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Investigating regional and continental aerosol sources of PM2.5 in Paris (France) during springtime from fast chemical measurements

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Hourly concentrations of inorganic salts (ions) and carbonaceous material in fine aerosols (aerodynamic diameter, A.D. < 2.5μm) have been determined from fast measurements performed for a 3-week period in spring 2007 in Paris (France). The sum of these two chemical components (ions and carbonaceous aerosols) has shown to account for most of the fine aerosol mass (PM2.5). This time-resolved dataset allowed investigating the factors controlling the levels of PM2.5 and showed that polluted periods with PM2.5>40μg/m3 were characterized by air masses of continental (European) origin and chemical composition made by 75% of ions. By contrast, clean marine air masses have shown the lowest PM2.5 concentrations (typically of about 10μg/m3); carbonaceous aerosols contributing for most of this mass (typically 75%). The rather stable levels of carbonaceous aerosols observed during this study suggest that the region of Paris is a major contributor to this fraction. By opposite, long-range transport from Europe is proposed as the main contributor for ions measured in Paris during springtime. The use of artefact-free measurements of PM2.5 made by TEOM-FDMS has shown to amplify the contrast between periods with low (respectively high) PM2.5 concentrations. Although carbonaceous aerosols showed to be mainly produced at regional scale, our results also suggest that almost 2/3 of organic carbon measured in Paris is of secondary origin, pointing out the high reactivity of organic aerosols and gas precursors, in the few hours following their formation and/or transformation.