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Sequences of slope formation and actual process dynamics in the Flysch Zone of the Wienerwald (Vienna Forest/Austria)

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In general, Flysch consists of alternating sequences of sandstones, clays and marls deposited as marine deep sea sediments during the Lower Cretaceous to the Eocene periods. Along the northern margin of the Alps the Rhenodanubian Flysch Zone runs in W-E direction and dips below the Vienna basin at the periphery of Vienna.

The Wienerwald Flysch Zone is formed by Upper Cretaceous to Eocene sediments. They are composed by various layers of (calcareous) sandstones, marly shales, calcareous marls and clay shists, which are covered by Quaternary periglacial cover beds and loess. The study area represents an undulating landscape of the central European low mountain regions with deeply incised valleys and is between 300 and 500 m a.s.l.

Concerning slope stability Flysch regions are considered to be susceptible to landslides. Both, petrography of the bedrock and soil mechanical properties of the Quaternary sediments control the actual slope dynamics in the Wienerwald area. In particular calcareous sandstones tend to a profound decomposition under influence of humidtiy („Mürbsandstein“). The base of the Quaternary deposits had been formed by solifluction processes, resulting in a widespread distribution of periglacial cover beds, mainly consisting of clays and marls. These impermeable layers are responsible for the occurrence of springs. The hanging layer consists of permeable loess deposits ($\leq$ 4m) of the last glacial period. The top of the sequence is characterised by a further periglacial cover bed, composed of a mixture of loess and sandstones, originating from the Late Glacial.

In a temporal context it is evident that the stability of slopes $> 27^{\circ}$ is controlled by

sequences of landscape formation. On the basis of field survey, in particular mapping, morphometrical and geotechnical studies as well as laboratory analyses and slope stability modelling, investigations on recent landslides give evidence of the following sequences in the northern Wienerwald:

1. Initial situation: The described geological profile is completely developed

2. First sliding phase: Sliding of loess deposits on top of basal clays and marls

3. Erosional phase: Downwash of the basal clays and marls, uncovering the bedrock

4. Weathering phase: Profound decomposition of calcareous sandstones

5. Second sliding phase: Sliding of the decomposed sandstone, after exceeding a “critical mass”

Afterwards, the phases four and five reoccur in an alternating pattern. After passing phases 1 - 5, the stability of the studied slopes is increased, due to the different soil mechanical properties of the potential sliding masses. Now, the critical slope is at 3 - 5 ˚ increased.

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