MASS MOVEMENT (also known as MASS WASTING)

Mass Movement — downslope movement of material (rock & soil) due to gravity. May be slow or fast, wet or dry, gentle or steep. Driving force in mass movement is gravity, but depends also on the weight, size, and shape of the surface material, slope angle and amount of moisture.

Angle of Repose — how steeply loose objects will stack before they begin to roll & slide; approximately 30 °.

Controlling Factors
1) slope angle
2) local relief
3) thickness of debris
4) orientation of planes of weakness
5) climatic factors
6) presence of vegetation

Causes
1) earthquakes
2) added weight to upper slope
3) undercutting of bottom slope
4) water

Classes of Mass Movements

1) Fall - movement involves free-fall of detached individual pieces of any size

- 1) *Rockfall-rock* falling through air and hits a surface; movement occurs along surfaces of weakness in bedrock (e.g. foliation, joints, faults). Rocks at base are called *talus.*
- 2) *Debris avalanche-moving* mass of rock, soil, snow usually associated w/volcanic eruption

2) Slide- movement involves material that remains fairly coherent & moves along a well-defined surface

- *Landslide — 1) translational* (along a planar surface); and 2) *rotational* (slippage is concave)

3) Flow- material moves downslope as a viscous fluid since it has a high moisture content

- 1) *Earthflow* (grass-covered movement); 2) *Debris/mudflow;* 3) *Lahar* (volcanic mudflow)

4) Creep-slow movement of soil and rock debris by gravity which is usually not perceptible except through extended observation

- 1) Soil creep — slow glacier-like movement of shallow soil downslope with surface levels moving fastest & rate of movement decreasing with depth. Primarily due to expansion & contraction (expands when wet, gets warm, or freezes; contracts when dries, cools, or thaws); also due to gravity and rainfall and & slight vegetation. Most common type of mass wasting.

- 2) Solifluction — rising up of soil, due to alternate freezing & thawing over permafrost (ground that remains below freezing- underlies 20% of land surface on Earth).