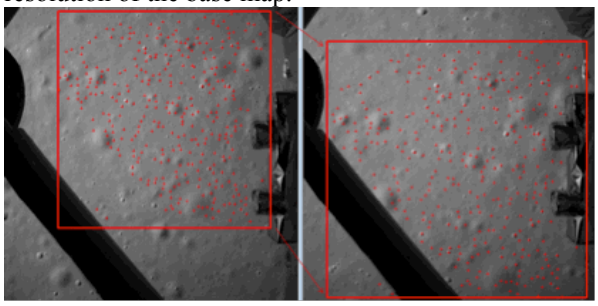
LOCATING AND 3D DIGITAL TERRAIN MODEL RECONSTRUCTION OF THE CHANG'E 3 LANDING SITE. H. Li[1], C. L. Li[1], J. J. Liu[1], X. Ren[1], L. L. Mu[1], W. R. Wang[1], F. F. Wang[1], W. Zuo[1], and Y. Su[1], [1]National Astronomical Observatories, Chinese Academy of Sciences (20A Datun Road, Chaoyang District, Beijing 100012, China. lih@nao.cas.cn).

Introduction: At 13:11 (GMT) December 14, 2013 Chang'e 3 (CE-3) successfully landed in northwestern Mare Imbrium on the Moon, making it China's first planetary mission to land on a celestial body other than Earth. Launched at 17:30 (GMT), December 1, 2013, CE-3 reached the Moon on December 6 after a six-day cruise, orbited the Moon for another week before it landed to the south of *Laplace F* crater at (19.51ºW, 44.12ºN). Approximately seven hours after landing, the Yutu rover separated from the lander at 20:35 GMT of December 14.

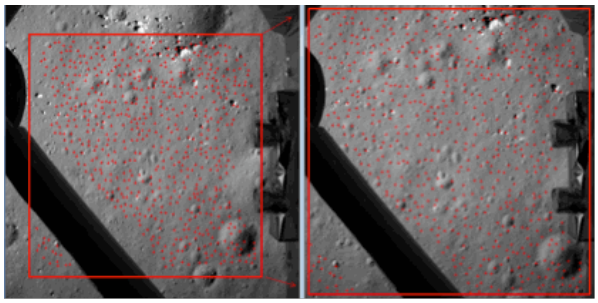
CE-3 carries eight scientific instruments onboard, including the descent camera, the terrain camera, the Lunar-based ultraviolet telescope (LUT), and thge Extreme ultraviolet (EUV) camera on the lander, and the panoramic camera, the lunar ground penetrating radar, the alpha particle X-ray spectrometer (APX), and the infrared spectrometer on the rover. Of these eight instruments, the descent camera was the first powered on, which captured a total of 4,673 optical images of the surface of the landing area from an altitude of 12.5 km to the surface. Subsequently, after rover deployment, the panoramic camera imaged the surrounding environment of the landing site.

Precise location of the landing site is critical for planetary rover misisons. Employing images obtained by the descent camera and stereo images by the panoramic camera, we have located the lander on 1.5 m/p Chang'e 2 (CE-2) images and constructed 3D terrain models of the landing area. Some of the preliminary results are presented in this paper.

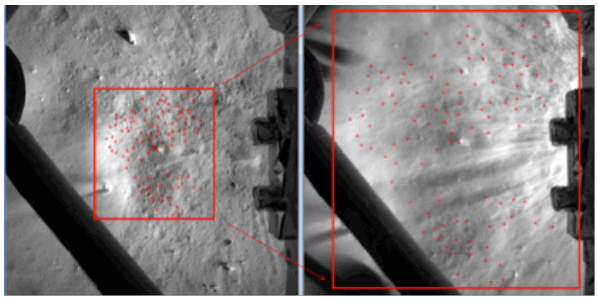
Lander Location: 30 of the descent images are included in the "descent image sequence" in this study, with the first image's resolution being 1.5 m/p, same as CE-2 image resolution in the landing region. Employing Scale-invariant feature transform (SIFT)[1], we are able to match images in the descent image sequence with CE-2 base map (Fig. 1) and locate the landing site to be (19.512416ºW, 44.119642ºN) within one pixel resolution of the base map.



(a)



(b)



(c)

Figure 1. Matching of descent image sequence. (a) descent with latitudinal variation; (b) vertical descent; (c) last two descent images.

3D Digital Terrain Model Reconstruction: During its first lunar day observation (December 15–25), the Yutu rover travesed from the lander-rover separation point to make a semi-circle around the lander, allowing the panoramic camera onboard Yutu to obtain color images of the lander. Subsequently the panoramic camera obtained 112 and 56 image pairs of the surrounding terrain at observation points S and E3, respectively. Based on these image pairs, we have reconstructed 3D Digital Terrain Models of 0.02 m resolution near points S and E3 (Fig. 2).

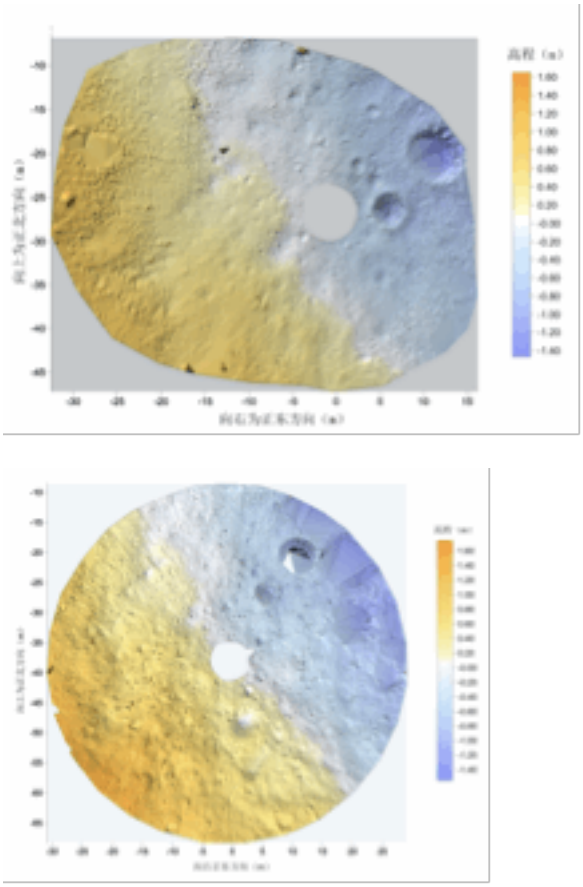


Figure 2. Reconstructed 3D digital terrain models near points E and S3.

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