
AN EXPLANATION FOR THE BEDFORMS ON COMET 67P/CHURYUMOV-GERASIMENKO

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The recent approach of comet 67P/Churyumov-Gerasimenko by the European Space Agency spacecraft Rosetta has revealed the presence of geomorphologic features at its surface. In particular, surface patterns resembling aeolian ripples or dunes as well as ‘wind tails’ have been observed, especially in the ‘neck’ region. Erosion/deposition processes are unexpected on a comet because of the absence of an atmosphere, that would generate a wind to transport the grains at the surface. However, it is well known that comets experience outgassing when approaching the sun: the solar heat flux induces ice sublimation, generating dust/gas jets, which is at the origin of the comet’s coma. Combining a description of sediment transport and hydrodynamics with a thermal model of the comet’s surface and outgassing, we show that, albeit generated by a rarefied atmosphere, these bedforms are paradoxically analogous to ripplemarks emerging on granular beds submitted to viscous shear flows.

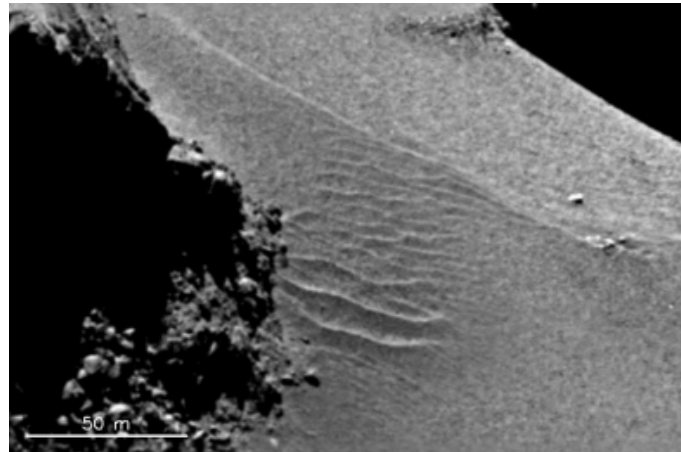


Figure 1. Ripplemarks on comet 67P/Churyumov-Gerasimenko in the neck ‘Hapi’ region. Photo credit: ESA/Rosetta/MPS for OSIRIS Team.