Geophysical Research Abstracts, Vol. 7, 02566, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02566

Geology and 3D seismic structure of the Niedergallmigg- Matekopf mass-movement, Tyrol, Austria

W. Chwatal (1), H. Kirschner (2), E.Brückl (1) and C. Zangerl (2)

(1) Institute of Geodesy and Geophysics, Vienna University of Technology, Austria (wchwatal@luna.tuwien.ac.at) (2) alpS GmbH - Zentrum für Naturgefahren Management, Austria

The Niedergallmigg-Matekopf mass-movement, which is located near Landeck, in Tyrol, Austria, covers 4.5 km2. This slowly creeping rock mass has an elevation of about 1400 m between its toe and main scarp. It is, therefore, one of the largest active mass-movement in the Eastern Alps, bigger than the better known mass-movements at Gradenbach, Hochmais and Lesachriegel. Results from geodetic measurements (i.e. applying terrestrial and GPS methods) showed average surface displacements in the range of between 50-100 mm/year; the highest slope displacement rates were observed in the lower west part of the slope. Geologically, the mass-movement is situated in the Silvretta crystalline complex, next to the Ötztal-Stubai crystalline basement and in the Lower Engadine Window, a large-scale NE-SW striking antiform. In this region, the NE-SW striking Engadine Fault Zone and the E-W striking Inntal Shear Zone form the main structural lineaments, both having a strike-slip movement. Polyphase deformation formed ductile and brittle structures within the tectonic units. Phyllitic gneisses, phyllites and amphibolites cover the lower to middle part of the study area whilst the upper part comprises paragneisses and two-mica schists of the Silvretta crystalline basement. Generally, the main foliation strikes E-W, dipping gently to steeply towards the south, and is characterized by intense internal folding. Conjugated joint systems, combined with E-W striking brittle shear zones have been observed. A seismic survey was carried out to explore the thickness and internal structure of the mass-movement. 373 seismic stations were deployed along 4 cross-lines, with a total length of 7.5 km. 41 shots were recorded simultaneously by all receivers. This field layout not only allowed a 2D evaluation to be made along the 4 lines but also for a 3D inversion of

the whole data set (inline and cross-line shots). The seismic data showed a vertical gradient of the velocity for the creeping rock mass and a nearly constant velocity for the underlying compact rock. Therefore, a combination of tomographic inversion and standard refraction seismic methods was necessary. For this, some of the 3D processing techniques described by Brückl et al. (2003) were used. Compact rock has been interpreted as the basal surface of the mass-movement, which, on this basis, lies at a maximum depth of about 250 m. The P-wave velocities of the creeping rock mass are; near surface, between 1000-2000 m/s; at a depth of 25-100m, 2000-3000m/s and below 100m depth, 3000-3500m/s. Some down-slope dipping structures of the P-wave velocity field of the creeping rock mass may be correlated with internal shear or sliding zones.

Brückl, E., Behm, M., Chwatal, W., 2003. The application of signal detection and stacking techniques to refraction seismic data. Oral Presentation at AGU, San Francisco, 08-12 December 2003