NATURAL HAZARDS IN MOUNTAIN AREAS

Learning objectives

- You know the basis terms related to and process behaviour of the most common natural hazards in mountain areas
- You know the most commonly used techniques for hazards identification
- You know standard techniques for hazard analysis and mapping

Terms and concepts

Landslides, rockfalls, debris flows, floods and flash floods, hazard assessment, mapping, modelling, susceptibility, frequency, magnitude, conditioning and triggering factors, risk analysis.

References and further reading

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Weblinks

https://www.un.org/earthwatch/mountains/

http://geohazards.cr.usgs.gov/

http://www.dendrolab.ch/index.php

Additional information

Natural hazard is defined either as the probability that a reasonably stable condition may change abruptly (Scheidegger, 1994), or as the probability of occurrence of a potentially damaging phenomenon within a given area and in a given period of time (Varnes et al., 1984). The latter remains the most widely accepted definition for natural hazard and for maps portraying its distribution over a region. The definition incorporates the concepts of magnitude, geographical location and time recurrence. The first refers to the ‘‘dimension’’ or ‘‘intensity’’ of the natural phenomenon which conditions its behaviour and destructive power; the second implies the ability to identify the place where the phenomenon may occur; the third refers to the temporal frequency of the event. Therefore, hazard analysis involves the classification, location (spatial distribution), volume (or area), travel distance and velocity of potential mountain process in a given area. Hazard mapping usually comprises developing an inventory of processes which have occurred in the past and an assessment of the areas with a potential to experience processes in the future, with the assessment of the frequency (annual probability) of the temporal occurrence and the magnitude potential hazardous events. This may be expressed as the frequency of a particular type of event of a certain volume, or events of a particular type, volume and velocity (which may vary with distance from the source), or in some cases as the frequency of events with a particular intensity, where intensity may be measures in kinetic energy terms.

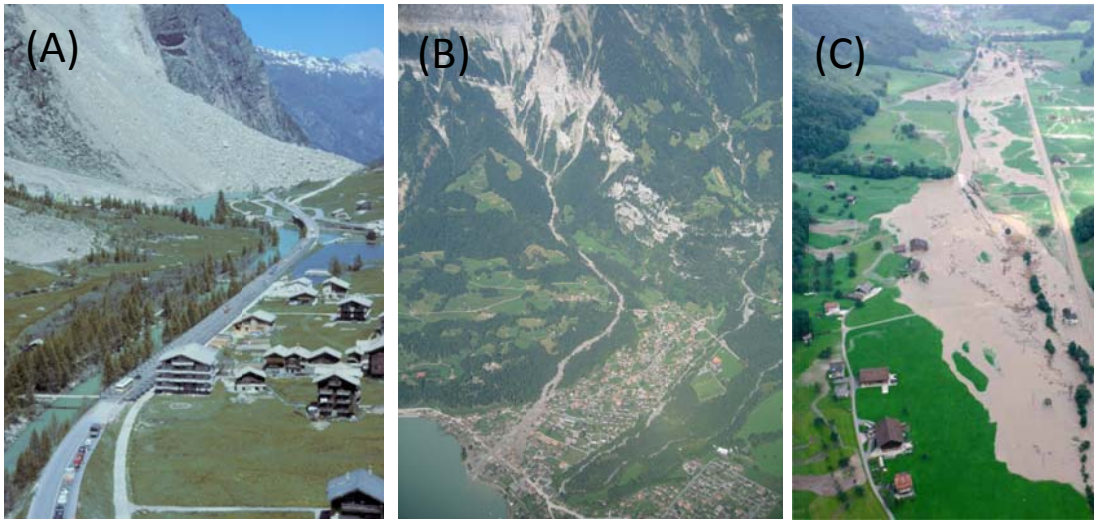

Figure: Fall, slide/flow and flow examples from Switzerland (A) Randa rockslide f (Valais); (B) Brienz debris flow from 2005 (Berne); (C) Flood in the Engelberger Aa i (Nidwalden)

Main processes:

Landslides

A landslide is the gravitational movement of a mass of rock, earth or debris dow The process are usually classified on the basis of the material involved (rock, deb mud) and the type of movement (fall, topple, avalanche, slide, flow, spread). Thus, th term landslide also refers to mass movements such as rockfalls, mudslides and debris

Shallow landslides usually involve only the soil layer and upper regolith zone, w seated landslides additionally involve bedrock at larger depths. Landslide volume can some tens of cubic metres for small events to several cubic kilometres for giant landsli landslide speed may range from a few centimetres per year for slow-moving landslid of kilometres per hour for fast, highly destructive landslides. According to the state of movement, existing landslides can be classified as active, dormant (potentially react inactive (often relict or fossil).

Landslides are generally induced when the shear stress on the slope material ex material’s shear strength. The occurrence and reactivation of landslides is conditic number of terrain and geo-environmental factors related to bedrock and soil p weathering conditions, jointing and structure, slope morphology, land cover/use, su