

GLG 101 - CHAPTER 6 - WEATHERING AND SOIL

- **Weathering** is the falling apart of rocks at or near the Earth's surface, under the influence of mechanical and chemical processes.
- **Erosion** is the removal of weathered material by wind, liquid water or ice. The downslope movement of water and ice are caused by **gravity**. The movement of materials downslope under the influence of gravity, but *without* a transport agent (i.e., wind, water, and ice), is known as **mass wasting**.
- **Mechanical weathering** is the physical breaking up of rocks into smaller pieces. These broken pieces are known as **clasts**. Examples of mechanical weathering include abrasion, growing plant roots, frost wedging, burrowing animals, thermal expansion, and unloading (pressure-release) fracturing.
- **Chemical weathering** is the process by which minerals that are **out of equilibrium** at the Earth's surface get changed chemically to reach equilibrium. Water is the most important agent of chemical weathering, producing **oxidation**, **hydrolysis**, and **dissolution** reactions.
- Typical products of chemical weathering include **clays**, **iron oxides**, **ions in solution**, and the remaining quartz that remains relatively stable over time.
- The rate at which chemical weathering occurs depends on **surface area exposed** (which is related to particle size), **mineral composition**, and **climate**.
- More surface area, minerals from higher on Bowen's reaction series (more out of equilibrium at Earth's surface) and wetter climate will all increase chemical weathering rates of rocks.
- **Differential weathering** occurs when one rock weathers more quickly than an adjacent rock layer. It is controlled by factors like rock type and degree of *jointing* (fracturing).
- Igneous minerals weather in the same order in which they formed – **olivine and Ca-rich plagioclase** weather the fastest, and quartz weathers most slowly.
- **Soil** is a combination of weathered rocks fragments, organic materials, water and air. The factors affecting soil formation are *parent material*, *slope*, *time*, *climate*, and *plants and animals*.
- Soils can be divided into different **horizons**, including O (organic matter), A (mixture of organic matter and humus), E (leached and eluviated mineral materials), B (accumulated clays of the "subsoil"), and C (partially weathered bedrock fragments).
- **Pedocal** soils are common in arid environments and consist primarily of caliche (calcite accumulations) and partially weathered bedrock clasts.
- **Pedalfer** soils are common in temperate environments and contain all 5 soil horizons. These soils are typically fertile and rich in clays.
- **Laterite** soils are common in tropical rainforest-type environments. These deep soils are highly leached and contain abundant organics and thick layers of highly leached and eluviated minerals (E horizon). These soils are not very fertile without their organic layer. Removal of this layer by burning and clear-cutting of rainforest is a major source of erosion and destruction of the rainforest environment.
- **Soil erosion** is a natural process that varies in rate depending on slope, soil type, climate and amount of vegetation.