Press release

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CNES ONERA cooperation
First ultra-precise measurements from Microscope

In orbit since April, Microscope (MICROSatellite à trainée Compensée pour l'Observation du Principe d'Équivalence) is pursuing functional tests before its scheduled switch to mission mode at the end of the year. Teams at CNES and the French aerospace research agency ONERA are currently gearing up for the science phase of the mission with the first ultra-precise measurements acquired by the satellite.

Microscope has been in orbit since 26 April and teams at CNES and the French aerospace research agency ONERA are conducting final tests before switching the satellite into mission mode. During this in-orbit checkout phase, they have been testing and adjusting the satellite and verifying the performance of its instruments, which have already accomplished two remarkable feats:

- The differential accelerometers supplied by ONERA have been able to clearly observe the predicted gravity gradient effects due to the relative motion of the two proof masses. This gravity gradient corresponds to the difference in the pull exerted by Earth's gravity on the inner mass and outer mass housed inside the T-SAGE instrument. During tests, the accelerometers were able to measure a difference of 25 µm for one of the masses and 33 µm for the other, the equivalent of half the thickness of a human hair.

- A further demonstration of the instruments' extreme precision was provided when the satellite was able to measure and compensate for the force exerted not by Earth's gravity but by sunlight. On 1 September, the Moon eclipsed 15% of the Sun's surface and Microscope was able to detect the eclipse four times as it circled Earth. These partial eclipses produce a variation in the forces acting on the satellite equivalent to the weight of a small grain of sand. These measurements prove the instrument's sensitivity and the precision of its drag-compensation system.

Microscope is designed to test in space the validity of the founding principle of the theory of general relativity developed by Albert Einstein between 1907 and 1915, in which he assumed the equivalence of a gravitational field and a corresponding acceleration of the reference system. The challenge for Microscope is to achieve a level of precision 100 times better than any experiment yet performed on Earth, thus opening new vistas for theories of gravitation. A near-perfect laboratory for measuring freefall is thus taking shape in orbit 710 kilometres from Earth.

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