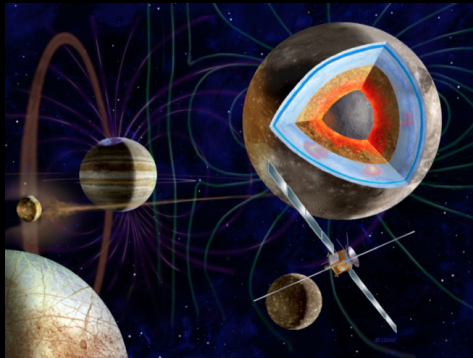


THE JUICE - JUUpiter ICy moons Explorer - MISSION



SUMMARY.

The Juice mission is an ESA large mission of exploration of the main satellites of Jupiter. Its main goal is the characterization of the ocean under the surface of Ganymede, the largest Jupiter satellite. In this METEOR, we will firstly explore the Jovian system in overviewing the main topics addressed by the mission. We will then see how the instruments proposed for this mission will bring answers to open questions related to the nature of the satellites, the formation of this tiny solar system and its evolution.

OBJECTIVES

The main objectives are

- to learn how, in the solar system, the inner structure of planets or natural satellites are studied and constrained with remote measurements. We will also see how the internal structures are modeled and characterized.
- to understand how spacecraft are navigated and how radio science measurements and gravity field characterization can be deduced from the motion of a spacecraft orbiting a planet or a natural satellite

PREREQUISITES

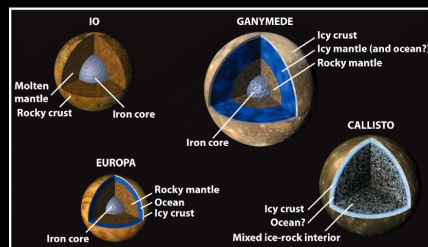
Dynamics and Planetology ; Numerical methods ; Maths/Stat ; Possible complementary with the METEOR BEPI

THEORY

by A. FIENGA; C. SALIBY

orbital mechanics (three-body problem, gravity field perturbations) ; rheology and tidal deformations ; numerical

integration of equations of motion; inversion problem



APPLICATIONS

by A. FIENGA; C. SALIBY

This METEOR is directly related to the 3GM radio science instrument on board of the JUICE mission. As an application of the theoretical part, the student will have to simulate 3GM observables (in using python libraries such as rebound and spice) for different hypothesis of rheologies for Ganymede during the orbital phase of the JUICE mission.

MAIN PROGRESSION STEPS

For instance :

- First half: step with spice (computation of JUICE orbit us-

ing ESA characteristics as well as planetary orbits) and rebound (integration of the motion of JUICE around Ganymede in introducing the shape of Ganymede, introduction of the tidal effect induced by Jupiter on Ganymede using rebound)

- First Second Half: simulation of 3GM observations using rebound and spice; determination of accuracy for the Love numbers measurements obtained with these simulations.
- Second Second Half: in using the code TABOO for Love number computation program, estimation of different Love numbers for different hypothesis of internal structure
- Last week : preparation of the final oral presentation.

EVALUATION

- Type of examinations: written (40%), project (60%).

- The written examination is a concise but detailed report on a chosen article.
- The student's performances will be evaluated based on the achievement of the project and on the code developed by the stu-

dent to reach the goals(second half of the METEOR) .

BIBLIOGRAPHY & RESSOURCES

[Reference Link](#)

CONTACT

☎ +33-483-61-85-29 (A. Fienga) (supervisor)
✉ agnes.fienga@oca.eu