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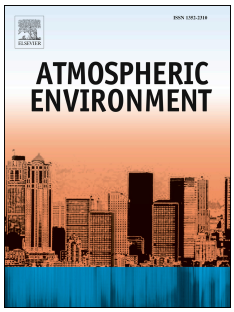

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Long-term monitoring of black carbon across Germany

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Abstract

Lately, black carbon (BC) has received significant attention due to its climate-warming properties and adverse health effects. Nevertheless, long-term observations in urban areas are scarce, most likely because BC monitoring is not required by environmental legislation. This, however, handicaps the evaluation of air quality models which can be used to assess the effectiveness of policy measures which aim to reduce BC concentrations.

Here, we present a new dataset of atmospheric BC measurements from Germany constructed from over six million measurements at over 170 stations. Data covering the period between 1994 and 2014 were collected from twelve German federal states and the Federal Environment Agency, quality checked and harmonized into a database with comprehensive metadata. The final data in original time resolution are available for download (https://doi.org/10.1594/PANGAEA.881173). Though assembled in a consistent way, the dataset is characterized by differences in (a) measurement methodologies for determining evolved carbon and optical absorption, (b) covered time periods, and (c) temporal resolutions that ranged from half hourly to 6-daily measurements. Usage and interpretation of this dataset thus requires a careful consideration of these differences.

Our analysis focuses on 2009, the year with the largest data coverage with one single methodology, as well as on the relative changes in long-term trends over ten years. For 2009, we find that BC concentrations at traffic sites were at least twice as high as at urban background, industrial and rural sites. Weekly cycles are most prominent at traffic stations, however, the presence of differences in concentrations during the week and on weekends at other station types suggests that traffic plays an important role throughout the full network. Generally higher concentrations and weaker weekly