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# Phenomenology of organic aerosols light absorption in europe based on in situ surface observations

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Both chamber and field experiments have shown that a fraction of organic aerosols (OA), called brown carbon (BrC), can efficiently absorb UV-VIS radiation with important effects on radiation balance. However, the optical properties of BrC, and its climate effects, remain poorly understood because a variety of chemical compositions are involved and their fractions vary with source and formation process. We present a phenomenology of OA light absorption in Europe using Aethalometer (AE) data. AE data were used to calculate the black carbon (BC) and BrC contribution to the total measured absorption in the UV-VIS spectral range ($b_{abs,BC}(l)$, $b_{absBrC}(l)$). Fig. 1 shows the BrC absorption at 370 nm and shows that the BrC absorption was on average higher in urban than in rural sites.

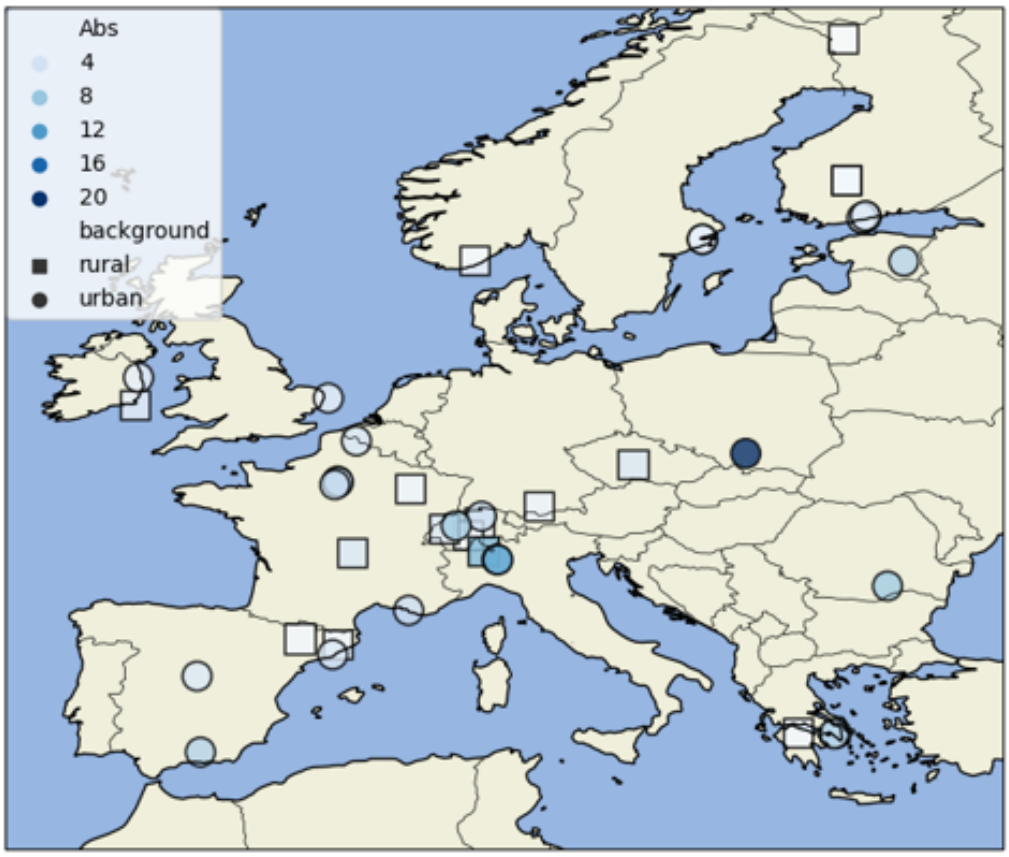


Figure 1. Map of BrC absorption in rural and urban sites.

At 18 out of 41 sites, simultaneous ACSM (Aerosol Chemical Speciation Monitor) data were available allowing reporting the mass absorption cross-section (MAC), the imaginary refractive index (*k*), the *k* Angström Exponent (w) of OA particles and OA sources. We compared the experimental data the with Saleh's classification, that groups BrC in four optical classes, namely very weakly (VW-BrC), weakly (W-BrC), moderately (M-BrC) and strongly (S-BrC) absorbing BrC. Preliminary results show that both MAC and *k* of POA sources were higher compared to SOA sources and that BBOA (biomass burning OA) followed by CCOA (coal combustion OA) and HOA (hydrocarbon-like OA) dominated the absorption by BrC. Data reported indicate a relationship between w and *k* with higher w associated to less absorbing OA particles.

With this work we provide a robust experimental framework that can be used to better constrain the climate effect of OA particles represented in climate models. In our results we found that most of the measured ambient OA particles present from W to M absorption properties. Variations in OA *k* and w depend on the relative contribution of POA compared to SOA as also reflected by the higher *k* observed in winter compared to summer. Our results also demonstrate a strong variation of OA optical properties in Europe thus further confirming the complexity of OA absorption properties.

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