MORPHOLOGY OF AEOLIAN BEDFORMS ON 67P/CHURYUMOV-GERASIMENKO.

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Introduction: Comets are no typical place to expect aeolian bedorms at the surface, but surprisingly, such bedforms have been identified on the surface of 67P/Churyumov-Gerasimenko (hereafter named 67P) in OSIRIS (orbiter camera, [1]) and ROLIS (descent imager, [2]) data [3]. Intensive studies aim at finding an answer to the question how to explain aeolian granular transport on a comet with an extremely rarified atmosphere and with almost negligible gravitation, hence, without the fundamental physical mechanisms generally responsible for particle motion [3]. However, conclusive identification of aeolian bedforms indicates that grain transport must have happened on 67P. It is not clear, yet, how saltation (or creep [4]) has been initiated on the comet but conceivable processes are currently under discussion. [3] introduced the term "cometary saltation" for this special type of grain transport, that seem to involve uncommonly coarse particle sizes. [4]

Discussion of Aeolian Bedforms: Dune-like features have first been discovered by [5] in the neck region of the nucleus, called the Hapi region (Fig. 1). The large ripples measure about 60 meters in width and comprise sharp crests, suggesting an "uphill" transport direction in Figure 1. It also is conceivable that the largest crest at the very end of the ripple field (downwind/uphill) represents the crest of a larger bedform, being superposed by the ripples. On planets like Earth or Mars, sharp crests often point to relatively fine-grained substrates and active bedforms. It is questionable, though, if the dune-like features of the neck region are composed of finer grained material compared to the bedforms found at other places on 67P since the balance of gravity, gas drag and cohesion is another one on comets.

Further dune-like features on 67P resemble (but are no) coalesced barchan dunes and are located nearby Philae's landing site in a region called Ma'at.

Numerous other aeolian bedforms, in association with obstacles, have been identified in ROLIS images covering the primary landing site of Philae lander. This is a relatively flat region vastly covered by smooth airfall deposits [3]. OSIRIS images reveal that these bedforms spread over adjacent areas. Particles on 67P can be subject to aeolian motion if gas transport is initiated by sublimation-driven ejection of material [3, 5]. It is noteworthy that the obstacle-associated bedform size on 67P is much larger than those known from Earth and Mars. This might be an effect of low gravitation and coarse grain size. Except for the aeolian ripples in the neck region, all aeolian bedforms identified so far, show rounded crests and a coarser overall shape. Such features generally point to grain-sizes that are coarser than sand and/or to immobile and degraded bedforms [6].

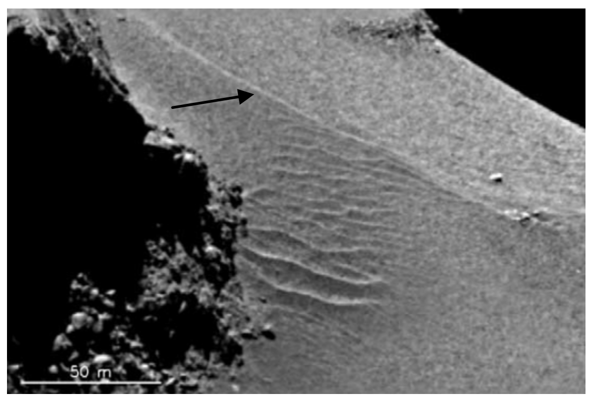

Fig. 1: Large aeolian ripples in the Hapi region, the so-called neck region of the comet. The width of this ripple field is about 60 m. The black arrow marks the crest of a possible mega-barchan. (OSIRIS image NAC_2014-09-18T00.33.01.377Z_ID10_1397549800 _F22 [4]) © ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA.

Commentary: Detailed analyses are currently in progress and publications have been submitted. The latest results will be presented at the workshop.

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