



REFIR – The operational FutureVolc multi-parameter system providing a best estimate of mass eruption rate during ongoing eruptions in near real-time

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Volcanic ash injected into the atmosphere poses a serious threat for aviation. Forecasting the concentration of ash promptly requires detailed knowledge of eruption source parameters. However, monitoring an ongoing eruption and quantifying the mass flux in real-time is a considerable challenge. Due to the large uncertainties affecting present-day models, best estimates are often obtained by the application of integrated approaches. One example for this strategy is represented by the EU supersite project “FutureVolc” which aims to monitor eruptions of volcanoes in Iceland. A quasi-autonomous multi-parameter system, denoted “REFIR”, has been developed. REFIR makes use of streaming data provided by a multitude of sensors, e.g. by C- and X-band radars, web-cam based plume height tracking systems, imaging ultra-violet and infrared cameras and electric field sensors. These observations are used with plume models that also consider the current local wind and other atmospheric conditions, and a best estimate of source parameters, including the mass eruption rate, is provided in near real-time (within a time interval of 5 minutes) as soon as an eruption has started. Since neither the time nor the location of the next Icelandic eruption is known the system has been developed with a guiding principle of maximum flexibility, and it can effortlessly be implemented elsewhere needing minimum adoption to local conditions. Moreover, it is designed to be easily upgraded, which allows future extension of the existing monitoring network, learning from new events, and incorporating new technologies and model improvements. Data-flow, features and integrated models within REFIR will be presented and strategies for implementing potential future research developments on ash plume dynamics will be discussed.