IMPACT ESTIMATION OF THE EYJAFJALLAJÖKULL ERUPTION ON THE GROUND LEVEL OF PM_{10} IN AUGSBURG, GERMANY

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Background and Aims: On April 14, 2010 the Icelandic volcano Eyjafjallajökull erupted and its ash cloud was transported by wind directly towards Central Europe. On April 19 and 20 exceedences of the daily PM_{10} threshold value were reported at nearly all monitoring stations in Munich and Augsburg, two cities located around 2500 km apart from the Icelandic volcano. In this study we applied positive matrix factorization (PMF) method using particle size distribution (PSD) data in the range from 3 nm to 10 µm for the identification of the Eyjafjallajökull ash plume and estimation of its contribution to PM_{10} levels in Augsburg, Germany.
Methods: A Twin Differential Mobility Particle Sizer system combined with an Aerodynamic Particle Sizer was used to measure PSD. We used the receptor model PMF 3.0 from the U.S. Environmental Protection Agency to identify and quantify PSD factors.
Results: A PMF factor associated with long range transported dust rose from background concentration to high levels simultaneously with the arrival of the volcanic ash plume in the planetary boundary layer. We used this factor for estimation of the Eyjafjallajökull ash plume contribution to ambient PM_{10} measured on ground level in Augsburg. From April 17 to 22, 2010 this factor contributed on average 31.6% (12.3 µg m^{-3}) to ambient PM_{10}. The maximal contribution of this factor to PM_{10} level in Augsburg was 70% (37 µg m^{-3}) which was observed at 20:00 on April 19, 2010.
Conclusions: The PMF method could be used for identification and quantification of natural source impact on PM threshold exceedences. Without further evidence from toxicological studies and following the knowledge about the ash plume components we assume that the volcanic plume contributed to the overall exposure of the population and therefore in principal may have had minor effects on exacerbation of respiratory and cardiovascular symptoms.