

SPACE EXPLORATION SYMPOSIUM (A3)  
Small Bodies Missions and Technologies (5)

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PREPARING THE ROSETTA DEEP-SPACE OPERATIONS

**Abstract**

The International Rosetta Mission, cornerstone of the European Space Agency Scientific Programme, was launched on 2nd March 2004 on its 10 years journey towards a rendezvous with comet Churyumov-Gerasimenko. Rosetta will reach the comet nucleus in summer 2014, orbit it for about 1.5 years down to distances of a few Kilometres and deliver the Lander Philae onto its surface. After its successful Asteroid fly-by in September 2008, Rosetta is coming back to Earth, for a final gravity acceleration towards its longest heliocentric orbit, up to a distance of 5.3 AU, never reached by a spacecraft powered by solar generators. This revolution around the Sun will last several years, during which the spacecraft will have to be spun-up and put into hibernation mode, with most of the systems deactivated, to minimise power consumption. The deep space phase of the mission is so different from the other phases, that it requires not only a reconfiguration of the spacecraft systems to cope with the lower available power, but also a new way of operation and special tools on the ground. Procedures already executed in flight will be modified and re-validated, taking into account power and communication constraints. Power budget and monitoring tools, together with appropriate mission planning schemes will be developed to facilitate the definition of the operational strategy. Implementation of new on-board control procedures, special application programs for the on-board autonomous execution of operations, will be required and even modifications of the on-board application software cannot be excluded. Also the on-board software of the payload instruments will be updated prior to hibernation, in preparation for the comet operations in 2014. In addition, operations that are performed only in this phase, such as refreshing of all EEPROMs, hibernation entry, including the critical spin-up of the spacecraft, the comet rendezvous manoeuvre, will be prepared, tested and validated before execution. Critical element will be the selection and implementation of specific and unique in-flight tests. This paper presents the activities already carried out and planned for the definition, preparation and implementation of the deep space phases of the Rosetta mission. The differences between the operations performed until now, at moderate distances to Earth and Sun, and the upcoming ones, involving distances up to 800 MKm from the Sun and almost 1 BKm from Earth, are analysed and their impact on the operational concept described. The ground tools required in support of the operations are presented.