UAV-based landslide deformation monitoring - first results from Corvara landslide

**Methods**

- Hardware:
  - SoLeon GmbH octocopter with 1550 g payload
  - Ricoh GR 16.3 Megapixel camera
  - 22 ground control points (40 x 40 cm laminated sheets) measured with DGPS + 5 minutes

- Flight characteristics:
  - 70 m flight height and 1 m/s flight speed
  - 5 flights of 20 min each
  - Photos taken every 2 seconds with 3 exposures

- Post-processing:
  - Pix4D point cloud generation, ArcGIS for DSM generation, ERDAS for mosaicing
  - DoD (DEM of Difference) creation with 2006 DSM

Orthophoto, point cloud and DSM
- 13 hectares covered within 1 day
- Processing time > 2 days
- Orthophoto based on > 2000 georeferenced images and a total resolution of 1.5 cm (RMS error 6.3 cm)
- Point cloud > 200 million points
- DSM with 1.5 cm resolution, resampled to 2.5 m for DoD analysis

**First results**

Morphological changes
- Topographic changes of up to 12 m, i.e. annual rates > 1 m
- Regressive growth of the landslide of 30 m within the last 4 years (or less), e.g. relating to a annual growth of approx. 8 m

**Discussion and conclusions**

Method and results
- Fast data acquisition in the field but weather-dependent post-processing is time-demanding
- Valuable products (i.e. orthophoto, point cloud, DSM) with extremely high resolution
- Uncertainties due to vegetation cover

Next steps for Corvara
- Continued monthly dGPS monitoring
- Installation of new C-band corner reflectors
- Additional radar interferometry (MTI) with Sentinel-1
- Large field campaign in June 2016 planned
  - TLS
  - Repetition of UAV survey
  - Quantitative comparison to first flight results
  - Integration of all data and results

**Perspectives**

The Corvara activities are kindly supported by the Geologitcal Survey of South Tyrol, the municipality of Corvara and the SouthTyrolean Cadastre. Further details on the study in Corvara are provided in: B. Thiebes, E. Tomelleri, A. Mejia-Aguilar, M. Balsamo, B. Schlager, M. Anselmo, A. Canini (2016) Assessment of the 2016 to 2017 Corvara landslide evolution using a laser-derived DSM and orthophotos. 40th EUSCR radar conference, Italy.