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SPACE ENVIRONMENT SIMULATIONS: RESULTS FOR THE MICROSCOPE MISSION

Abstract

During its lifetime in space the attitude and the orbit of a satellite are influenced by different perturbances resulting from the space environment. On the one hand these boundary conditions have an impact on the design of the satellite, for instance the thermal shielding or the propulsion system. On the other hand, these disturbances affect any data which are exchanged between a satellite and its ground station. For missions that rely on high-precision measurements it is crucial to develop appropriate models for the environmental perturbations in order to derive the correct science signal.

One important project in the field of fundamental physics is MICROSCOPE. This French space mission aims at testing the Weak Equivalence Principle (WEP) with a new level of accuracy. The experiment setup consists of two capacitive differential accelerometers (T-SAGE; Twin Space Accelerometer for Gravitation Experiments) which are developed and built by ONERA. The satellite will be operated in drag free mode which means that all disturbances are reduced to a minimum by the attitude control system in order to achieve high-precision differential acceleration measurements. Nevertheless residuals will remain due to various sources. In preparation of the data analysis, which will start after the launch in 2016, ZARM performs simulations in order to characterise the environmental conditions MICROSCOPE will be exposed to on its orbit. For this purpose the High Performance satellite dynamics Simulator (HPS) is utilised, a tool that is developed by ZARM in cooperation with the DLR Institute of Space Systems. The results of these simulations and the effects on the science signal will be presented.