



High resolution DEM from Cartosat – 1 for landslide investigation in the Himalayan region, India

T. R. Martha (1,2), N. Kerle (2), C. V. Westen (2), K. V. Kumar (1)

(1) National Remote Sensing Agency, India, (2) International Institute for Geo-Information Science and Earth Observation, Hengelosestraat 99, P. O. Box 6, 7500 AA Enschede, The Netherlands (martha@itc.nl)

Digital Elevation Models (DEMs) are one of the most critical requirements for landslide investigation. Morphometric parameters extracted from high resolution DEMs are essential for the preparation of landslide susceptibility and risk maps. 2.5m along-track panchromatic stereoscopic data from the recently launched Cartosat-1 provide an excellent opportunity for the generation of such DEMs. Through block triangulation with 8 control points and the Rational Polynomial Coefficients (RPC) supplied with the satellite data, a 10 m grid spacing DEM with a total horizontal and vertical RMSE of 1.3 and 1.4 pixel, respectively, was achieved in the very steep topographic areas in the High Himalayan region, characterised by an elevation range of 700 - 3880m. Given the steep terrain and consequent rapid slope changes, as well as shadow, snow and vegetation cover, fully automated production of high quality elevation models is not feasible. We thus tested the utility of manual break lines to correct spurious points, but also methods to quantify the elevation contribution of vegetation as a means to move towards a digital terrain model (DTM) from a digital surface model (DSM). The corrected surfaces were also used to calculate the volume of the 2007 Salna landslide. Knowledge of failure volumes is a critical component of landslide hazard assessment as well as for runout modelling, and Cartosat data appear suitable for accurate volume calculation of large failures.

The generated DEM was also tested as a source for morphometry, which was extracted for both old and recent landslides. Morphometric indices, such as plan and profile curvatures, in association with the spectral information from the multispectral IRS-P6

LISS III data, were successfully extracted for both landslide categories.

Key words: *DSM, morphometric indices, volume estimation*