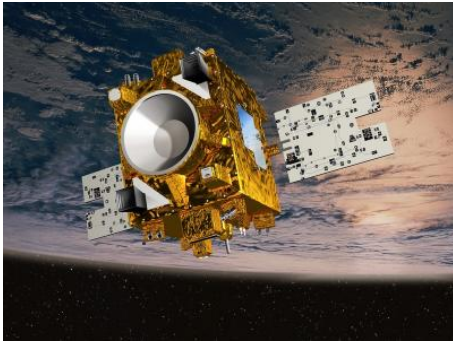


# Extragalactics, Cosmology and Relativity

## MICROSCOPE - Metrology and Dynamics in the Earth's environment to test gravitation



### Summary :

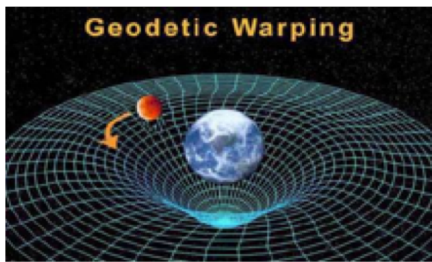
*In this training we will question the theory of gravitation by studying the following points :*

- (i) limits of general relativity and needs to extend it,*
- (ii) gravity theories versus experiments,*
- (iii) space as a relevant laboratory to test gravitation,*
- (iv) focus on a flying space mission to test the Equivalence Principle.*

### Theory

by BERTRAND CHAUVINEAU AND  
GILLES MÉTRIS

#### Mass, General relativity and the Equivalence Principle



The aim of this part of the Meteor is to get some knowledge and skills in gravitation theories related to the Microscope and space missions, following the lines of the basics learned in the fundamental courses (FC2.5). Mainly : General Relativity and the problem of motion ; the mass of a system in General Relativity ; the necessity to go beyond General Relativity ; gravity theories versus experiments.

#### Dynamics of artificial satellites

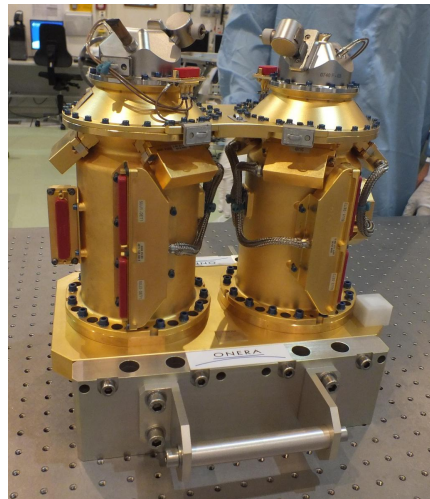
The space offers a very interesting environment to test gravitation theories, either by observing the long term dynamics of natural or artificial

bodies in gravity fields, or by embarking dedicated experiments in spacecrafts. In any case, the knowledge of the main elements of satellite dynamics is required. In these lessons, we will learn the main elements of orbit dynamics : motion parametrization and equations, simplest solutions, main perturbations.

### Applications

by GILLES MÉTRIS AND AGNES  
FIENGA

#### Testing the Equivalence Principle in space: the MICROSCOPE project



The MICROSCOPE space mission aims at testing the Equivalence Principle, through the Universality of Free Fall which is one of its most important consequences, with an accuracy more than 100 times better than current experiments. In this part we will understand the principle of the experiment, set up a simplified model of the measure, study the main perturbation (namely the gravity gradient) and try to imagine methods to minimize the impact of this perturbation and, if possible, we will apply these methods to simulated and real data.

See also

[MICROSCOPE web site](#)

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