

## Scaling of volcanic eruptions

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Volcanic eruption where the plume is carried away with the wind can be geometrically similar to another eruption in length scale and time scale that are determined by the plume height and the wind velocity. They can also be dynamically similar if the dispersion factor scales according to the same scales. The median grain size in different distances from the crater scale according to a self similarity rule so  $1/\text{dist}$  is a measure for the grain size. Different phases of the same eruption need to be scaled to same plume height and wind velocity to find the self-similarity rule, this is demonstrated using data from the Eyjafjallajokull eruption in 2010. A satellite photo of the Eyjafjallajokull plume is used to demonstrate a new method of estimating the dispersion coefficient from the linear expansion rate of the visible boundary of the plume. Finally a measurement of in-situ ash concentrations in a volcanic cloud from Sakurajima mountain is scaled up to a larger cloud using wind from the east and a plume magnitude relation recommended by Sakurajima Volcanological Observatory.