/internal features

Theme 1. Surface compositions: Interpretation of mapping spectrometer data – two examples

Europa: what are the “red” ices in faults?

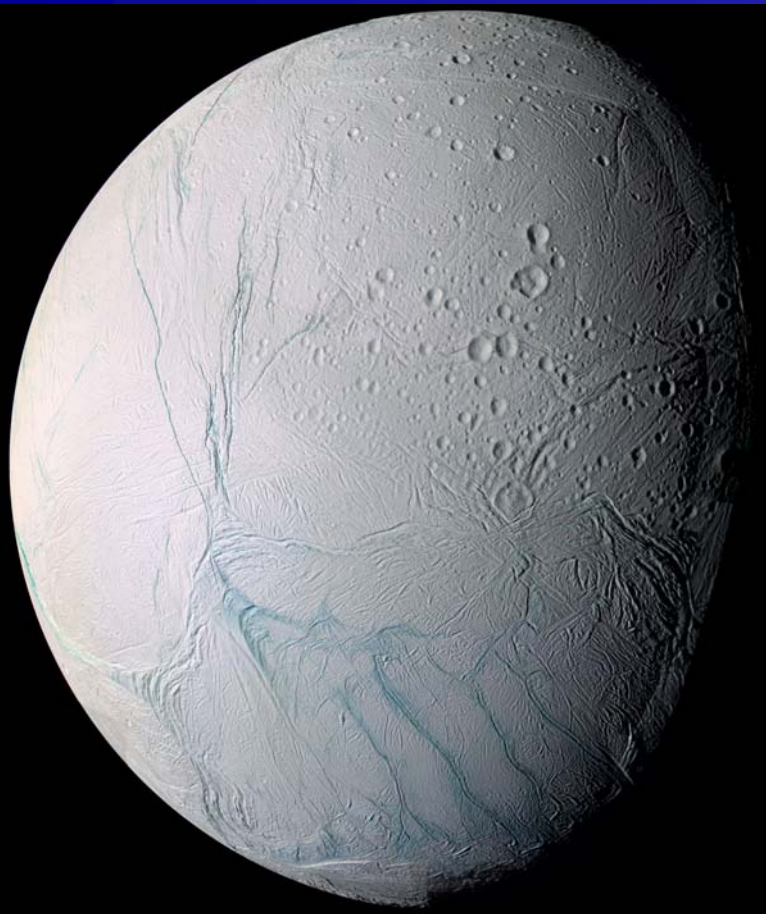
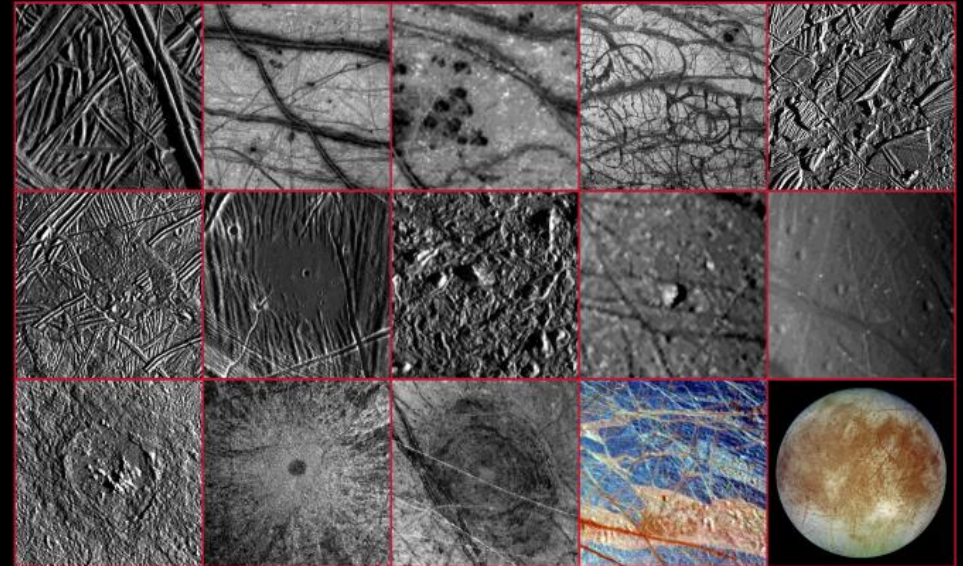


