9. Mass movements

Mass movement = large-scale movement of the Eatrh´s surface without a moving agent (river, glacier, ocean wave)

Mass movement:

- very slow – soil creep
- fast – avalanche
- dry – rock fall
- fluid (wet) – mud flow

Safety factor expresses the likelihood (probability) of a slope failing = relative strength (resistance) of the slope compared with the force that is trying to move the slope mass

What are factors causing mass movement on a slope?

Mass movement on the slope is determined by:

1. gravity
    a. it can move the material down slope = *slide component*
    b. it holds the particle to the slope = *stick component*
2. slope angle – the downslope movement is proportional to the *weight of the particle* and to the *slope angle*
3. pore pressure – water fills the spaces between the particles, lubricates them and pushes them apart under pressure, very important in movement of wet material on low-angle slopes

Types of mass movement

What types of mass movements do You know?

Falls = on steep slopes (>70°) weathered rocks are detached and fall due to gravity =>

- *short fall* produces a straight scree
- *long fall* produces a concave scree

Slides = when the whole mass of material moves along a slip plane =>

- *rockslide* – schist, mica
- *landslide*
    a) downslope force > the resistance (friction and cohesion)
    b) material moves downslope after a shear failure

Slumps = rotational slides on softer rocks (claystone) along a curved plane.

Flows = continuous, fluent movements of fine, deeply weathered clay, saturated with water => highly fluid, no cohesion

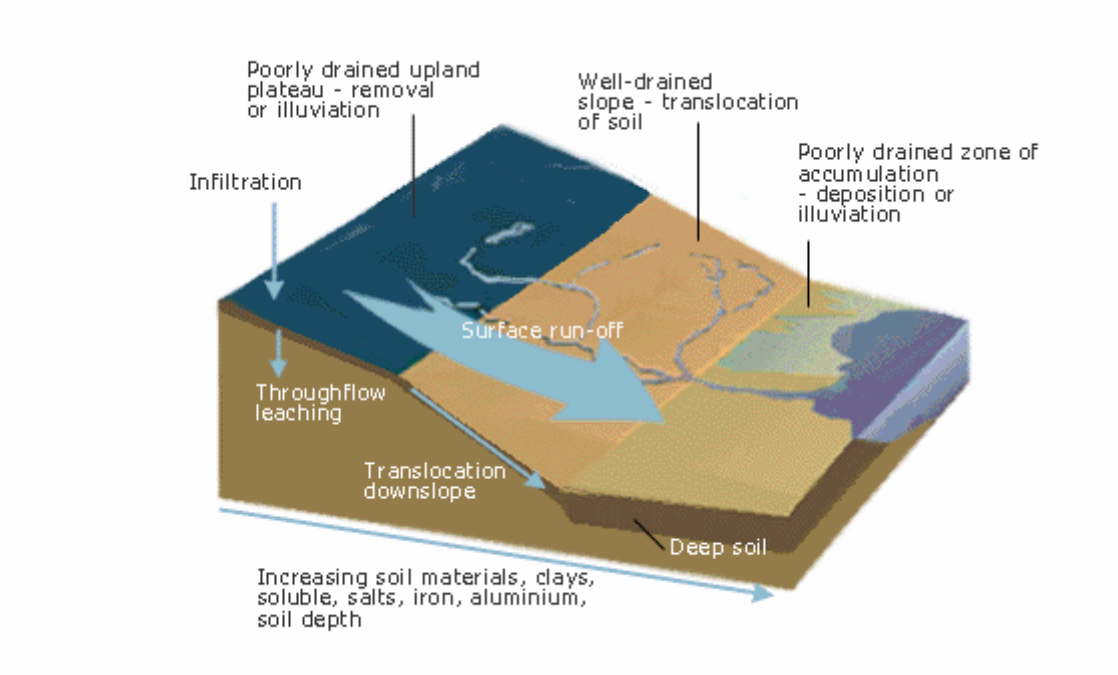
Avalanches = rapid movements of snow and ice, rock and soil (debris avalanche) down a slope, very common in mountain areas.

- dry avalanche = newly fallen snow falls off older snow – mainly in winter
- wet avalanche = partially melted snow (triggered by skiing) – in spring

Slope measuring

Clinometer = a protractor with a weight which is always perpendicular, the protractor is aligned with the slope => we can read the slope angle.

Pantometer = collapsible parallelogram placed on the slope, the angle is read off from a protector placed on the vertical.



Effect of topography on soils

Slopes influence the character of soils. On upland plateaux high rainfall and colder conditions often lead to acidic conditions, thick soils, and poor drainage. On steeper slopes drainage is usually good, and loss or eluviation of material dominates, especially where precipitation exceeds evaporation. Material accumulates at the base of slopes, but drainage is often poor and gleying occurs. A sequence of soils develops from the top to the bottom of slopes. Each soil is similar to its neighbouring soil, as material is lost to the downslope side and gained from the upslope side. However, a comparison of the soils at either end of the slope shows them to be very different in character. This type of sequence is known as a soil catena.

Keywords:

mass/large-scale movement, safety factor, gravity, slope angle, pore pressure, short/long fall, rockslide, landslide, rotational slide (slump), downslope force, flows, cohesion, dry/wet avalanche, clinometer, pantometer