



## **Multi-temporal and multi-platforms remote sensing data for the analysis of open-pit mining earth surface dynamics**

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Open-pit mining activities can affect the earth surface processes inducing soil erosion, landslides, and subsidence. The recognition and the analysis of mining induced Earth surface changes and the related processes represent, therefore, a challenge for a sustainable environmental planning for those regions affected by an intense mining activity. The purpose of this study is to monitor the effects of open-pit mining and the associated landform processes using multi-temporal and multi-platforms remote sensing data.

The study area consists in an open-pit mine located in Miyun county, northern Beijing. For the study area different datasets are available for different years: a GeoEye image (2011, res. 1m/pix), two pairs of Cartosat - 1 stereo pairs (2009, 2012, res. 2.5m/pix) from which we extracted two DSMs (res. 5m/pix), an UAV aerial photograph (2014, res. 0.07m) and the derived DSM (2014, res. 0.1m). We also obtained a DTM (2014, res. 1m) from terrestrial laser scanner (TLS) and a DSM (2014, res. 0.5m) using the Structure from Motion (SfM) technique by a camera. These data served as the basis to recognize, through the application of morphometric indicators, the areas subject to erosion and landsliding. A volumetric estimate of soil loss from 2009 to 2014 has been also quantified using the multiple DSMs provided by the multi-platform. The recognition and the analysis of earth surface dynamics using low-cost multi-temporal and multi-platforms remote sensing such as SfM and UAVs represents a useful tool to mitigate the environmental consequences open-pit mining, and to mitigate the related natural disaster and risk.