Titan: Links between IR spectra and composition; a clue is still missing



Theme 2. Past and present dynamics of icy surfaces: erosion, tectonism and cryovolcanism – two examples

EUROPA – Surface-feature examples



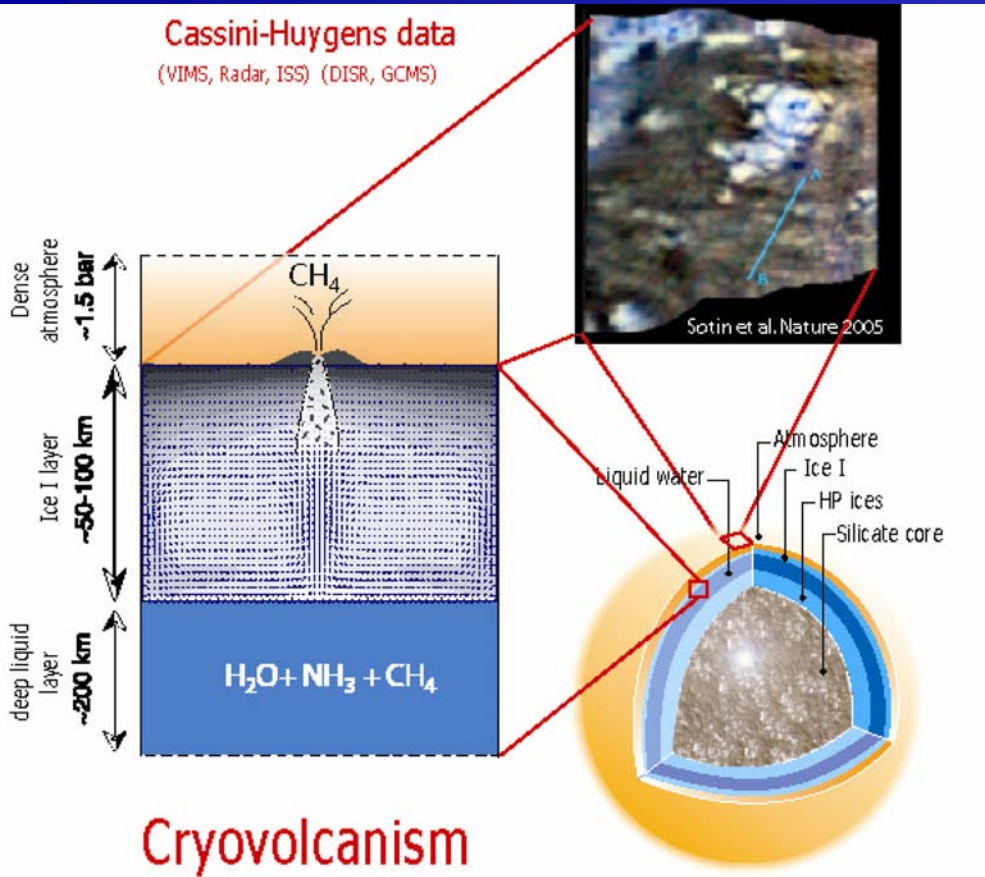
Enceladus:
a present volcanic
and tectonic activity

