



Climatological Study of Black Carbon Transport from Major Population Centers in the Northern Hemisphere.

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The offline Lagrangian transport and dispersion model FLEXPART is applied to describe the climatological dispersion characteristics of black carbon emissions from major population centers (MPCs) in the Northern Hemisphere for the period 1980-2018. Black carbon plays a significant role as a positive radiative forcer, impacts notably human health, and is well suited for transport studies due to its linear chemistry. The tracer is modeled subject to removal processes by dry and wet deposition. The simulations of normalized black carbon emissions are forced by ECMWF ERA-Interim reanalysis data and the output in post processing is scaled with black carbon emissions from the MACCity emission inventory. The main scientific question to be addressed is the quantification of the impact of the emissions from the selected MPCs on air pollution levels at local, regional and hemispheric scales as compared to the impact of other sources of black carbon in the Northern Hemisphere. The anthropogenic black carbon emissions from the chosen MPCs are treated separately to allow the investigation of their individual but also their cumulative impact as well as the identification of dominating source sectors for each MPC. Due to the climatological significance of the Arctic region the MPCs emissions outflows are additionally studied in order to quantify their contribution to black carbon concentrations above and deposition on sea ice and the Greenland ice sheet. As an outlook, consequences for human health of the exposure to elevated black carbon concentrations are discussed.