



Estimation of the SO₂ source term for the Holuhraun event and its influence on central Europe air quality

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On 29 August 2014 a fissure eruption began in Holuhraun, Northeastern Iceland, associated with increased volcanic activity in the Bárðarbunga system. For more than 150 days, the eruption released large quantities of SO₂ into the atmosphere affecting not only the local Icelandic air quality, but also leading to periods of increased ambient SO₂ concentrations in parts of mainland Europe. During the second half of September, significant amounts of SO₂ were rapidly transported southward by favourable meteorological conditions and several countries in Central Europe experienced high ground-level SO₂ concentrations. The measured concentrations reached and even exceeded the EC directive health thresholds.

In this work, we evaluate the air quality effects in Europe during this targeted period using both ground-based and satellite observations (GOME2B and OMI) as well as dispersion modelling with the Lagrangian particle model FLEXPART. We estimate the volcanic SO₂ source emissions by comparing the satellite observations with atmospheric transport model simulations in an inverse modelling approach. The estimated source term is evaluated against independent ground-based observational data (e.g. MAX-DOAS, Brewer) and used as emission term in dispersion model forecasts for evaluating the air quality effects in Europe. In addition, the potential use of air quality data to perform the source term estimation by inversion with ground-based data will also be investigated.