Theme 3. Internal processes: dynamics of icy mantles

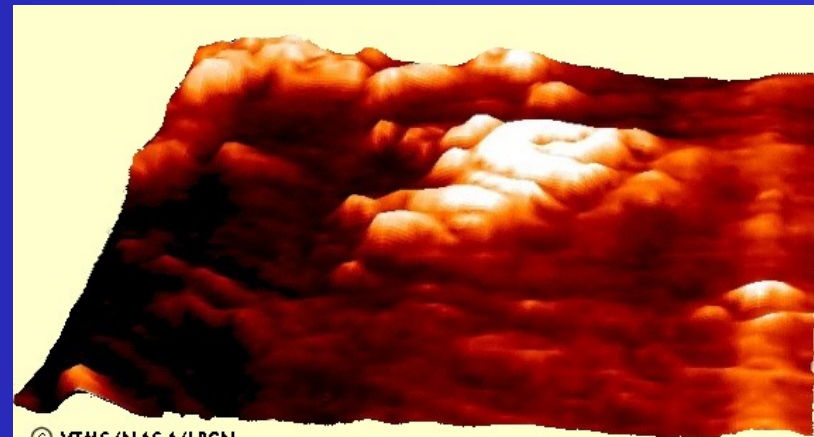
Titan's cryovolcanism as an example

Cassini-Huygens data

(VIMS, Radar, ISS) (DISR, GCMS)

