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Landslide detection methods and inventory analysis applied to the Tien Shan, Kyrgyz Republic

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This paper presents results of landslide detection and mapping in the Central and Southern Tien Shan. Landslide inventories have been compiled for areas of major interest in the Kyrgyz Republic. For those areas, landslides were first mapped manually using KFA satellite images and aerial photographs. Recently, a landslide detection method has been developed in order to map landslides automatically by uni- or multi-temporal spatial analyses. This method is based on a neural network scheme applied to detect particular slope failure features from remote sensing data. Multi-spectral and/or panchromatic ASTER, SPOT and Quickbird images as well as digital elevation models (DEMs) are used as inputs. This automatic method is designed to map medium-size mass movements (105-107 m3). This approach supplements the manual mapping of large slope failures and helps to complete the inventory of mass movements (including rockslides, loess slides, natural dams, etc.) and related landslide susceptibility/hazard maps for large areas within the Tien Shan. Size-frequency analyses have been applied to the two existing regional landslide inventories. These size-frequency analyses revealed the incompleteness of the respective inventories (in the low-size domain) as well as regional and local differences due to natural and anthropogenic influences. To be able to perform reliable susceptibility and size-frequency analyses, the completed inventories need to be verified. At present, we perform local verification by manual mapping and control, but automatic verification methods are being developed. They will also allow us to determine the level of uncertainties. Ongoing research is focused on the propagation of uncertainties throughout the chain of processing.