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Kinematics and Hazard of the Niedergallmigg-Matekopf mass movement

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The Niedergallmigg-Matekopf mass movement is one of the largest, active saggings in the Alpine region. It covers an area of 4,5 km2 and from seismic measurements the maximum thickness and total volume of the creeping rock mass was calculated to about 320 m and 0,85 km3. Actual movements at the lower part of the sagging cause damage of buildings in the hamlet Niedergallmigg. An acceleration of the movement could cause greater hazard to population and infrastructure in this area, because of damming up the river Inn.

The main part of the Niedergallmigg-Matekopf mass movement is assumed to develop after the retreat of the glaciers of the last ice age, about 14 000 years ago in this area. Morphology, especially the extent of the head scarp indicates a total displacement of about 200 m. Further constraints on the kinematics can be derived from geological observations. The dominant tectonically structures are oriented in approx. E-W (e.g. joints, shear faults, b-axes) to N-S striking joint direction. Conjugated joint systems combined with E-W striking brittle shear zones were observed. The 65° to 90° steep and SE to S main foliation dip forms a northvergent anticline-structure and is characterized by intensive internal folding. Therefore the foliation acting as a potential failure plane can be excluded from considerations. The deformation style of the mass movement corresponds to the tectonic structures and not with the metamorphic fabric. The shape of the basal surface of the mass movement is well defined by the seismic model. Down-slope dipping seismic structures of the creeping rock mass, which are indicated by low seismic velocities, may correlate to internal shear zones. Geodetic measurements in the range between 5 to 10 centimetres per year show for the displacements a dip angle of 28° in the upper part and 13° in the lower part of the mass movement, which fits to the dip angle of the basal surface. Therefore the geodetic

results support the idea, that the whole volume of the sagging, as determined by the seismic, belongs to the currently moving rock mass.

Several methods of retro-deformation were applied in order to reconstruct earlier and even the initial state of the mass movement. Furthermore, the erosion at the toe of the slope by the river Inn was estimated. A rotational slider block model was adapted to this data and a state dependent friction law was applied. An estimate of potential hazard and, especially the sensitivity of the mass movement to changing pore pressure at the sliding surface will be presented.