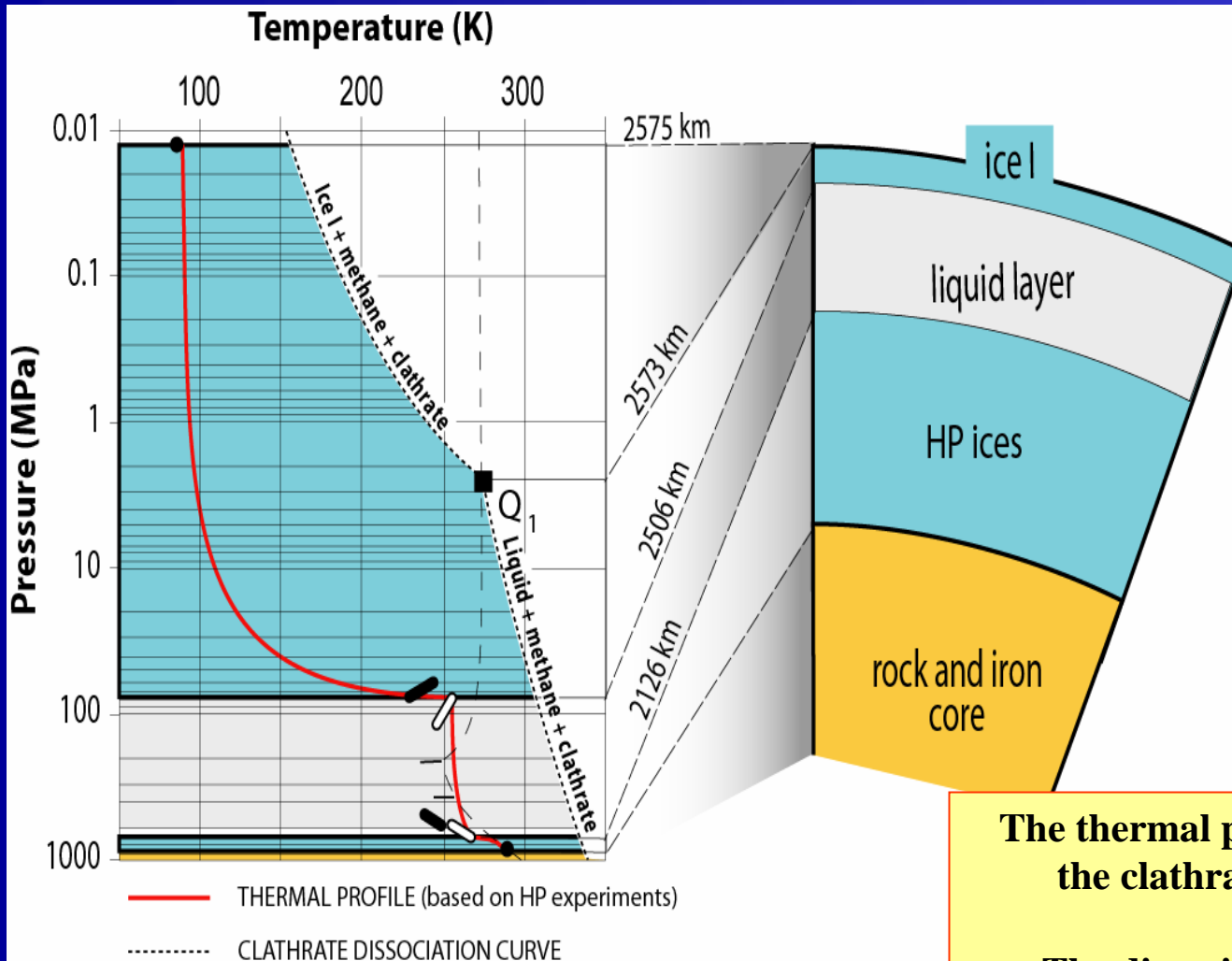


Tortola Facula: a volcano detected on Titan?



Theme 4. Physics and chemistry of ices: experimental constraints on hydrates, clathrates and organics

Titan: how do methane clathrates dissociate through the icy crust?



The thermal profile seems to be below the clathrate dissociation curve

BUT

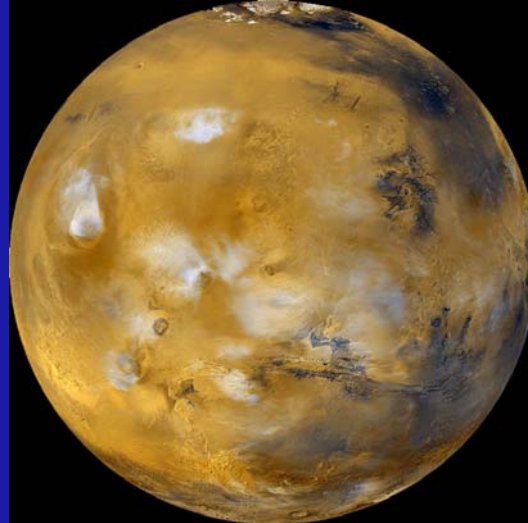
The dissociation curve is not well constrained (lack of experimental data)

Theme 5. Earth analogs: a tool for understanding surface/ internal features

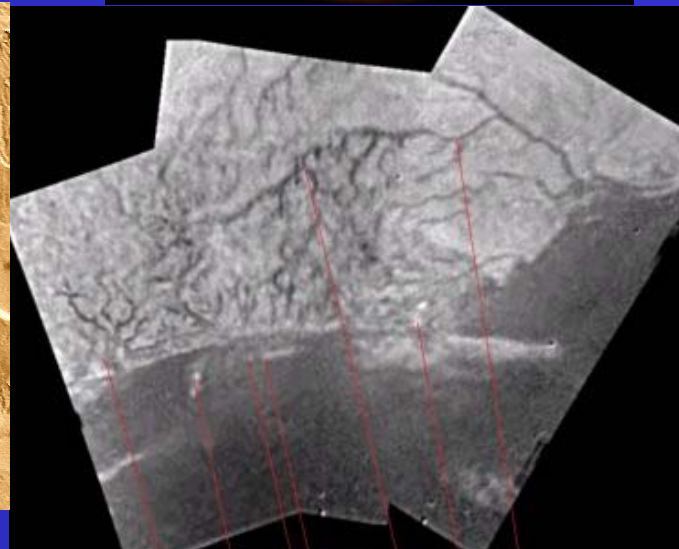
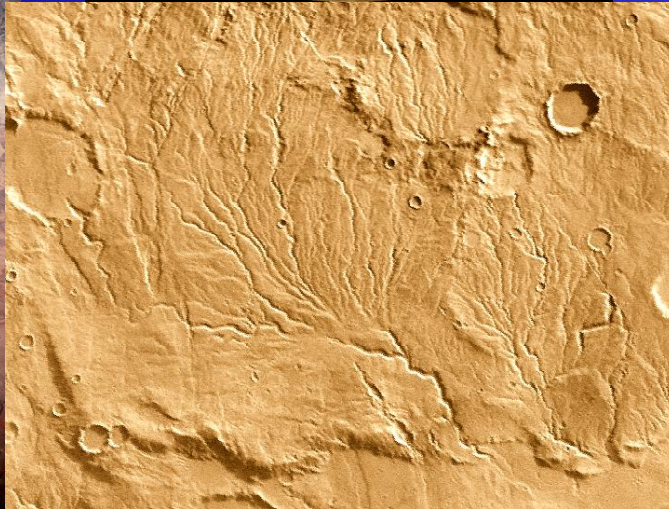
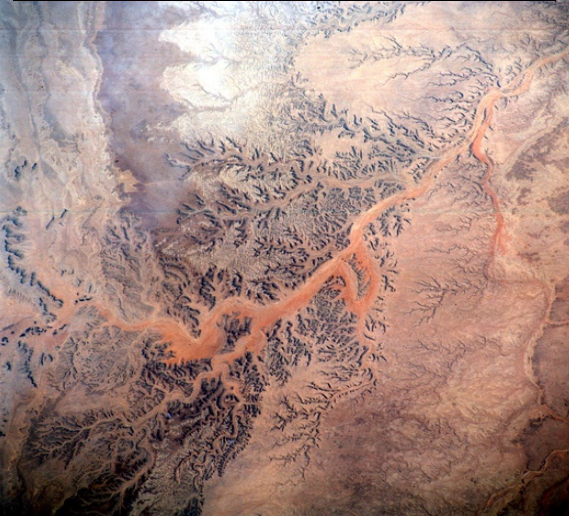
EARTH



