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Source apportionment of speciated $\mathrm{PM}_{2.5}$ over Halifax, Nova Scotia, during BORTAS-B, using pragmatic mass closure and principal component analysis

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During BORTAS-B, 42 days of contiguous $\mathrm{PM}_{2.5}$ filter samples were collected during the summer of 2011 in Halifax, Nova Scotia. The aim of the $\mathrm{PM}_{2.5}$ filter sampling was to apportion the source contribution to the total $\mathrm{PM}_{2.5}$ mass concentration in Halifax to inform and validate other surface measurements and chemical transport models related to BORTAS-B. Sampling was conducted on the roof of a Dalhousie University building at a height of 15 m. The building is located in a residential area of Halifax. Continuous black carbon (BC) was measured using a Magee AE-42 aethalometer. Continuous organic carbon was measured using an Aerodyne, Aerosol Chemical Speciation Monitor. Daily teflon filter samples were collected for the determination of fine particulate with a median aerodynamic diameter less than or equal to 2.5 microns ($\mathrm{PM}_{2.5}$). An additional, daily, nylon filter was used for the determination of $\mathrm{PM}_{2.5}$ cations and anions by IC. The $\mathrm{PM}_{2.5}$ teflon filter was analysed for 33 metals by XRF and 10 trace metals by ICP-MS. The biomass burning marker levoglucosan was analysed by GC-MS following derivatization. Excellent agreement ($R^2 = 0.88$) was observed between continuous and filter based measurements with a gradient of 2.76. The median (min : max) $\mathrm{PM}_{2.5}$ mass concentration during BORTAS-B = 3.9 (0.08 : 13.7) $\mu\mathrm{g}/\mathrm{m}^3$. The median (min : max) continuous $\mathrm{BC} = 0.39$ (0.12 : 1.03); $\mathrm{SO}_4 = 0.47$ (0.14 : 5.59); $\mathrm{NO}_3 = 0.067$ (0.007 : 0.64); $\mathrm{OC} = 0.77$ (0.18 : 2.77); $\mathrm{NH}_4 = 0.15$ (0:003 : 1.45); $\mathrm{Cl} = 0.011$ (0.0019 : 0.32); $\mathrm{Fe} = 0.018$ (0.0011 : 0.097); $\mathrm{Al} = 0.011$ (0.0091 : 0.086); $\mathrm{Si} = 0.03$ (0.0044 : 0.29); $\mathrm{V} = 0.0026$ (0.0016 : 0.017) and $\mathrm{Ni} = 0.0007$ (0.0005 : 0.0037) $\mu\mathrm{g}/\mathrm{m}^3$ respectively. Absolute principal component scores (APCS) and pragmatic mass closure (PMC) will be used to identify the sources driving the observed $\mathrm{PM}_{2.5}$ variability over Halifax, during BORTAS-B. A comparison of APCS and PMC $\mathrm{PM}_{2.5}$ receptor model output results will be presented. These model data will provide further insight into the source contribution to summertime surface $\mathrm{PM}_{2.5}$ mass in Halifax, Nova Scotia, Canada.