THE KINEMATICS OF A DEEP-SEATED MASS MOVEMENT DERIVED FROM GEOPHYSICAL, GPS AND PHOTOGRAMMETRIC DATA

E. Brueckl (1), F. K. Brunner (2) and K. Kraus (3)

(1) Institute of Geodesy and Geophysics, Vienna University of Technology, (2) Institute of Engineering Geodesy and Measurement Systems, Graz University of Technology, (3) Institute of Photogrammetry and Remote Sensing, Vienna University of Technology

The deep-seated mass movement at the intersection of the Gradenbach and Möll Valley near Döllach, Austria, has been the target of many scientific investigations. In this paper we concentrate on geophysical, GPS and photogrammetric data for the derivation of a constraint for the kinematics of this sagging process. Seismic surveys were carried out to explore the internal structure of the slope, especially the basis of the moving rock mass. From 1999-2003 eleven differential GPS campaigns were carried out yielding displacement patterns for the whole sagging slope. The accuracy is 3 mm for the horizontal and 7 mm for the vertical component. The photogrammetric models are based on flights in 1962, 1996 and 2003. Displacement vectors of about 30 individual characteristic points were determined for the periods 1962-1996 and 1996-2003. Applying a semi-automatic technique an accuracy of 0.2 m for the vertical and horizontal components was achieved. The sagging slope can clearly be recognized as a rather uniformly moving mass. The maximum total displacements for 1962-1996 are about 20 m. Furthermore, digital terrain models were derived for all three photogrammetric epochs. The equation of continuity was applied to the photogrammetric data and average velocities through cross sections were calculated. Changes of the total rock mass due to erosion have been considered. The ratio of the average velocity through a cross section and the surface velocity supply information about the 3D kinematics. The significance of velocity depth profiles derived by this method will be discussed.