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Eruption rates in explosive eruptions: Ground truth and models

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Estimations of eruption rates in explosive eruptions are difficult and error margins are invariably high. In small to moderate sized eruptions effects of wind on plume height can be large and in larger eruptions observations are often difficult due to masking of source by low cloud, pyroclastic density currents and monitoring system saturation. Several medium-sized explosive eruptions in recent years have been an important in sparking off intense research on e.g. atmosphere-plume interaction and associated effects of wind on plume height. Other methods that do not rely on plume height are e.g. infrared satellite monitoring of atmospheric loading of fine tephra, infrasound, analysis of video recordings from vents, and it has been suggested that co-eruptive tilt-meter deformation data can predict eruption intensity. The eruptions of Eyjafjallajökull in 2010 and Grímsvötn in 2011 provided a wealth of data that potentially can be of use in developing constraints of eruption rates in explosive eruptions. A key parameter in all such comparisons between models and data is as detailed knowledge as possible on tephra fallout. For both Eyjafjallajökull and Grímsvötn intensive field efforts took place to map out the deposits during and immediately after the eruptions. The resulting maps cover both individual phases as well as total fallout. Comparison of these data with plume-based and other models of mass discharge rates is presently work in progress. A desirable future aim is near real time estimates of mass eruption rates based several of the parameters mentioned above. This type of work is currently ongoing within the framework of the EU-funded supersite project FUTUREVOLC.