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The Planning of Lander Science Observations after ROSETTA Deep Space Hibernation

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After 10 years of its interplanetary journey, Rosetta has woken up from hibernation to meet Churyumov-Gerasimenko comet in the second term of 2014. The Rosetta spacecraft is composed of an Orbiter and a Lander part. The spacecraft will deliver the Lander, named Philae, to land on the surface of the comet in November 2014. During the Cruise Phase, the Lander, attached to the Orbiter, participated in several commissioning and payload checkout observations. In April 2014, after almost 3 years of hibernation, the Lander and the Orbiter will enter a commissioning phase to check the health of all instruments. Then, from May to November, Prelanding science activities can be planned, although the priority will go to those observations that help to select the landing site.
The Lander project has, in much the same way as the Orbiter, its own ground segment: the Rosetta Lander Ground Segment (RLGS). The RLGS is composed of the Science Operations and Navigation Center – SONC – at CNES in Toulouse and the Lander Control Center – LCC – at DLR in Cologne. There are 10 instruments on board of Philae trying to conduct science observations during the life of the Lander. As the comet travels closer to the sun the temperature will eventually become too hot for Philae. The Orbiter, however, is planned to operate for much longer, until end of 2015, passing perihelion. Each of the 10 instruments is represented by a principal investigator. The Lander project also has Lead Scientists, who make sure that the science objectives of the Lander are fulfilled and are on hand to solve any eventual conflicts in this regard. To plan their observations, the Lander team listed their science objectives and ranked them. From these objectives, Specific On-Comet Operation Plan (SOCOP) documents are written by LCC describing the proposed observations. Then, at SONC, the MOST (Mission Operation Scheduling Tool) is used to generate a science experiment plan. This plan is confirmed by the PIs and the Lead Scientists. It is then validated with the Ground Reference Model (GRM). The telecommands are then sent to Rosetta Ground Segment for uplink and execution.
The Rosetta mission is very challenging particularly with respect to the landing. Once landed, the Lander will have to repeatedly charge its battery. Planning observations in advance without knowing the landing site nor the battery charging status at a given time is also a great challenge. Finally, further complexity is introduced with the need to plan and execute combined observations between complimentary Lander and Orbiter instruments.