Use of an optimized Pulse Doppler RADAR technology in alpine mass movement monitoring

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1. Introduction

For investigation and detection of important mass movements in alpine regions a reliable monitoring system is required. Parameters for detecting and characterizing movements are volume, mass and velocity. A reliable technology to measure velocities very accurate is the RADAR-technology using the Doppler-Effect on moving objects. The RADAR cross-section of an object for a given wavelength is a function of the magnitude, material, incident and reflecting angle, which determines the scattered intensity. Therefore, this reflected intensity is a parameter that belongs to the cross section of the **moving volume of the detected object. So, RADAR-technology is able** to measure both magnitude and velocity.

2. Principle

- The RADAR emits modulated pulses (Figure 1)
- Max. measurement distance 2,5 km
- Up to 128 Range Gates (RG)
- RG-length 15-250 m
- Velocities from 1 km/h 300 km/h are detected
- If there is a hazardous event (fast moving objects), an alarming trigger is activated.



Figure 1: Radar at the Lattenbach/ Tirol/ Austria with the monitored area and a scheme of the measurement principle

3. Case Study Lattenbach/Tirol/Austria	
07/2012	Installation of the Radar (Example Data
	Figure 2)
07/2014	Test wise operative integration in the ÖBB alarming
	system (ÖBB-ASFINAG-FFG Project VIF2011

-Naturgefahrenradar)



5 Conclusion

The experience of the five year showed the enormous potential of the presented RADAR technology in use as an independent warning and monitoring system in the field of natural hazard. As evidenced by the current results, both avalanches and fluvial natural hazard processes can clearly and reliably be detected with the natural hazards RADAR. For the installation of the RADAR only a mast and a power supply of 40 Watt is necessary. Over the entire period, there were no restrictions on the measurements caused by environmental factors and /or secondary processes.

Furthermore, the RADAR can be used now to estimate water levels, flow volumes, measure velocities of normal outflows and with an additional antenna a detection of heavy rainfall cells is possible.





