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UK hazard assessment for a Laki-type volcanic eruption: modelling results for sulphur dioxide and sulphate aerosol

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In response to the recent introduction of large gas-rich volcanic eruptions to the UK National Risk Register a modelling project has been conducted to improve our understanding of potential impacts to the UK from such an eruption on Iceland. A precautionary reasonable worst case eruption scenario based on the 1783-4 Laki eruption has been modelled 80 times using two different atmospheric chemistry and transport models (NAME and EMEP4UK) over 10 years of meteorology.

The results provide information on the range of concentrations of sulphur dioxide gas (SO_2), sulphate aerosol (SO4) and some halogen species that might be experienced in the UK during such an eruption and the likelihood of key thresholds being exceeded and over what durations. Data for the surface and for a range of key flight levels have been produced. In this presentation we will evaluate the ambient mass concentrations of SO_2 and SO4 that could be experienced during and following such an eruption, as well as the likelihood of key health concentration thresholds being exceeded, and the maximum duration that levels could persist for. The prevailing meteorological conditions are the key influence on which parts of the North Atlantic and European region are affected at any time.

The results demonstrate that the UK is unlikely to be affected by week after week of significantly elevated concentrations; rather there will a number of short (hours to days) pollution episodes where concentrations would be elevated above Moderate and High air quality index levels at the surface. This pattern fits with the generally changeable nature of the weather in the UK. Consecutive exceedance durations are longer for sulphate aerosol than SO_2, and can be particularly lengthy in the low air quality index levels (1-2 weeks), which may be of relevance to health impact assessments.

This work represents a detailed initial study but has not explored the full range of such an eruption. Nonetheless, the results from this project are informing cross-Government work to improve the understanding of the risk to the UK from an effusive gas-rich eruption in Iceland. This includes the production of area-specific impact assessments for sectors including health, aviation and environment.