

Characterization of the Abydos landing site of Philae on comet 67P/Churyumov-Gerasimenko

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Abstract

On 12 November 2014, the Philae surface module of the Rosetta mission did not land at the planned Algika “J” site on the surface of the nucleus of comet 67P/Churyumov-Gerasimenko but rebounded several times before final touchdown at an unknown place later labeled “K” and named Abydos. Unambiguous detection of Philae was achieved in March 2015 and was later confirmed by twelve campaigns carried out in 2016. They resulted in a detailed mapping of the Abydos region in several filters thus allowing a detailed characterization on the basis of anaglyphs, a digital terrain model at a spatial scale of ~40 cm and color maps, all constructed from OSIRIS-NAC images. We present the regional setting of Abydos and define geological units. Abydos is essentially an alcove at the foot of a scarp composed of heavily fractured consolidated materials.

1. Introduction

After a first touchdown at the selected Agilkia “J” landing site on the head of the nucleus of comet 67P/Churyumov-Gerasimenko on 12 November 2014, the Philae surface module of the ESA Rosetta mission bounced for a two-hour flight and finally landed at a site later named Abydos. Unambiguous detection of Philae was achieved in March 2015 by comparing images taken with the OSIRIS Narrow Angle Camera in October (pre-landing) and December (post-landing) 2014 [1]. Starting in early March 2016, twelve campaigns were carried out to image Philae thus resulting in a detailed mapping of the Abydos region at a pixel scale down to 5 cm/pixel and in various filters ranging from 362 to 986 nm (Fig. 1). This region has therefore benefited from the best coverage of the nucleus except for the Rosetta landing site.

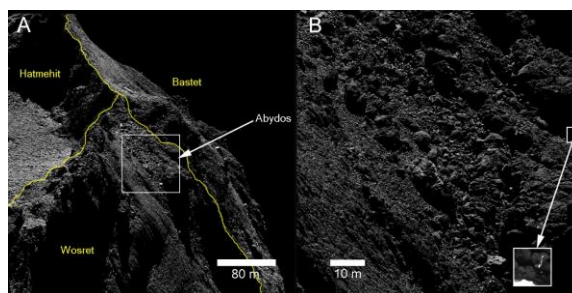


Figure 1: Regional setting of Abydos. [A] WAC image showing the regional context of Abydos with the regional boundaries outlined. The area lies in the southern hemisphere, ~150 m away from the Hatmehit depression. [B] NAC image showing a high resolution view of Abydos. Boxes mark the location of Philae and a close-up of the actual lander.

2. Analysis and Results

We have analyzed the whole set of images of the Abydos region obtained over the period 2014-2016. Different geological/geomorphological units have been identified and delimited by regional boundaries as displayed in Fig. 2. Two complementary approach

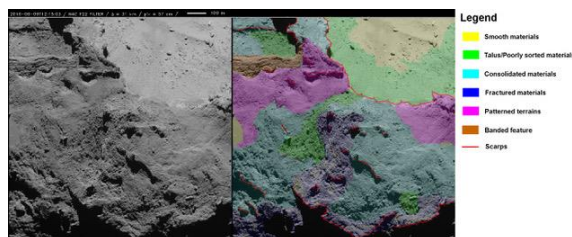


Figure 2: Geological units of Abydos

were implemented to characterize the 3-dimensional topography of the Abydos region. Twenty stereo anaglyphs (an example is presented in Fig.3) offer spectacular views at different scales down to 5 cm/pixel. A digital terrain model (DTM) has been successfully constructed at a sampling of 40 cm although the conditions in terms of incidence and emission angles were unfavorable (Fig. 4). The photometric properties of the surface as related to its composition have been characterized by the reddening slope of the spectral reflectance. An example of the map of this slope is given in Fig. 5.

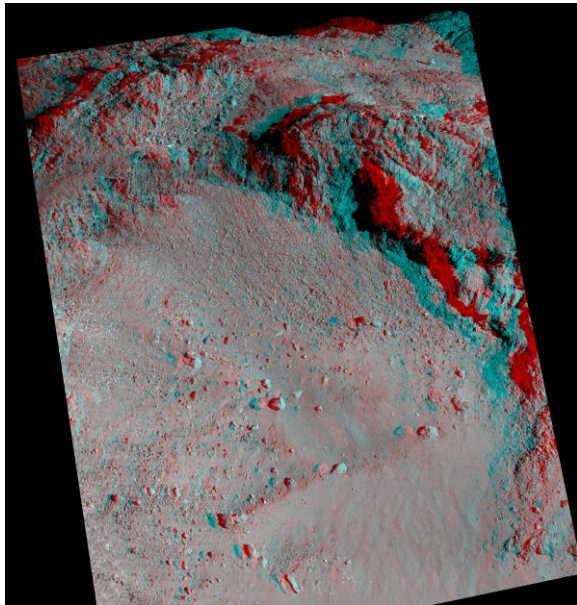


Figure 3: Stereo anaglyph allowing a 3D perspective view of the Abydos region above the rim of the Hatmehit depression.

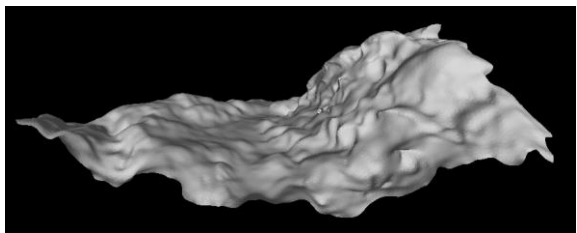


Figure 4: Digital terrain model of the Abydos region. The longitudinal extent (left to right) is 40 m.

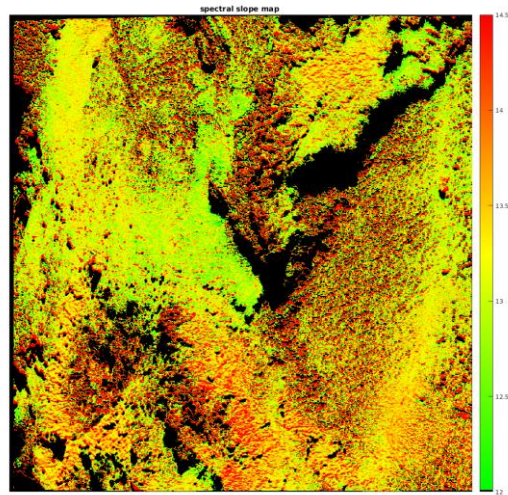


Figure 5: Map of the reddening slope of the spectral reflectance (in %/100 nm) of the Abydos region in the spectral range 362-986 nm. The square has dimensions of 630 x 630 m. Part of the Hatmehit depression is seen at right.

Acknowledgements

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References

- [1] Lamy P. et al. (2015), EPSC2015-783.