

## **The Cumbre Vieja tsunami threat: Q & A**

### **What is the Cumbre Vieja**

The Cumbre Vieja is a volcano on the island of La Palma in the Canaries. It is the most active volcano in the archipelago and erupted last in 1949 and 1971.

### **Why is it a threat?**

During the 1949 eruption the western flank detached itself from the rest of the volcano and dropped 4 m seawards before grinding to a halt. This huge landslide has a volume of up to 500 cubic kilometres. If it collapses into the North Atlantic, it will generate a series of tsunami (giant sea waves) with the potential to devastate the Atlantic rim.

### **When will the collapse happen?**

We have no idea, but it is almost certain to occur during a future eruption when pressure exerted by new magma and by heated ground water, accompanied by earthquakes caused by the rising magma, will provide optimum conditions for destabilising the landslide. We don't know, however, if collapse will be triggered during the next eruption or five or ten eruptions down the line. Eruptions happen every 20 to 200 years or so, with the last eruption in the extreme south of the island (off the landslide) in 1971. In theory, therefore, the collapse could occur during an eruption later this year or ten eruptions and a couple of thousand years in the future.

### **Will the whole landslide collapse as one?**

This remains a matter for debate. Evidence from observations of other collapsing volcanoes suggests, however, that it will move largely as a coherent mass. This happened in 1949 and measurements made during the mid-1990s suggest that it is continuing to creep very slowly as a coherent mass. An aborted collapse on the neighbouring island of El Hierro fell 300 m as a coherent block before stopping.

### **Will the landslide collapse quickly or slowly?**

Previous studies and observations suggest that steep-sided volcanoes tend to collapse rapidly. Parts of the surface of the aborted collapse on El Hierro are covered with melted rock, indicating that movement of this landslide was very rapid. The Cumbre Vieja west flank could collapse in just a couple of minutes.

### **How big will the tsunami be?**

The tsunami have been modelled by Steve Ward of the University of California, Santa Cruz and Simon Day of the Benfield Hazard Research Centre (currently at Santa Cruz). In the worst case scenario (for a 500 cubic km collapse), this envisages an initial bulge of water 900 m high. This subsides to form waves in excess of 100 m in height that strike neighbouring islands. After an hour waves 50 – 100 m high hit the NW African coast, while Spain and the UK experience waves 7 – 10 m high two to five hours after collapse. After nine hours, the Florida coastline can expect to face around a dozen waves between 20 and 25 m high.

**How realistic is the tsunami model?**

Although a debate is in progress about the persistence and destructive capacity of landslide-related tsunami waves at remote distances, the Ward & Day model has proved reliable in reproducing the behaviour of tsunami generated by submarine collapses (Storegga , Norway) and other collapsing volcanoes ( Ritter Island , Papua New Guinea ). To read the Cumbre Vieja La Palma paper click here:

<http://www.benfieldhrc.org/SiteRoot/tsunamis/WardandDay.pdf>

**Is the Cumbre Vieja being monitored?**

Three seismometers on the island will be able to detect the small swarms of earthquakes that will precede the next eruption. The landslide was monitored for short periods during the mid-1990s, when small movements within the error of the methods used (electronic distance measurement and GPS) were detected. The coherence of the observed displacements, however, mean they can reasonably be accepted as indicating the continued, but very slow, westward movement of the landslide. Since 1997, the landslide has been completely unmonitored. To read about the monitoring programme during the mid 1990s click here:

[http://www.benfieldhrc.org/SiteRoot/activities/journal\\_papers/gdm\\_la\\_palma.pdf](http://www.benfieldhrc.org/SiteRoot/activities/journal_papers/gdm_la_palma.pdf)