

CHARACTERISTICS OF CIRCULAR FEATURES ON COMET 67P/CHURYUMOV-GERASIMENKO

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Abstract

Comet 67P/Churyumov-Gerasimenko shows a large variety of circular structures such as pits [5], elevated roundish features in Imhotep [1], and even a single occurrence of a plausible fresh impact crater [4]. Imaging the pits in the Ma'at region, aiming to understand their structure and origin drove the design of the final descent trajectory of the Rosetta spacecraft. The high-resolution images obtained during the last mission phase allow us to study these pits as exemplary circular features. A complete catalogue of circular features gives us the possibility to compare and classify these structures systematically.

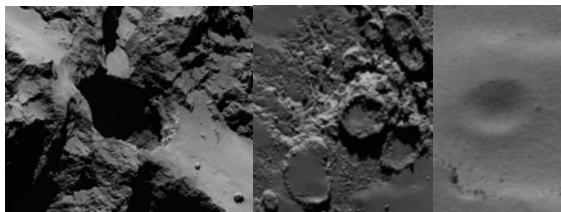


Figure 1 Pit in Seth region (left). Elevated roundish features in Imhotep (centre). Potential fresh impact crater in the Ash region (right).

1. Classes of circular features on comet 67P/Churyumov-Gerasimenko

The comet shows a large variety of circular features. While the pits are certainly the most prominent ones (Fig. 1 left, Fig. 2), with sizes ranging from 50 to 310 m [5], there are also intriguing elevated circular structures found in the Imhotep region (Fig. 1, centre). Their sizes range between 2 and 59 m, without any characteristic size dominating [1]. The fact that all these features seem to be confined to

specific regions on the comet [2] poses questions about their origin. We will present a full inventory of all circular features found on the comet to test which of these features could be a different occurrence of the same morphological process.

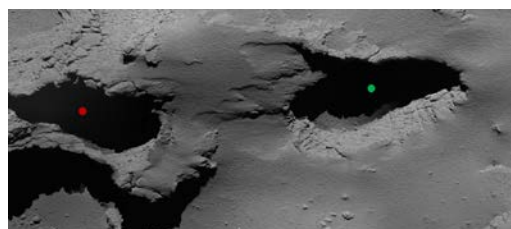


Figure 2 Composite image of Ma'at pit 'E' (red dot) and the Deir el-Medina pit (green dot) in the Ma'at Region imaged during Rosetta's final descent.

2. Possible origin and evolution of pits, at the example of the Ma'at pits

Both pits imaged during final descent in the Ma'at region have been observed as sources of activity early in the mission [5]. In the 2.5 years of the Rosetta mission, no major morphological changes to pits have been observed, and jet activity is found not to be primarily originating from specific features. We will reassess the available observational evidence to test the plausibility of pit formation scenarios proposed as a sinkhole collapse mechanism [5] or a sinkhole collapse mechanism followed by mass wasting of the surrounding material [3]. Using numerical impact experiments we will assess a possible impact origin of the pits as well as the elevated features in Imhotep.

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