Volcano - Pyroclastic Flow

When Vesuvius exploded in August of 79 A.D., the plight of people and towns in the immediately surrounding area worsened as the volcanic event continued.

At first, the Plinian column emanating from the erupting volcano attracted attention and generated fear. That, however, was before a pyroclastic flow began to rapidly move toward Herculaneum and Pompeii.

What is a pyroclastic flow?

It is a very fast-moving current of combined rock, ash and hot gases traveling away from an erupting volcano at speeds of up to 700 kph (435 mph). A pyroclastic flow can result from an explosive eruption of solid or molten rock fragments. In the case of Pompeii, during the summer of 79, it occurred when the vertical eruption column collapsed.

The moving current of rock fragments, gas and ash can get extremely hot. Scientists who have studied the evidence at Pompeii—including more than 200 lava clasts and fragments of roof tiles—discovered that the majority of test samples had reached temperatures between 240-340 degrees Celsius.

If we think about the temperatures of those materials in Fahrenheit, that's the equivalent of 464-644 degrees. (See, for example, the 2004 report "Temperatures of the A.D. 79 Pyroclastic Density Current Deposits (Vesuvius, Italy)," by Cioni, R., L. Gurioli, R. Lanza and E. Zanella.)

What did all of this mean for the people of Herculaneum and Pompeii?

It was the pyroclastic events, particularly the flows, which ended their lives and buried their towns. A pyroclastic flow is usually more dense and travels with a greater physical force than a pyroclastic surge which typically contains more gases.

The USGS provides more detailed information about the frightening power of pyroclastic flows:

> *... pyroclastic flows have originated from collapsing eruption columns and from gravitational or explosive disruption of growing lava domes. Driven by gravity, pyroclastic flows seek topographically low areas and can travel down valleys at high velocities beyond the flanks of the volcano.*
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> *They pose lethal hazard from incineration, asphyxiation, burial and impact. They are difficult or impossible to escape; therefore evacuation of likely hazardous areas must take place before such events occur.*
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> *Scientists today do not have contemporaneously prepared details about the pyroclastic flows of 79 A.D., but they have studied events at Mt. St. Helens. The USGS describes the travel patterns of those pyroclastic flows:*
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> *Pyroclastic flows from the May 18, 1980, eruption ran out no farther than 8 km (5 mi) from the vent.*
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> *During the past 4,000 years, numerous pyroclastic flows are known to have traveled at least as far as 10 to 15 km (6 to 9 mi) and one older flow reached 20 km (12 mi) from source.*
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> *The present orientation of the volcano, with the open crater to the north, favors distribution of pyroclastic flows into the North Fork Toutle River valley; however, all flanks of the volcano are subject to pyroclastic- flow hazard during a large explosive eruption.*

In this image, we see a pyroclastic flow emanating from Mt. St. Helens during its eruption in May of 1980. The photo is by Joel E. Harvey, who owns the copyright to it. It is online via NOVA and its "Filming in a Disaster Area" article.

Click on the image for a better view.

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