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Global Shape and Topography of the Nucleus of Comet 67P/C-G from ROSETTA/OSIRIS Images

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Abstract

The ROSETTA spacecraft will approach the nucleus of comet P/Churyumov-Gerasimenko in early August 2014 after a successful wake-up on January 20, 2014. The OSIRIS instrument is a set of two cameras aboard ROSETTA: the Narrow Angle Camera and the Wide Angle Camera which have fields-of-view of 2.2° and about 12° respectively. Both cameras are equipped with a 2K by 2K CCD detector. The two cameras have been successfully re-commissioned at the end of March 2014.

Observations during the approach and first bound orbits in July-August 2014 will allow to map the surface of the nucleus with OSIRIS at a scale as small as 1 m/pixel. The images will be used to reconstruct the 3D global topography of the nucleus at high-resolution with a combination of two advanced reconstruction techniques: stereophotogrammetry and stereophotoclinometry. The reconstructed global shape will be used to determine the bulk density of the nucleus with an accuracy of a few percent and to localize and quantitatively characterize the main topographic features at its surface. It will also allow us to identify the different types of terrains present at the surface of the nucleus.

We will describe and discuss the bulk properties of the nucleus (bulk shape, density and moments of inertia) against those of other comets observed from the ground or by previous space probes. We will also identify the main topographic features from a combined analysis of images and global digital terrain models and compare them with those identified at the surface of comets P/Borrelly, P/Wild 2 and P/Tempel 1 by previous space probes. Finally, we will propose a preliminary interpretation for the processes involved in their formation.