Fine, jagged ash increased Eyjafjallajokull volcano's influence

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The 2010 eruption of Eyjafjallajökull volcano was not a large event. Over months of volcanic activity the ash plume never pushed above 10 kilometers (6.2 miles), and the mass flows peaked at 1 million kilograms per second (2.2 million pounds per second), feeble amounts compared to some other volcanic eruptions. In total, the volcano spewed out only 270 million cubic meters (353 million cubic yards) of ash-a single day's activity for some eruptions. By any conventional measure, Eyjafjallajökull lacked power. Yet the eruption had a powerful effect on society, leaving tens of thousands of people stranded as air traffic around Western Europe was shut down.

The eruption's widespread influence was due to the unusually large distribution and high residency time of volcanic ash particles. By analyzing ash samples collected across Iceland, Dellino et al. show how the eruptive mechanisms acting at the vent, and thus the ash's small-scale properties, changed throughout the eruption. A simple computer simulation let the authors estimate an ash grain's drag and terminal velocity, and hence residency time, from measurements of small-scale properties.

The authors find that upwelling magma reacted with water from a nearby glacier, and the rapid cooling caused it to contract and fragment into fine, irregularly shaped ash. Near the end of the eruption, equally fine ash was produced when small gas bubbles trapped in the magma expanded as the molten rock neared the surface. From their collected samples, the authors find that the median diameter of the ash grains is 1

millimeter (0.04 inches). Starting 10 km (6.2 miles) from the volcano's vent, particles smaller than 16 micrometers became an important portion of the mix. The authors argue that the violent fragmentation processes caused jagged and porous ash grains. These aspherical aberrations increased the ash grains' time aloft and, according to the authors, explain how a small eruption inconvenienced such a large area.

More information: Ash from the Eyjafjallajökull eruption (Iceland): Fragmentation processes and aerodynamic behavior, P. Dellino and D. Mele, *Journal of Geophysical Research-Solid Earth*, Doi:10.1029/2011JB008726 , 2012.

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