Morphology of the nucleus of Comet 67P/Churyumov–Gerasimenko from stereo and high spatial resolution OSIRIS-NAC images

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The Narrow Angle Camera (NAC) of the OSIRIS imaging system aboard ESA's Rosetta spacecraft has acquired images of the surface of the nucleus of comet 67P/Churyumov-Gerasimenko at scales down to 0.2 m/pixel. We employ a variety of techniques to characterize its morphology. Digital terrain modeling (DTM), indispensable for quantitative morphological analysis is performed using stereophotoclinometry (SPC). Depending upon the observational coverage, the resolution of the DTMs exceed 1 m in the most favorable cases. The ultimate stereographic analysis is performed by exploiting pairs of images able to produce anaglyphs whose spatial resolution surpasses that of the DTMs. Digital image filtering and contrast enhancement techniques are applied on the original images as appropriate. We first concentrate on the dust covered terrains possibly resulting from airfall deposits, on the quasi-circular depressions or basins possibly connected to collapses of the underground terrain, and on large scarps that suggest extensive mass disruption. We pay special attention to lithologies that may give clues to the subsurface structure of the nucleus. Our ultimate goal is to understand the processes at work on the nucleus, directly or indirectly connected to its activity as there appears to a variety of processes far beyond what was classicaly considered in the past, for instance airfall deposits, surface dust transport, mass wasting, and insolation weathering.