1.167 Towards improved quantification of Russian oil and gas extraction emissions based on analysis of YAK-AEROSIB aircraft data.

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Abstract:

The Arctic is undergoing unprecedented changes as a result of global warming due to long-lived greenhouse gases, notably carbon dioxide, and short-lived climate forcers (SLCFs) including black carbon (BC), ozone and methane. Whilst, pollutant climate effects in the Arctic are primarily due to long-range transport of aerosols, ozone and their precursors from mid-latitudes, it is now apparent that there are already important local anthropogenic emissions (e.g. resource extraction, shipping, domestic combustion) that can impact climate, ecosystems, local/regional air quality and human health. Local Arctic emissions are also likely to increase in the future as a result of global warming providing opportunities for increased industrial activity. However, large uncertainties exist about the magnitude and spatial/temporal variation of emissions of SLCFs and their precursors and their contribution to SLCF loadings and impacts. Here, we focus on improving understanding about BC emissions from oil and gas extraction activities in northern Russia. This source has already been identified as an important source of Arctic BC. We analyse the origins of polluted air masses sampled during French/CNRS-Norwegian/NILU-Russian YAK-AEROSIB flights over the Ob Valley, Yamal and Kara Sea regions during October 2014 using WRF-Chem BC tracer runs for emissions from different sectors (*Huang et al. (2015)* inventory). We also separate plumes originating from oil/gas flaring and venting using measured trace gas (e.g. CO_2, CH_4) and aerosol ratios together with examination of VIIRS (Visible Infrared Imaging Radiometer Suite) satellite data, providing information on daily variability of flaring hotspots, and high-resolution FLEXPART-WRF simulations. Results are used to make updated estimates of BC flaring emission ratios (relative to CO_2). We examine the sensitivity of modelled aerosol (BC) distributions to these results and to the use of daily varying flaring emissions, as opposed to annual

mean emissions, in full chemistry-aerosol WRF-Chem simulations over Russia and the eastern Arctic.