MARS



TITAN



Several planets – same features...

Topics (1/2)

- Differentiation of icy moons
- Thermal evolution of icy mantles
- Heat sources
- Dating of icy moons surfaces
- Experimental constraints on internal structures: a state of the art
- Cryovolcanic activity in the outer system (Enceladus, Triton, Titan, ...)
- Tectonics on icy moons (Europa, Ganymede, Enceladus, Mimas, ...)

Topics (2/2)

- Cryosphere/atmosphere exchanges on Titan
- Enceladus: a new active world
- The resurfacing of Europa
- New discoveries on Pluto/Charon and the TNO

Timeliness and relevance to space science (1/2)

- Cassini/Huygens mission
 - interpretation of remote sensing and in situ data
 - atmosphere/interior exchanges on Titan
 - Cryovolcanic activities on Enceladus
 - Comparing the evolution of saturnian moons
- New Horizons
 - Preparation of data interpretation on Pluto/Charon
 - Preparation of data interpretation of TNO
- Rosetta :
 - The link between comets and icy worlds

Timeliness and relevance to space science (2/2)

- Future Europa mission:
 - Prioritize the scientific goals and required instruments
 - A reassessment of the deep ocean existence.
- All future missions to Titan and Enceladus
- Discovery of icy exoplanets: Corot, Kepler , Darwin/TPF
 - How to distinguish between Earth-like and icy planets
 - Spectral signatures of habitable planets

Scientific Relevance

- Will provide some constraints on open questions such as:
 - Characteristics of liquid layers within icy moons?
 - Cryovolcanism on Titan?
 - Resurfacing of Europa ?
 - What is the composition of Titan's surface ?
 - Enceladus – an active world?
 - ...
- A *WS* on interior/surface exchanges could provide:
 - A better understanding of Cassini/Huygens and Galileo data
 - Some clues for preparing the treatment of New Horizon data improvements for surface dating of icy moons
 - More constraints on the surface composition of icy moons
 - New ideas for defining future missions
 - ...

WS Date & Structure

- 2007
- 4.5 days, 4 talks/half day, plenary sessions, no splinter sessions, no working groups .
- “Round tables” on given topics (1/day).

Proposed Convenors

- A. Coustenis (Meudon, France)
- J. Kargel (Flagstaff University, US)
- J. Lunine (Tucson, US)
- B. Pappalardo (Colorado, US)
- F. Sohl (DLR Berlin, Germany)
- C. Sotin (Nantes, France)
- J. Zarnecki (Open university, UK)