

## The current degassing state of Hekla volcano, Iceland

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Hekla volcano is one of the most active and also most unpredictable volcanoes in Europe, as a precursory seismic swarm tends to precede its eruptions by <1 hour. Since 1970, Hekla has erupted every 10 years, and is now inflated to same level as prior to the last eruption in 2000.

There is a significant uncertainty about the depth of the magma source<sup>1,2,3,4,5</sup> (<9 to >25 km) and the total output of gaseous emissions both during eruptions and the quiescent intervals. It is also unknown whether the frequent activity of Hekla during the past century is a beginning of a new eruptive trend.

In the summer of 2012 we examined gas emissions from Hekla during a quiescent interval. This was the first time that continuous and near real-time gas measurements were set up at an Icelandic volcano. The aims were twofold: Firstly, to quantify the current gas release and investigate the gas source (magmatic vs hydrothermal components); secondly to evaluate a 'proof-of-concept' methodology for volcanic gas measurements in Iceland and thus contribute to volcanic monitoring.

Our findings showed that Hekla's gas emissions are dominated by CO<sub>2</sub> (flux 14 T d<sup>-1</sup>) which is consistent with a deep-lying magma source. Hekla's gas emissions are proportionally significantly more CO<sub>2</sub> rich than other known volcanic gas sources in Iceland. Gas is only emitted from Hekla's top crater (last active 1980), while more recently active craters (1991 and 2000) have higher ground temperatures, but no detectable degassing. The isotopic signature of CO<sub>2</sub> is magmatic, while H<sub>2</sub>O isotopes have a more complicated behaviour and may indicate a hydrothermal component. We believe that the elevated ground temperature at the younger craters are caused by residual heat in the erupted material from 1991 and 2000, while the gas flux in the summit crater is driven by ongoing degassing of magma at depth.

The project is ongoing and now forms a part of the FUTUREVOLC, a newly commenced EU FP7 supersite project.

References: 1. Geirsson et al. 2012 JGR; 2. Ofeigsson et al. 2011. JGR 116(B5); 3. Sigmundsson et al. 1992. Geophys. Res. Lett. 19(14); 4. Soosalu and Einarsson 2004 . Bull. Volc. 66(3); 5. Sturkell et al. 2005. EOS 86(52)