



How Local Subsoil Affects Level of Hazard

Local subsoil

The type of subsoil in the uppermost ten to 50 meters directly beneath a location or building has a significant influence on the ground movement likely to occur in this location during an earthquake. Ground movement in two directly adjacent locations, where one is on soft sediment and the other on solid rock, can often vary by a factor of ten or more. The ground movement and associated damage can therefore be up to one level of intensity higher. Topography also has an effect. For example, sedimentary basins (often in the vicinity of lakes or riverbanks) strengthen and prolong ground movement, because sediment basins are particularly affected by earthquake waves (resonance vibration).

Reference rock

Because the local subsoil across Switzerland has not been studied in sufficient detail, the SED's hazard maps are based, in accordance with standard practice, on a "reference rock" that behaves in a precisely defined manner. The shear-wave velocity of the ground as a function of depth is an important parameter to consider. In order to determine the level of hazard specific to each particular location, the makeup of the local ground must be taken into account. This necessitates a geotechnical study of the subsoil or a local microzonation.

Analyzing the local subsoil

In order to show at least a rough approximation of the influence of the local subsoil, the SED has included this information on the effects maps as part of its 2015 hazard model. The local amplification shown is based on macroseismic data (e.g. from the "Did you feel it?" survey). These macroseismic observations are combined with geological and geotechnical maps to allow typical seismic characteristics to be deduced from particular types of soil.

Strong vs. weak amplification

Particularly strong amplification is usually observed in organic soils and soft Quaternary sediments in large fluvial plains. The flysch deposits of the pre-Alps and Engadine region are examples of areas that typically experience below-average amplification. Amplification values are still unknown for many types of rock in the Alps, as the region is so sparsely populated that too few observations on intensity take place.