

## VOLCANIC DEFORMATION CYCLES

Why is it that earthquakes sometimes occur at the same time as volcano eruptions? How do scientists predict when a volcano will erupt, other than by earthquakes? How do craters and/or volcanoes form?

Earthquakes nearly always precede a volcanic eruption. The magma forces its way upward generating stress in the brittle system. The sudden release of stress results in earthquakes. Seismometers can also detect a sustained vibration called a “harmonic tremor” which is believed to be the result of magma reverberating in conduits as it forces its way to the surface.

Another important predictor is the actual ground deformation. Kilauea in Hawaii has been carefully monitored as it has repeatedly undergone inflation-eruption-deflation cycles. Geodimeters, optical levels, and tiltmeters have monitored the ground to measure the stretching, uplifting (as much as one meter over time), and tilting as the surface swells. This inflation period for Kilauea is about six months. The eruption is out of the summit or down the slope (a flank eruption). Deflation takes less than a day.

Surtsey Island, Iceland was formed in an explosive eruption in 1963. Surtsey was a surprise. Indications that a below water level eruption was going to occur were (noted after the fact) increased seismic activity, a smell of hydrogen sulfide (rotten egg smell) in a nearby coastal village, and a strange increase in ocean temperature in the area. Also, today (Sept 1997) in Iceland, many Icelanders believe dormant Hekla (known as the “Gate to Hell”) will erupt soon. There has been a mysterious drop in the water level in local streams near Hekla.

When summit domes explode, there is generally a collapse inward after the inflation pressure is released. This crater is classified as a caldera if it is more than 1km across. Calderas form on Hawaiian volcanoes in a different way. Here there is a lack of explosive volcanic debris indicating that large flank eruptions caused the magma removal and subsequent caldera-forming collapse.