



Landslide displacement measurements from Optical Satellite Images: A Case Study on the North Anatolian Fault Zone

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Several geodetic and remote sensing methods are used to monitor the movements due to the tectonic and geomorphic processes and the assessment of associated hazards. Recent advances in image-correlation techniques and high resolution satellite imaging at meter resolution offer the possibility to measure surface displacements with sub-metric accuracy. Moreover, this methods enables an accurate mapping of the surface displacements, and vector visualization of the horizontal movements over a period through establishing correlation among the different dated satellite images belonging to the same area. This study analyzes the displacement pattern of the earth flows using sub-pixel image correlation techniques along the tectonic Kelkit Valley, Central Anatolia, Turkey. In this study, we used Co-Registration of Optically Sensed Images and Correlation (Cosi-Corr) to measure the horizontal surface displacement of landslides from SPOT-5 images. The significance of the horizontal displacement results was verified through fieldwork studies. The landslide displacement vectors obtained from SPOT 5 (2.5 meter resolution) optical satellite images on 11 August 2006 and 21 September 2011 indicate that many of the old landslides reactivated in the study area. It was determined that such reactivation occurred due to the secondary slides developed inside the main body of the old landslides, especially in their accumulation sections. The horizontal displacement values in the accumulation sections of the old landslides vary between 4.9 and -7.7 meters in the North-South direction and between 8.2 and -5 meters in the East-West direction. The maximum displacement values were observed in the eastern hill-slopes. The results show that the Cosi-Corr technique provides important contributions in the determination of the landslide movements especially with very slow, slow to moderate slip velocities and their deformation quantities and patterns.

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