Particulate Matter

1- Sources of particulate-matter air pollution and its oxidative potential in Europe

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Abstract

Particulate matter is a component of ambient air pollution that has been linked to millions of annual premature deaths globally(1-3). Assessments of the chronic and acute effects of particulate matter on human health tend to be based on mass concentration, with particle size and composition also thought to play a part(4). Oxidative potential has been suggested to be one of the many possible drivers of the acute health effects of particulate matter, but the link remains uncertain(5-8). Studies investigating the particulate-matter components that manifest an oxidative activity have yielded conflicting results(7). In consequence, there is still much to be learned about the sources of particulate matter that may control the oxidative potential concentration(7). Here we use field observations and air-quality modelling to quantify the major primary and secondary sources of particulate matter and of oxidative potential in Europe. We find that secondary inorganic components, crustal material and secondary biogenic organic aerosols control the mass concentration of particulate matter. By contrast, oxidative potential concentration is associated mostly with anthropogenic sources, in particular with fine-mode secondary organic aerosols largely from residential biomass burning and coarse-mode metals from vehicular non-exhaust emissions. Our results suggest that mitigation strategies aimed at reducing the mass

concentrations of particulate matter alone may not reduce the oxidative potential concentration. If the oxidative potential can be linked to major health impacts, it may be more effective to control specific sources of particulate matter rather than overall particulate mass.

Observations and air-quality modelling reveal that the sources of particulate matter and oxidative potential in Europe are different, implying that reducing mass concentrations of particulate matter alone may not reduce oxidative potential.

Keywords

Keywords Plus

POSITIVE MATRIX FACTORIZATIONOXYGEN SPECIES GENERATIONSECONDARY ORGANIC AEROSOLSOURCE APPORTIONMENTCHEMICAL-COMPOSITIONDITHIOTHREITOL DTTAMBIENT AIRMULTILINEAR ENGINEMASS-SPECTROMETERELEMENTAL CARBON

Particulate Matter

2- Asymmetric effects of fine particulate matter and stringency policy on COVID-19 intensity

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Abstract

This study aims to examine the influence of environmental performance (PM2.5) on COVID-19 intensity . For this purpose, we employ the newly introduced Hidden Panel Cointegration test and Nonlinear Panel Autoregressive Distributed Lag model. Results indicate the asymmetric linkages between PM2.5 and COVID-19 intensity, as the positive shock in PM2.5 raises the COVID-19 intensity by 21%, whereas the negative shock in PM2.5 decreases COVID-19 intensity by 12% in long-run. On the contrary, the positive shock in stringency measures decreases COVID-19 intensity by 42.8%, while the negative shock in stringency policy increases COVID-19 intensity by 66.7%. These findings imply that higher pollution increases the COVID-19 severity while higher stringency measures slow down people's movement and reduce COVID-19 intensity. However, a sudden negative shock in lockdown increases people's interaction, leading to a higher spread of the virus. These results suggest that governments should adopt stringent action plans to contain the transmissibility of COVID-19.

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Air pollutionasymmetric effectsPM25climate changeCOVID-19 pandemicnon-Linear panel ARDL
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Particulate Matter

3- Particulate organic matter as a functional soil component for persistent soil organic carbon

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Abstract

The largest terrestrial organic carbon pool, carbon in soils, is regulated by an intricate connection between plant carbon inputs, microbial activity, and the soil matrix. This is manifested by how microorganisms, the key players in transforming plant-derived carbon into soil organic carbon, are controlled by the physical arrangement of organic and inorganic soil particles. Here we conduct an incubation of isotopically labelled litter to study effects of soil structure on the fate of litter-derived organic matter. While microbial activity and fungal growth is enhanced in the coarser-textured soil, we show that occlusion of organic matter into aggregates and formation of organo-mineral associations occur concurrently on fresh litter surfaces regardless of soil structure. These two mechanisms-the two most prominent processes contributing to the persistence of organic matter-occur directly at plant-soil interfaces, where surfaces of litter constitute a nucleus in the build-up of soil carbon persistence. We extend the notion of plant litter, i.e., particulate organic matter, from solely an easily available and labile carbon substrate, to a functional component at which persistence of soil carbon is directly determined. The fate of soil carbon is controlled by plant inputs, microbial activity, and the soil matrix. Here the authors extend the notion of plant-derived particulate organic matter, from an easily available and labile carbon substrate, to a functional component at which persistence of soil carbon is determined.

Particulate Matter

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Particulate Matter

4- Short-term effects of particulate matter on cardiovascular morbidity in Italy: a national analysis

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Abstract

Aims We aimed at investigating the relationship between particulate matter (PM) and daily admissions for cardiovascular diseases (CVDs) at national level in Italy. Methods and results Daily numbers of cardiovascular hospitalizations were collected for all 8084 municipalities of Italy, in the period 2013-2015. A satellite-based spatiotemporal model was used to estimate daily PM10 (inhalable particles) and PM2.5 (fine particles) concentrations at 1-km(2) resolution. Multivariate Poisson regression models were fit to estimate the association between daily PM and cardiovascular admissions. Flexible functions were estimated to explore the shape of the associations at low PM concentrations, also in non-urban areas. We analysed 2 154 810 acute hospitalizations for CVDs (25% stroke, 24% ischaemic heart diseases, 22% heart failure, and 5% atrial fibrillation). Relative increases of total cardiovascular admissions, per 10 mu g/m(3) variation in PM10 and PM2.5 at lag 0-5 (average of last 6 days since admission), were 0.55% (95% confidence intervals: 0.32%, 0.77%) and 0.97% (0.67%, 1.27%), respectively. The corresponding estimates for heart failure were 1.70% (1.28%, 2.13%) and 2.66% (2.09%, 3.23%). We estimated significant effects of PM10 and PM2.5 also on ischaemic heart diseases, myocardial infarction, atrial fibrillation, and

ischaemic stroke. Associations were similar between less and more urbanized areas, and persisted even at low concentrations, e.g. below WHO guidelines. Conclusion PM was robustly associated with peaks in daily cardiovascular admissions, especially for heart failure, both in large cities and in less urbanized areas of Italy. Current WHO Air Quality Guidelines for PM10 and PM2.5 are not sufficient to protect public health.

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