Project: **777**

Project title: **Evaluating the Climate and Air Quality Impacts of Short-Lived Pollutants (ECLIPSE)**

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Report period: **1.1.2018 – 31.12.2018**

The work in the reporting period builds on previous work assessing the role of aerosol emissions for climate (Baker et al., 2015), in particular focusing at the recent past and near future (Myhre et al., 2017). A key ingredient is the availability of observations that may be useful to evaluate the models (e.g., Cherian et al., 2014).

First transient simulations were conducted with the ECHAM5-HAM2 aerosol-climate model (Zhang et al., 2012) to study the correlation between trends in aerosol emissions and other climate-relevant observables. Currently these simulations are being evaluated and analysed to assess aerosol-cloud-climate interactions. As an example, Fig. 1 shows the relationship between multi-decadal trends in column cloud droplet number concentration and aerosol emissions – in the recent period, for which partly observational data are available, a clear relationship exists. This promising result may now allow to judge on the model skill in simulating these decadal trends and thus may allow to conclude about aerosol-cloud-climate interactions.

References

*Baker, L. H., W. J. Collins, D. J. L. Olivié, R. Cherian, Ø. Hodnebrog, G. Myhre, and **J. Quaas**, Climate responses to anthropogenic emissions of short-lived climate pollutants, Atmos. Chem. Phys., 15, 8201-8216, doi:10.5194/acp-15-8201-2015, 2015.*

*Cherian, R., **J. Quaas**, M. Salzmann, and M. Wild, Pollution trends over Europe constrain global aerosol forcing as simulated by climate models, Geophys. Res. Lett., 41, 2176-2181, doi:10.1002/2013GL058715, 2014.*

*Myhre, G., W. Aas, R. Cherian, W. Collins, G. Faluvegi, M. Flanner, P. Forster, Ø. Hodnebrog, Z. Klimont, J. Mülmenstädt, C. Lund Myhre, D. Olivié, M. Prather, **J. Quaas**, B. H. Samset, J. L. Schnell, M. Schulz, D. Shindell, R. B. Skeie, T. Takemura, and S Tsyro, Multi-model simulations of aerosol and ozone radiative forcing for the period 1990-2015, Atmos. Chem. Phys., 17, 2709-2720, doi:10.5194/acp-17-2709-2017, 2017.*

*Zhang, K., D. O'Donnell, J. Kazil, P. Stier, S. Kinne, U. Lohmann, S. Ferrachat, B. Croft, **J. Quaas**, H. Wan, S. Rast, and J. Feichter, The global aerosol-climate model ECHAM5-HAM, version 2: sensitivity to improvements in process representations, Atmos. Chem. Phys., 12, 8911-8949, doi:10.5194/acp-12-8911-2012, 2012.*

Figures

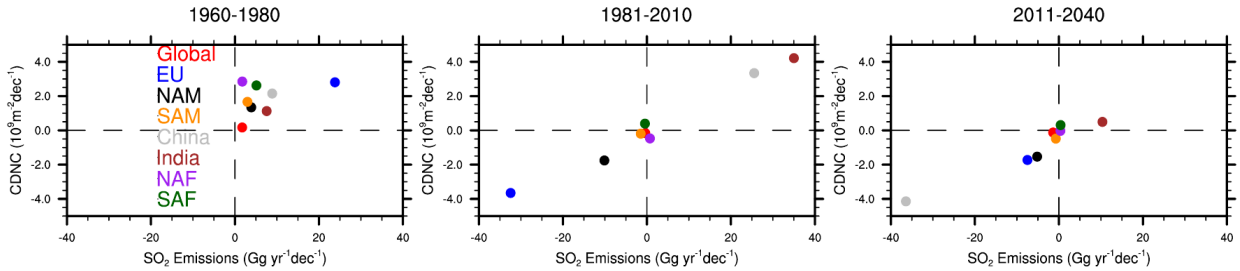

Fig. 1: Area-average relationship between SO_2 emission trends (x-axis) and cloud droplet number concentration burden trends (y-axis) for (red) the entire globe; (blue) Europe; (black) North America; (orange) South America; (grey) East Asia; (brown) India; (purple) North Africa, and (green) South Africa. Left: period of globally increasing aerosol emissions; middle: period of partly increasing/partly decreasing trends; right: period of mostly decreasing aerosol trends. Data from transient coupled-model integrations.