Geophysical Research Abstracts
Vol. 14, EGU2012-7614, 2012
EGU General Assembly 2012

Shape from shading under Titan's sky

B. Grieger
European Space Astronomy Centre, Madrid, Spain (Bjoern.Grieger@sciops.esa.int)

During the Descent of the Huygens probe towards Titan's surface, the Descent Imager/Spectral Radiometer (DISR) aboard the probe took about 400 images. About half of these were taken with low enough altitude and emission angle to show surface features through the optically thick atmosphere. Soderblom et al. (2007) used two stereo pairs of images to photometrically reconstruct the surface topography of two areas.

Here, we investigate the possibilities to retrieve the surface topography of the complete landing site region by means of shape from shading. We base the reconstruction on the stitched image mosaic which has been put together by Karkoschka et al. (2007). In this mosaic, the atmospheric component in the observed surface brightnesses has already been removed. In order to take into account the complete illumination from Titan's sky for the shape from shading reconstruction, we use the results of the radiative transfer modelling by Tomasko et al. 2008.

For a shape from shading approach, it is usually assumed that the intrinsic surface albedo is constant, and that all observed brightness variations are due to topographic shading. For the Huygens landing site region, this is clearly not the case. The observed brightness distribution is bimodal, and a dichotomy of bright and dark areas is evident. We investigate different a priori assumptions to constrain the underdetermined problem of simultaneously retrieving topography and surface albedo variation. E. g., assuming that there are only two types of surface material (a bright one and a dark one), we allow for only two different values for the surface albedo and attribute all additional brightness variations to topographic shading.

It has been argued that the darker "river beds" withing the brighter areas contain deposits of the same material that makes up the darker areas, however, Keller et al. (2008) have shown that the magnitude of darkening observed in the river beds could also be caused just by topographic shading due to moderate terrain. We assess different assumptions about the nature of the river beds by comparing their consequences for the retrieved topographic models.