

Transcript of U.S. Geological Survey Open-File Report 2009-1067, Three short videos by the Yellowstone Volcano Observatory, video 1, 'Yellowstone Eruptions'

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[graphic of logo: USGS, science for a changing world]

### **Yellowstone Eruptions**

An unscripted interview, January 2009, 6:45 Minutes

[video of geologist standing in front of a large geologic map of Yellowstone while he talks to the camera and points out features on the map]

I'm Jake Lowenstern and I work for the U.S. Geological Survey and I'm the Scientist-in-Charge of the Yellowstone Volcano Observatory. Today we're going to talk about some of the eruptions that occur at Yellowstone, have occurred in the past, how big they get, how we know when they might be coming, what we need to worry about, what we don't need to worry about.

#### **When was the last supereruption at Yellowstone?**

The last one of these mammoth eruptions, so called supereruptions, was 640,000 years ago and that created this green deposit, the Lava Creek tuff.

There were three of these really large eruptions. There's the Lava Creek tuff, then there's the Huckleberry Ridge tuff that's 2.1 million years ago, and then you can just make out down here, this is the Mesa Falls tuff and it erupted 1.3 million years ago. It was a bit smaller than the other two eruptions.

#### **Have any eruptions occurred since the last supereruption?**

Since the eruption of the Lava Creek tuff, 640,000 years ago, we've had a lot of eruptions within the caldera, probably 80 different eruptions both within the caldera and outside the caldera. Many of them are these really large lava flows. The most recent lava flow was down here on the Peachstone plateau, 70,000 years ago and it's a really enormous eruptive unit. These are big eruptions but they're just within Yellowstone and they don't appear to be highly explosive.

Besides that we have a number of smaller eruptions that are similar in composition. These are rhyolite lava flows. They're really sticky and gooey and don't move very far from their source and these are in pink. We also have basalt lavas that are more similar to what gets erupted in Hawaii. It's more rapid moving material and there found here, outside the caldera and then out in the area to the east as well. [Jake meant to say ".....to the west as well."] One of the reasons that we know that Yellowstone still has an active magma system, other than the fact that there's so much heat coming out, is the fact that we never seen these basalt lavas actually making it out of the caldera and that's because it's denser than the rhyolite and it's also relatively...it can't penetrate through this very

viscous, sticky, and less dense material and as a result, it just ponds beneath the rhyolite magma chamber and it loses its heat to the rhyolite. When you're outside the caldera, the rocks are cooler, and there isn't as much, there isn't any rhyolite and the basalt can just create cracks and come up and make it to the surface.

### **Is Yellowstone overdue for an eruption?**

When you see people claiming it's overdue, usually the numbers they come up with, they say the last eruption was 640,000 years ago, but it erupts every 600,000 years and therefore, it's 40,000 years overdue. But in fact, if you average the eruption intervals, there's 2.1 million to 1.3 million, and then there was another eruption 640,000 years ago and you average those numbers and you come up with something that's over 700,000 years and so in reality, even if you tried to make this argument, it wouldn't be overdue for another 70,000 years or so. The other thing that is important to realize is that when anybody does statistics based on two eruptive intervals, they're just kinda playing games, because we don't know. There's no clock down there. The magma is going to erupt when it wants to erupt. There's been a lot of things that have happened over the last 600,000 years that might indicate there's less likely of an eruption. For example, about 500 or 600 cubic kilometers or a couple hundred cubic miles of magma was erupted just in the last 150,000 years, so you might think that that would slow the clock down in terms of the next eruption.

### **What does the magma below indicate about a possible eruption?**

The last piece of evidence that we have in terms of the next eruption at Yellowstone is that when scientists or seismologists do tomography, when they do like a catscan on a human being, you do a tomographic image using seismic waves and when they try to image the magma chamber, generally they find that the magma that's down there is not wholly molten. There may be molten bodies down there that are the order of 100 or 200 cubic kilometers, but they don't see this massive magma chamber that's all molten material so we don't expect that there's enough liquid magma down there to produce one of these immense eruptions as it happened in the geologic past at Yellowstone.

### **What else is possible?**

Having said that, we don't know everything. It's possible it will erupt. It's possible it'll have small lava flows. It's possible, but not very likely, that it'll have another massive eruptions. Ultimately this is stuff that's happening 4 or 5 miles beneath us. But everything we know seems to indicate that nothing right now is truly unusual. The kinds of activity we see at Yellowstone is the kind that's been going on for the last 100 years and from our geologic evidence has gone on for thousands of years before then.

### **Why didn't you think the recent earthquake swarm would lead to an eruption?**

Well, occasionally we get swarms of earthquakes and some of these swarms can be intense. We had one here in 2009 and the end of 2008 that was almost a thousand

earthquakes and there were many of them that were above magnitude 3. Some of them were felt in the northern part of the lake. But that's pretty much all that happened. We had no evidence that there were any explosions that there were occurring. The caldera had been moving up for a period of years, for about 4 years, and the caldera had moved up about this distance [indicating with his hands about 5 or 6? inches] over a very broad area, but we didn't see any change that was occurring when the swarm was happening and so we didn't really see any of the other indicators that would make us really think that something bigger was about to happen in terms of a volcanic activity.

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Featuring Jake Lowenstern, Scientist-in-Charge, Yellowstone Volcano Observatory

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For additional information:  
<http://volcanoes.usgs.gov>  
<http://volcanoes.usgs.gov/yvo/>

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