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An atlas of comet 67P/Churyumov-Gerasimenko

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Abstract

The cartography of celestial bodies is a fundamental tool in comparative planetology as maps display various types of information in a common reference frame. This allows a direct comparison of many data sets at different epochs and for different objects. In the case of comet 67P, however, a full high resolution mapping of the surface remains unpublished so far, due to the complexity of the nucleus' shape, especially its very large concavities.

This work present a new software package developed for the purpose of mapping such non trivial body. We are now able to texture the 3D shape model of the comet with an arbitrary number of images and unwrap this data set onto several types of maps, with the highest accuracy. Although we have mainly used OSIRIS data (the highest resolution available), our approach is not limited to images. We can indeed map different types of products such as spectral units, elevation, gravity, slopes...

We are now processing all the data to produce a global atlas of the comet which will be presented at this conference. We will display full 3D views and global maps of the comet obtained at different epochs (before and after perihelion) with a spatial resolution of about 1 m per pixel or better. Spectral maps and other products will be used to show how different data sets can be combined together.

Mapping the comet also provides a quick way to track changes over time. With high resolution images we can investigate signatures of surface evolution far beyond what can be achieved from shape models alone. To illustrate this, we will present a change detection algorithm developed to automate the cataloging of small scale features. We will showcase some examples such has meter-sized objects traveling across the surface, boulder fracturing, moving dune fields, and collapses of the topography, all detected automatically. This catalog of changes will be used to provide new constraints on the various processes governing cometary evolution.

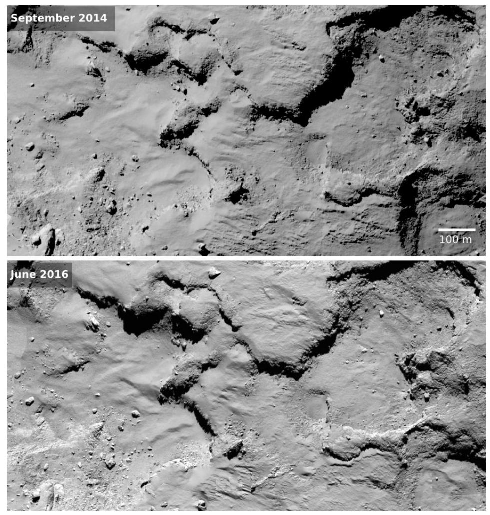

Figure 1: Two mosaics (top panel: 8 images, bottom panel: 10 images) of a small area of 67P's small lobe, automatically generated by our mapping tool. Such mosaic contains several hundred minor changes of topography.

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