Title:	Effect of aerosol sampling conditions on PM2.5 sampling accuracy
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Abstract:	Filter-based devices were found to underestimate PM2.5 mass concentrations due to the evaporation loss of semi-volatile inorganic materials (SVIM). To reduce the evaporation-induced PM2.5 loss, the chilled Teflon filter sampler (CTF) was developed in which the sampling air was chilled to low temperatures (T) of 4–7 °C after dehumidification. The CTF with the aerosol flow dehumidified to low relative humidity (RH) of 25.50 ± 4.88% by using a Nafion dehumidifier and chilled at 4 °C showed an accurate measurement for the total ion concentration with the mean normalized bias (MNB) of +4.17 ± 8.96% as compared to the actual value measured by the porous denuder sampler (PDS). In comparison, the normal single Teflon filter sampler (STF) sampled PM2.5 ion concentration at ambient T and RH showed a negative MNB of −14.26 ± 13.66%. It indicates that the 4 °C CTF can suppress the evaporation loss of SVIM and measure actual ion concentrations accurately. However, 4 °C CTF over-measured PM2.5 concentrations with the MNB of +15.01 ± 7.99% as compared to −10.40 ± 5.92% of the STF, due to normal and capillary condensations of water vapor although the condensed water on particles prevented SVIM evaporation loss. After correcting for the remaining water concentration determined by using surrogate TiO2 nanoparticles, the accuracy of PM2.5 concentrations was improved significantly with the MNB of only about +2.93 ± 8.56%. To avoid excessive remaining water, the CTF was chilled to 7 °C and found to be able to reduce the evaporation loss of SVIM while measuring PM2.5 concentrations accurately with the MNB of +4.92 ± 6.52% without remaining water correction in most sampling days.
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