

The role of temperature in physical weathering -

2018 Q2B

Physical weathering is the breaking down of rocks into smaller pieces. Temperature plays a big role in the process of mechanical or physical weathering.

Freeze-thaw Action

Freeze-thaw action is the most common type of physical weathering. It occurs in cold climates and in upland areas where the temperature regularly rises above and falls below freezing point (0°C). It occurs in areas that experience a large diurnal range in winter. The diurnal range is the range of temperatures experienced by a region on the same day. For example Arctic environments and upland west of Ireland both have a large diurnal range. Temperature plays a big role in the process of mechanical weathering because freeze-thaw action cannot take place without a large diurnal range.

There are three conditions necessary for freeze-thaw action to occur. First, there must be an adequate water supply. There must also be pre-existing cracks in the rock where water can easily enter. Temperatures must frequently rise above and fall below freezing point.

By day, rain water seeps into joints in the rock. By night, the temperature drops below 0°C . This is freezing point and the water in the joint turns to ice. When water freezes it expands by approximately 9%. This causes stress on the joints and causes them to prise apart – this process is called wedging. Eventually, the rock breaks apart into smaller pieces of rock called scree. Scree can be seen in many locations such as Croagh Patrick in Co. Mayo.

Exfoliation

Temperature also plays a big role in the process of exfoliation. Exfoliation is when layers of rock are peeled away as a result of the layers of rock expanding and contracting repetitively. This is often called 'onion weathering' because the layers of rock peel off. This process relies heavily on

temperature change and can only occur in regions that have a large diurnal range. For example, a hot desert region.

By day, the temperature in the desert exceeds 40°C. The outer layers of rock heat much faster than the inner layers, and the outer layers of rock expand. By night, the temperature falls close to freezing point (0°C), and the outer layers of rock contract again. This repeats until the outer layers of rock loosen and crack, and eventually peel away in layers. Exfoliation can be seen in the Sahara Desert, where there is a large diurnal range.