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Radiocarbon-Based Source apportionment of Elemental Carbon Aerosols at Seoul, South Korea

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In this study, 10 samples of PM2.5 (aerosol particle with diameter less than 2.5 μm) were collected in the Northeast of Seoul (37.60o N, 127.05o E), South Korea, over 2-4 day periods in May and June of 2015 with a high volume air sampler. The samples were analyzed for their bulk carbon (TC) and nitrogen (N) elemental and stable isotope composition with EA-IRMS. Elemental carbon (EC) was quantified with the Swiss_4S protocol using a Sunset OC/EC analyzer. Both, TC and EC were analyzed for their radiocarbon (14C) content via accelerator mass spectrometry. The mass and isotopic composition of organic carbon (OC) was quantified by (isotope) mass balance. TC loads were 6.6 +/- 1.5 ug C m-3 air (ave. +/- sd; range 4.7-9.7), with a Δ14C ranging from 240 to -446 per mill and a δ13C of -25.4+/-0.3 per mill. EC was a minor fraction of TC (7.2+/-1.9% or 0.5+/-0.2 ug C m-3 air). EC was strongly depleted in 14C (Δ14C = -915 to -819 per mill), with fossil sources accounting for 88+/-3% of EC (6.3+/-1.7% of TC). OC was enriched in 14C above natural levels (Δ14C = -401 to 309 per mill), and thus could not be partitioned into fossil and modern sources. Local wind directions showed that air masses originated from the South, demonstrating that regional sources may be the crucial contributor to PM pollution in Seoul during that sampling period (early summer).