

Impacts of black carbon on air quality over Europe

Abstract:

Air pollution is one of the biggest threats to public health, killing over 7 million people per year, as much as the total death burden of the COVID-19 pandemic. To tackle air pollution we need to identify the main toxic components of atmospheric aerosol particles and their sources. Black carbon (BC, also referred to as soot or elemental carbon) from incomplete combustion emissions has been often linked to PM-related mortality. While vehicular exhaust emissions have been declining for the last two decades, biomass burning emissions from residential heating and forest are not. Our previous study (Daellenbach, et al., 2020 Nature) has shown that these biomass burning emissions are one of the important contributors to aerosol oxidative potential (a proxy of toxicity) in European cities. Understanding the spatial distribution of BC concentrations, their fossil and non-fossil sources and their past and future trends is critical for estimating the impact of combustion emissions on human health in Europe.

Methodology and objectives:

This project will combine in-situ BC observations, regional atmospheric chemistry transport modeling (CTM) and land-use data in a machine learning based framework to determine European high resolution maps for BC from both the residential and mobile sectors. Model outputs will be used to determine the sources of BC, their temporal evolution and their impacts on health.

What you will learn:

- In-deep knowledge and wide hands-on experience with atmospheric environmental data: from observations to models.
- Application of data-science techniques in real world environmental study, with the potential of big impacts on the public health.
- Cross-disciplinary collaboration opportunities with the Swiss Data Science Center (SDSC), the Paul Scherrer Institute (PSI) and Swiss Tropic and Public Health Institute (TPH) to develop your vision and network.

Prerequisites:

- High motivation;
- Experience in applied statistics;
- Experience in GIS;
- Experience in Python or R programming language
- Experience in Linux/Unix system

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