INVESTIGATION OF THE FIRST TOUCHDOWN SITE ON COMET 67P DERIVED FROM ROLIS HIGH RESOLUTION IMAGING. S. Mottola[1], R. Jaumann[1], S. Schröder[1], G. Arnold[1], H.-G. Grothues[2], M. Hamm[1], H. Michaelis[1], I. Pelivan[1], G. Proffe[1], and J.-P. Bibring[3], [1]DLR, Institute of Planetary Research, Berlin, Germany, DLR, [2]Space Management, Space Science, DLR, Bonn, Germany, [3]Institute of Space Astrophysics, Orsay, France

Introduction: ROLIS (ROsetta Lander Imaging System) [1] is an imager with multispectral capabilities onboard the Rosetta Lander Philae. From its location on the instruments balcony and having a down-looking orientation, ROLIS acquired an imaging sequence of the Agilkia landing site during the descent onto comet 67P/Churyumov-Gerasimenko. These images provide the highest resolution available for the first touchdown site. The aim of the ROLIS experiment is to study the photometric properties, the morphology, the texture and microstructure of the comet's surface in order to understand the processes that control the cometary evolution.

The ROLIS Instrument: ROLIS is a compact CCD imager with a 1k x 1k pixel sensor and a 57° field of view [2]. During the descent it was focused to infinity and acquired panchromatic images. After landing ROLIS was refocused to a nominal distance of 30 cm and performed close-up, multi-spectral imaging of the soil, with help of a 4-channel LED illumination device.

Figure 1 The ROLIS camera on Philae

Landing Sequence: During the descent, ROLIS acquired images with a cadence of 10s. Since the time of touchdown was not predictable with accuracy, and due to storage and uplink capacity limitations, the images were stored in a ring buffer with the capacity of seven images, with the latest image overwriting the oldest. At the moment of touchdown the acquisition sequence was halted, and the last seven images −the ones with the highest resolution− were relayed to the orbiter. The landing occurred on Nov 12, 2014 at 15:34:04 UT. The sun elevation angle of about 30° provided near-ideal conditions for morphological analysis. The image acquired at the highest altitude (70 m) has a footprint of about 70 m and a resolution of 7 cm/pix, whereas the image closest to the surface was acquired at about 10 m altitude and has a resolution of about 1cm/pix.

Figure 2 ROLIS image of the Agilkia landing site acquired on Nov 12, 2014 15:33:25 UT during Philae descent from an altitude of about 40m. The large block in the top right corner is about 5 m in size. In the same corner the structure of the Philae landing gear is visible.

Results: The high-resolution images acquired just before touchdown reveal a generally smooth and sub-

dued terrain whose characteristics vary over scales of a few tens of meters. A comparatively uniform background made of particles below or at the resolution limit (about 1 cm on the image at closest range) is superimposed by debris and blocks ranging in size from centimeters to several meters with a regionally varying spatial density. Within the region imaged by ROLIS there appear to be undulated formations, terraces and pitted terrains. The spatial density of blocks varies with the type of terrain: the region with pits shows a significantly smaller presence of blocks than the neighboring regions. The appearance of the blocks themselves also varies considerably, ranging in shape from angular, polygonal to rounded. Some of the largest blocks resemble assemblages of smaller, similarly-sized units. The presence of clusters of block suggests that fragmentation and degradation processes are at work. Some blocks are partly buried by regolith, suggestive of dust mobilization.

References: [1] Mottola et al. (2007), SSR, 128, 241-255. [2] Michaelis et al. (1999), proc. SPIE 3794, 115-121.