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Slope instabilities in the "La Glaive" forest, Ollon, CH

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The study area is located in the "La Glaive" forest above Ollon, SW Switzerland. Retreat of the alpine glaciers and dissolution of gypsum are probably the main causes of a large-scale landslide (600 x 400 meters, mean slope 45°). Several mud flows originated within the landslide area. The last event happened in 1998 and nearly reached a road, 340 meters away from the starting zone. Its causes lie in the soil nature and the several forest fires between 1960 and 1997, which burnt the vegetation.

Detailed maps of geomorphology and landslide activity reveal a typical scar with outcropping gypsum and an accumulation zone continuing below the Rhone plain. Reverse slopes, disturbed vegetation and soil creeping are obvious signs of activity in the scar area. Downwards they become less manifest suggesting a deepening of the sliding surface, which is probably situated at the anhydrite-gypsum transition. These observations also indicate that several sliding surfaces might exist, which needs confirmation by seismic reflexion measurements.

The 1998 mud flow started in a redzine type soil developed on gypsum composed of three horizons: 2 cm organic part h1, 10 to 35 cm organic-mineral part h2 and altered gypsum h3 presenting generally powdery texture. The soil has little coherence and low clay content. The thickness of h3 reaches up to 20 m, indicating high alteration rate. Root densities and shear resistance values (s) are particularly high in h1 and h2 (s = 22 kPa) but relatively low in h3 (s = 13 kPa). Thus the mud flow's sliding surface is situated in the upper part of h3. In the starting zone shear resistance values in the upper part of h3 are significantly higher (s = 24 kPa) due to carbonate recementation. Shear resistance is generally lower where the vegetation is less dense and/or soil creeping occurs. In these places mud flow hazard is increased. Vegetation data (Ellenberg index), mineralogical measurements and infiltration tests will help to quantify the factors that triggered the mud flow off.