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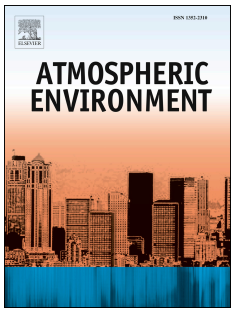

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Surface air quality implications of volcanic injection heights

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Abstract

Air quality implications of volcanic eruptions have gained increased attention recently in association with the 2010 Icelandic eruption that resulted in the shut-down of European air space. The emission amount, injection height and prevailing weather conditions determine the extent of the impact through the spatio-temporal distribution of pollutants. It is often argued that in the case of a major eruption in Iceland, like Laki in 1783-1784, that pollutants injected high into the atmosphere lead to substantially increased concentrations of sulfur compounds over continental Europe via long-range transport in the jet stream and eventual large-scale subsidence in a high-pressure system. Using state-of-the-art simulations, we show that the air quality impact of Icelandic volcanoes is highly sensitive to the injection height. In particular, it is the infinitesimal injections into the lower half of the troposphere, rather than the substantial injections into the upper troposphere/lower stratosphere that contribute most to increased pollutant concentrations, resulting in atmospheric haze over mainland Europe/Scandinavia. Besides, the persistent high pressure system over continental Europe/Scandinavia traps the pollutants from dispersing, thereby prolonging the haze.

Keywords:
Volcanic emissions, Surface air quality, Pollution transport