SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (4)

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ROSETTA END OF MISSION SCIENCE OPERATIONS

Abstract

The international Rosetta mission arrived at its target destination Comet 67P/Churyumov-Gerasimenko in August 2014. At arrival the Comet was still far away from the Sun and relatively inactive allowing orbits close to the Comet (distance about 8 km). In November 2014, the Philae lander was deployed from the Rosetta orbiter onto the Comet's surface. After this historic event the orbiter continued its mission by escorting the Comet for approximately one and a half year throughout perihelion and beyond.

As the Comet got closer to the Sun its activity increased creating new operational challenges along with interesting observation opportunities. Increasing comet activity, resulting in an increased dust environment near the nucleus, forced the Rosetta orbiter to follow trajectories further away from the Comet. In August 2015 the Comet passed its perihelion and its heliocentric distance started to increase. As the Comet moved away from the Sun the Comet activity levels decreased and close Comet operations were possible again.

At the end of September 2016 a Superior Conjunction will start. Visibility from Earth to the Comet and Rosetta will be obstructed by the Sun and no communications will be possible. By the time this Superior Conjunction is over the Rosetta orbiter will no longer have enough power for nominal operations. As a result the Rosetta mission will finish before the start of the Superior Conjunction.

The Rosetta mission will be concluded with the Rosetta orbiter descending to the Comet surface for a final controlled impact. This phase, with observations at extremely close range, is expected to result in further science highlights. In addition, in the months running up to the final descent, orbits will be flown

with very low pericentre passages (distance below 1 km) giving unprecedented observation conditions and completing many mission science goals. These continuous low pericentre orbits will be more challenging than Lander delivery from a spacecraft navigation point of view for the flight dynamics team. The science planning strategy will have to be adapted in order to streamline science observations with dense periods dedicated to navigation.

This paper describes the operational challenges faced by the Rosetta science operations teams and which plans had to be followed in order to achieve the unique science measurements during the final operations of the Rosetta mission. It shows how the science operations teams adapted to the new conditions for very close Comet operations and describes some of the observations that were planned.