

67P/Churyumov-Gerasimenko - Global, regional, and local shape of a comet's nucleus from stereo-photogrammetry

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Abstract

We applied stereo-photogrammetric methods to more than 200 OSIRIS NAC images of comet 67P/Churyumov-Gerasimenko (67P/C-G) that have been acquired from onboard the Rosetta spacecraft in August/September 2014. From this high-resolution SPG shape model at 2 m lateral sampling and a typical vertical accuracy at the decimeter scale, we present global three-dimensional views of the nucleus, as well as various regional and local close-ups of some prominent areas of this unique body.

1. Introduction

Stereo-photogrammetric (SPG) methods have been used for the derivation of highly accurate three-dimensional representations of the surfaces of planets, satellites, asteroids, and now also for the very irregular nucleus of comet 67P/C-G [1] using images from the SHAP4S image sequence (~1 m image resolution) of the OSIRIS NAC camera [2,3] onboard the Rosetta spacecraft.

2. The shape of comet 67P/C-G

67P-C-G's nucleus provides a great variety of different morphological units and regions [4,5]. On a global scale, the entire body consists of three main entities, the big lobe, a small lobe, and a connecting concavity, the neck region. Besides a global view (Fig. 1), exemplary views of different prominent areas and features are displayed in Figs. 2-4. Names for morphological units of 67P/C-G are defined in [4].

Because of the illumination conditions in Aug/Sep 2014, the SPG SHAP4S shape model is limited to the northern hemisphere and low southern latitudes. Within 2015, we expect to extend the coverage of the shape model by the stereo-photogrammetric analysis

of OSIRIS images of the imaging season in 2015 and to provide additional views of the currently unknown southern hemisphere. Finally, the integration of high-resolution OSIRIS NAC image data of up to a few decimeters per pixel will allow for local shape representations for specific regions at meter scale lateral resolution.

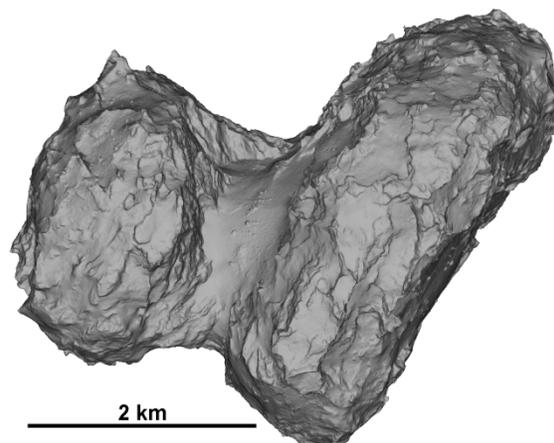


Figure 1: Global view of the SPG SHAP4S shape model of C-G [1].

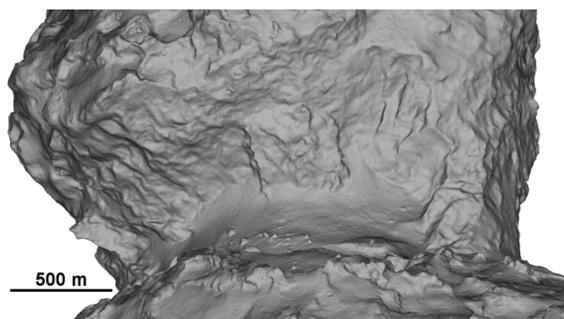


Figure 2: View of the cliff-like Hathor feature on the small lobe at the boundary to the Hapi region on the neck.

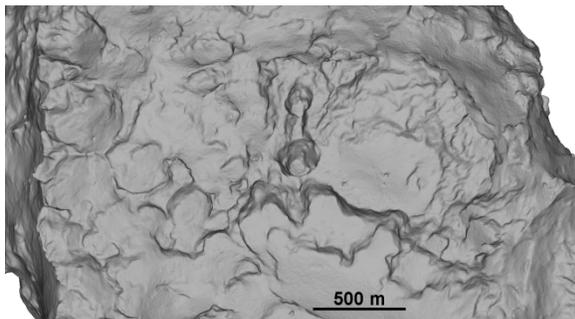


Figure 3: Pit-like structure in the Seth region on the big lobe (at the center of this figure, ~200 m in diameter) [6].

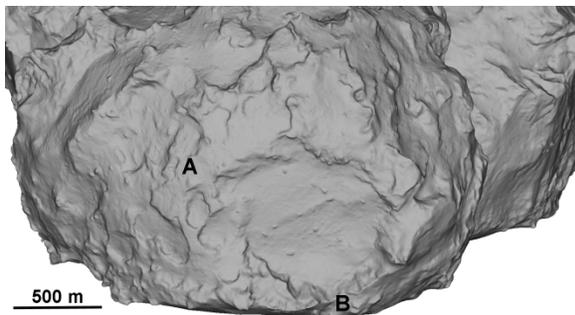


Figure 4: The Hatmehit depression on the small lobe. 'A' marks the first touchdown site Agilkia of the Philae lander, 'B' marks Philae's final landing site Abydos [7].

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