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The ROLIS post-landing images of comet Churyumov-Gerasimenko

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At Abydos, Philae's final landing site, the ROLIS camera imaged the surface of 67P/Churyumov-Gerasimenko from its vantage point on the instrument platform at the highest resolution ever obtained for a cometary surface (∼0.5 mm per pixel). Due to the strong tilt of the lander, ROLIS peered towards the local horizon instead of straight down onto the surface. Having landed at night, the surrounding of Philae were completely dark with the coma beyond the horizon faintly illuminated. Still, ROLIS could image the surface with aid of an illumination device with LEDs in four different colors: red, green, blue, and near-IR. Due to the highly non-nominal landing conditions the interpretation of the images was more challenging than anticipated. A 3D reconstruction of the scene demonstrates that the surface was meters away, instead of the few decimeters expected. As a consequence, the illumination was very weak and stray light off parts of the lander played a significant role. The surface has a unique morphology that defies easy interpretation. There are significant brightness variations in a bi-modal regime. Color variations appear to be minor and individual grains are not distinguished. We embarked on a series of experiments with a camera spare using a dark powder surface aimed at uncovering the basic photometric principles that govern the appearance of the scene ROLIS. On basis of the experimental results, and given the similarities with structures seen in the lower resolution CIVA images and the assumption that we must be looking at a compositionally homogeneous terrain, we infer some physical properties of the surface and speculate on a possible relation with activity at the landing site.