

TITLE: Experiments of ash resuspension in a horizontal wind tunnel

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Context

The ash injected into the atmosphere by volcanic eruptions represents a hazard for both human and animal health, as well as for transportation systems (e.g. aviation). Ash can also be remobilized by strong winds even years later causing the same disruption as primary ash sedimentation (e.g. 2011 eruption of Cordón Caulle volcano, Chile; 2010 eruptions of Eyjafjallajökull volcano, Iceland). In fact, whenever the wind goes over a threshold value, the aerodynamic forces acting on the particles overcome the adhesion forces that kept the particles attached to the ground, and resuspension occurs.

Objectives and Methods

The primary objective of this project is to carry out experiments in a horizontal wind tunnel in order to discover the dependency of the threshold velocity on particle size, shape and chemical composition. In order to characterize these parameters, a plate covered with ash will be fixed inside a horizontal wind tunnel, and the wind speed will be increased until the particles start to detach. Filming the plate with a high speed camera, it will be possible to observe the mechanics of detachment. Testing different angles and different roughness for the plate, it will be possible to investigate the role played by the slope and the surface characteristics. Moreover, the effect of the shape will be studied comparing the behaviour of both glass spheres and volcanic ash particles of different sizes. In conclusion, once the threshold velocity will be identified in different conditions, the results could be used to estimate the likelihood for resuspension to happen in a given area from the wind forecast and the morphology of ground, allowing an estimation of the hazard.

Literature

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- Liu, E. J., Cashman, K. V., Beckett, F. M., Witham, C. S., Leadbetter, S. J., Hort, M. C., & Guðmundsson, S. (2014), Ash mists and brown snow: Remobilization of volcanic ash from recent Icelandic eruptions, Journal of Geophysical Research: Atmospheres, 119(15), 9463-9480. doi: 10.1002/2014JD021598
- Wilson, T., Cole, J., Cronin, S., Stewart, C., and Johnston, D. (2011). Impacts on agriculture following the 1991 eruption of Vulcan Hudson, Patagonia: lessons for recovery. Natural Hazards, 57(2), 185-212



Recent ash storm in Iceland (20 August 2014) resuspended from the 2010 eruption of Eyjafjallajökull volcano (Iceland). Picture from: <http://emmaliu.weebly.com/volcanic-ash-resuspension.html>

Sites WEB

http://cms.unige.ch/sciences/terre/research/Groups/physical_volcanology/physical%20volcanology.php

Choice of orientation :

Geological Risks