Geophysical Research Abstracts
Vol. 18, EGU2016-15709, 2016
EGU General Assembly 2016

Estimates of mass eruption rates in Icelandic eruptions 1913-2015

Magnus Tumi Gudmundsson, Tobias Dürig, and Gudrún Larsen
University of Iceland, Institute of Earth Sciences, Nordic Volcanological Center, Reykjavik, Iceland (mtg@hi.is)

In the period from 1913 to 2015 about 35 eruptions occurred in Iceland, although some uncertainty exists about the number of the smallest events, particularly within the ice covered regions. For the smaller events in the earlier part of the period, only order of magnitude estimates of mass eruption rates (MER) are possible, based on the approximate amount of erupted products, duration of eruption, and information on eruption plume height in some cases. After 1947 estimates are more reliable. This is not least due to the detailed observations and interpretations of Sigurdur Thorarinsson and co-workers until the early 1980s. After 1980, various observations and instrumental data, e.g. on plume height, coupled with detailed mapping by several workers of tephra fallout and lava flow extent provide a good basis for MER estimates. The most frequent events are explosive eruptions producing tephra, often basaltic phreatomagmatic eruptions. A contributing factor to the large number of explosive eruptions is unusually frequent eruptions in Hekla since 1947. Eruptions under glaciers are also common, while a majority of these become explosive as they break through the ice. For the initially subglacial eruptions ice melting rates provide the best estimate of the MER in the first and usually most powerful phase. If the whole data set is considered, the magma volumes erupted in a single eruption span three orders of magnitude, $\sim$0.001 km^3 to 1 km^3. The range of intensity is similar, with the smallest Krafla or Askja events having maximum mass eruption rates (MER) of order 10-100 tonnes/second while the most powerful ones (Hekla 1947 and Katla 1918) had MER $\sim$50,000 tonnes/second ($\sim$5 x 10^7 kg/s). All the events with the highest MER were explosive, including Katla 1918 where initial subglacial melting caused the largest volcanogenic flood observed since the 18th century. The period 1913-2015 had no events that belong to the class of the largest observed eruptions in Iceland. In the last 1200 years several eruptions have been much larger. For example the eruption of Laki in 1783 was an order of magnitude larger than the largest effusive eruptions of 1913-2015. The same applies to e.g. Öræfajökull in 1362, being an order of magnitude larger than the explosive eruptions that occurred in the period analysed here.