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Particulate air pollution in the heart of the European Union: lessons learned from SAFICA 2017-2018 and SAAERO 2022-2023 projects in Central and Southeast Europe

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Particularly during the cold weather season, countries of the Southeast Europe are experiencing some of the poorest air quality in the world due to the extensive use of solid fuels and old vehicle fleets. The city of Sarajevo is the capital of Bosnia and Herzegovina (BiH) situated within a basin surrounded by mountains. In the winter months (domestic heating season), topography and meteorology cause the pollutants to be trapped within the city basin. *Countries of the Southeast Europe lack state-of-the-art atmospheric sciences research and access to sophisticated instrumentation and methodology, despite high levels of ambient pollution and position within the European Union (EU) borders, making it imperative to understand the emission sources, processing and the adverse health effects of atmospheric aerosol pollution.*

This presentation will highlight the field measurements in Central and Southeast Europe during the Sarajevo Canton Winter Field Campaign 2017-2018 (SAFICA) and Sarajevo Aerosol

Experiment 2022-2023 (SAAERO) projects, centered at the Sarajevo Bjelave supersite. Both projects were envisioned to produce crucial, not previously available information about aerosol emission sources and atmospheric transformations through a combination of online field and offline laboratory measurements. Online measurements during a) SAFICA and b) SAAERO included, a) black carbon, particle number and size distribution, and b) carbonaceous species, elemental composition and bulk chemical composition. SAAERO online measurements also included stationary and mobile measurements of gas- and particle-phase species on board the mobile laboratory in Sarajevo and Zenica, BiH, as well as in Ljubljana, Slovenia and Zagreb, Croatia. Finally, extended SAAERO project included measurements of black carbon at three additional urban centers: Ljubljana, Zagreb, and Belgrade, Serbia, enabling the first comparison of urban air quality in Central and Southeast Europe between two EU and two non-EU capitals.

During both projects, laboratory aerosol analyses determined aerosol bulk chemical composition, selected elements (Huremović et al., 2020; Žero et al., 2022) and molecular species (Pehnec et al., 2020). Aerosol chemical composition determined by aerosol mass spectrometry was further analyzed by Positive Matrix Factorization to separate organic aerosol into subtypes characteristic of specific sources and atmospheric processes. Aerosol oxidative potential was also determined to evaluate aerosol ability to generate reactive oxygen species. Sarajevo and Belgrade have high ambient loadings of aerosol and black carbon, indicative of strong and diverse combustion sources and a major public health hazard. Finally, aerosol surface concentrations will be discussed in the context of European air quality.

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