Measurement of refractory black carbon mass concentrations in falling and deposited snow in the Arctic

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Abstract

Deposition of black carbon aerosol (BC) on snow (i.e. wet deposition) is considered to lower snow albedo and accelerate melting of snow. The wet deposition estimates have increased attention for the last decades due to it's positive feedback (warming) in the Arctic climate, in particular. However, the measurements of the BC deposition in the Arctic are very limited. In this study, we present a novel approach to compare the measured BC mass concentrations in falling and deposited snow samples (C_{BC}) at different depths in Glacier and City sites in Ny-Alesund in the Arctic. The snow samples in the City and Glacier sites in Ny-Alesund were collected on 16 and 17 April 2013, respectively. C_{BC} is measured using a SP2 combined with a nebulizer. Accumulated precipitation corresponding to each day measurement of C_{BC} in falling snow samples is normalized with the water mass flux measured as function of snow depths and scaled the date (back in time from the date of sampling) with an error of ±1 day. C_{BC} and BC flux (F_{BC}) are then compared between falling snow and deposited snow samples for the scaled period of 24th September 2012 to 17th April 2013 (or 16th April 2013 for City). This comparison shows a well correspondence in regard to C_{BC} and F_{BC} between falling and deposited snow for Glacier. Surprisingly, C_{BC} in city snow samples do not show any correspondence neither with C_{BC} in deposited snow in Glacier nor with C_{BC} in falling snow samples. The ambient BC mass concentrations (M_{BC}) show a good agreement with C_{BC} for both City and Glacier deposited snow samples during the period of 24th September 2012 to 17th April 2013. Interestingly, the BC mass size distributions do not show any significant variations in deposited and falling snow samples and are represented by lognormal function with a mass median diameter of about 200 nm for deposited snow (for both Glacier and City sites) and about 200-300 nm for majority of the falling snow samples. Detailed results will be presented in the meeting.

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