Monitoring Projects in Tyrol

Examples and Experiences

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Used Sensors / Methods

Airborne Laserscanner (ALS):
• Covering large areas

Terrestrial Laserscanner (TLS):

Geodetic Monitoring (GM):
• Punctual measurement
• Related to Event
Status Digital Terrain Models (ALS) in Tyrol

### Data-Quality

- **Pointdensity:**
  - 1 p/sqm

- **Accuracy:**
  - Horizontal: +/- 30cm
  - Vertical: +/- 15cm

DOM 2006
Data-Quality

Point density: 8 p/sqm

Accuracy:
Horizontal: +/- 20 cm
Vertical: +/- 10 cm

DOM 2012

TLS-Projects 2018
Rockslide Bliggspitze

Event: in Summer 2007 (→Rock- / Glacierfall)
Location: Kaunertal, east of Gepatsch Stausee

Monitoring:
• Continuous ALS-Measurements
• Since 2014 annual TLS-Measurements
  (both in „snowfree conditions“)
• 2 Webcams since 2007 (Pictures every hour)
Fey et al (2017): Multi-temporal long-range laser scanning for spatial deformation monitoring of alpine slopes
Rockfall Valsertal

Location: Valsertal near Brenner

Monitoring:
• Regular TLS-Measurements (at least monthly)
• Geodetic Monitoring (hourly, 15 reflectors)
• Live-Webcam
Loss of Volume: 117,000 m³
Max. Depth (horizontal): 25 m
Max. Height (vertical): 150 m

Accumulated Volume: 130,000 m³
Acc. Area: 50,000 m²
Max. Acc.: 9 m

Top of Rockfall: 1650 m
Lowest Acc. Zone: 1270 m
Total Height: 380 m
Rockfall Valsertal

Profile: blue = 2008, red = 2017

Potential future Rockfall-Events?
Rockslide?
Rates or Dimensions?
Rockfall Valsertal

3D-Differences from 27.12.2017 to 28.03.2018 (RiScanPro)

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Detail: 3D-Differences from 27.12.2017 to 28.03.2018 (M3C2)

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Conclusions

**ALS:**
- Important basic data (for calculation of differences and volume)
- Widespread availability (whole country)
- High data quality essential (accuracy, point density)
- Topicality
  But this is not easy to realize (immense cost, data storage, data management)

**TLS:**
- Powerful monitoring tool
- May provide highly accurate and dense data rapidly
- Modern software can handle big datasets
- Registration and analysis methods good, but still need of improvement
  (especially when it comes to deformation rates)

Conclusions

Our work:
- provides essential information for decision makers (political, geological, ...),
  which are usually pressed for time
- provides basic data for natural hazard management (planning of construction
  measures, simulations of rockfall events, avalanches etc.)

Decisions do have consequences for affected residents (directly, indirectly)
  -> Know what you do!!

Key-Word „Sensitivity“:
- work with data (registration, analysis)
- dissemination and publication of data and results