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Quantifying Black Carbon emissions in high northern latitudes using an Atmospheric Bayesian Inversion

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Black carbon (BC) is the main light absorbing aerosol species and it has important impacts on air quality, weather and climate. The major source of BC is incomplete combustion of fossil fuels and the burning of biomass or bio-fuels (soot). Therefore, to understand to what extent BC affects climate change and pollutant dynamics, accurate knowledge of the emissions, distribution and variation of BC is required. Most commonly, BC emission inventory datasets are built by "bottom up" approaches based on activity data and emissions factors, but these methods are considered to have large uncertainty (Cao et al, 2006). In this study, we have used a Bayesian Inversion to estimate spatially resolved BC emissions. Emissions are estimated monthly for 2014 and over the domain from 180°W to 180°E and 50°N to 90°N. Atmospheric transport is modeled using the Lagrangian Particle Dispersion Model, FLEXPART (Stohl et al., 1998; 2005), and the inversion framework, FLEXINVERT, developed by Thompson and Stohl, (2014).
The study domain is of particular interest concerning the identification and estimation of BC sources. In contrast to Europe and North America, where BC sources are comparatively well documented as a result of intense monitoring, only one station recording BC concentrations exists in the whole of Siberia. In addition, emissions from gas flaring by the oil industry have been geographically misplaced in most emission inventories and may be an important source of BC at high latitudes since a significant proportion of the total gas flared occurs at these high latitudes (Stohl et al., 2013). Our results show large differences with the existing BC inventories, whereas the estimated fluxes improve modeled BC concentrations with respect to observations.

References

Cao, G. et al. Atmos. Environ., 40, 6516–6527, 2006.
Stohl, A. et al. Atmos. Environ., 32(24), 4245–4264, 1998.
Stohl, A. et al. Atmos. Chem. Phys., 5(9), 2461–2474, 2005.
Stohl, A. et al. Atmos. Chem. Phys., 13, 8833-8855, 2013.
Thompson, R. L., and Stohl A. Geosci. Model Dev., 7, 2223–2242, 2014.