



Volcano crystals could make it easier to predict eruptions

Volcano crystals could make it easier to predict eruptions Predicting when a volcano is going to explode is a very difficult task. Every volcano has its own unique and complex maze of tunnels that feed magma to the surface. So even when we detect volcanic activity, it's very hard to know when the magma will make its way through these tunnels and erupt. But there's now a way to assess this process using crystals that grow inside volcanoes and act like a record of its eruption. Our latest study on crystals from Mount Etna in Italy has shown that if new magma arrives in chambers 10km below Etna's surface, an eruption can follow within two weeks. No wonder the Roman poet Lucretius said Etna "rages with flames from the lowest pit of Hell". Geologists used to think of the magma below volcanoes as being in a large single chamber, but modern research shows that feeding systems contain many connected compartments with complex transport routes. We also know what when new magma recharges these volcanic feeding systems it can trigger an eruption. As it moves towards the surface, the newly stirred magma pushes apart the rock, building up pressure beneath the volcano. This produces earthquakes and inflates the volcano's cone-shaped edifice, effects that can be monitored at the surface or from space with satellites. What's difficult knows if a particular magma recharge will actually translate into an eruption and how much time it will take for the eruption to start. This is where the crystals can come in. These minerals are called antecrysts ("ante" meaning before) because they often start growing from early



magmas thousands of years before the volcano erupts. They grow layer by layer, recording changes in the surrounding magma, like tree rings registering variations in the climate. Laser technology now means we can look into the antecrysts to create maps of the trace chemical elements inside them. This essentially involves firing a grid of laser lines over the antecryst and then using what's known as a mass spectrometer to analyse the aerosol that is given off and work out what it contains.

This can be used to create a 2D image of the crystal's composition that can tell us something about its history. For example, when old antecryst cores are transported to the surface by newly stirred magma, it generates a distinctive rim on the crystal. The challenge is to extract meaning from these records. Mapping Etna Using crystal chemical maps from the last 40 years of volcanic activity at Mount Etna, we've been able to determine the depth at which the crystals grow but also when new magma began invading the underground volcanic system. We found that this started occurring in the 1970s, coinciding with when the volcano began to erupt more often, with faster-moving magma and more explosiveness and seismic activity. The type of contact between the crystal cores and the rims and thickness of the rims hold information on how much time elapses between the arrival of batches of magma and when an eruption started. This means we can better predict when an eruption is likely to occur after magma is detected at certain points beneath the volcano (in this case, two weeks after arrival at depth). In this way, carrying out laser surveys of antecrysts from around the world could help volcanologists better understand how magma recharge acts as a trigger for eruptions, and how to interpret monitoring data from active volcanoes. This could create a more accurate process for spotting warning signs and predicting imminent eruptions. Publié le 24/01/2018 Source Web: theconversation