4th International Workshop
on Uncertainty in Atmospheric Emissions
7-9 October 2015, Krakow, Poland

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About the Workshop

The assessment of greenhouse gases and air pollutants (indirect GHGs) emitted to and removed from the atmosphere is high on the political and scientific agendas. Building on the UN climate process, the international community strives to address the long-term challenge of climate change collectively and comprehensively, and to take concrete and timely action that proves sustainable and robust in the future. Under the umbrella of the UN Framework Convention on Climate Change, mainly developed country parties to the Convention have, since the mid-1990s, published annual or periodic inventories of emissions and removals, and continued to do so after the Kyoto Protocol to the Convention ceased in 2012. Policymakers use these inventories to develop strategies and policies for emission reductions and to track the progress of those strategies and policies. Where formal commitments to limit emissions exist, regulatory agencies and corporations rely on emission inventories to establish compliance records.

However, as increasing international concern and cooperation aim at policy-oriented solutions to the climate change problem, a number of issues circulating around uncertainty have come to the fore, which were undervalued or left unmentioned at the time of the Kyoto Protocol but require adequate recognition under a workable and legislated successor agreement. Accounting and verification of emissions in space and time, compliance with emission reduction commitments, risk of exceeding future temperature targets, evaluating effects of mitigation versus adaptation versus intensity of induced impacts at home and elsewhere, and accounting of traded emission permits are to name but a few.

The *4th International Workshop on Uncertainty in Atmospheric Emissions* is jointly organized by the *Systems Research Institute of the Polish Academy of Sciences*, the Austrian-based *International Institute for Applied Systems Analysis*, and the *Lviv Polytechnic National University*. The 4th Uncertainty Workshop follows up and expands on the scope of the earlier Uncertainty Workshops – the *1st Workshop* in 2004 in Warsaw, Poland; the *2nd Workshop* in 2007 in Laxenburg, Austria; and the *3rd Workshop* in 2010 in Lviv, Ukraine.

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Performance of global black carbon emission inventories in the Arctic

Ville-Veikko Paunu [a] and Kaarle Kupiainen [a]

[a] *Finnish Environment Institute SYKE*
Email: ville-veikko.paunu@ymparisto.fi

Recent assessments indicate that short-lived climate pollutants, especially black carbon (BC) play a major role in the climate of the Arctic (AMAP, 2015). However, uncertainties remain in the impact assessments. One source of the uncertainties are the emission estimates of black carbon. Bond et al. (2004) presented a quantitative uncertainty estimation of emission inventories of carbonaceous aerosol. They found that major uncertainties are caused by insufficient information on emission parameters and major emitting sector activities. Global emission uncertainties for anthropogenic BC emissions were identified as 3.1 to 10 Tg/y (-30% to 120%) expressed as 95% confidence intervals. Sectors contributing most to the uncertainties were found to be Chinese coke making, residential wood combustion, industrial coal combustion, and on-road diesel. Regionally the largest uncertainties were estimated in Asian emissions.

While global BC emissions have an impact on the Arctic, pollutants emitted closer to the Arctic might have higher impact per emitted mass. Furthermore, BC is removed relatively quickly from the atmosphere, therefore having higher concentrations close to their sources. Thus, the spatial allocation of the emission estimates has an important effect on the climate impacts. However, this spatial dimension has previously been neglected in uncertainty assessments. An initial study, presented in AMAP 2015, showed that differences between global BC emission inventories were relatively large in higher latitudes. The differences were further analysed in this study.

We compared available spatially-distributed global BC emission datasets available from the ECCAD-GEIA website (http://eccad.sedoo.fr) and analysed differences in both emissions and their locations.

Some of the variation between the inventories was found to be due to different treatment of Arctic relevant source sectors. For example only some inventories included emissions from flaring in full extent, although the emissions are significant in the Arctic region. Notably the spatial representation of flaring in the oil and gas production areas close to and within the Arctic area was missing in most of the datasets. Another sector omitted in some inventories was international maritime transport. Inclusion of relevant emission sectors is a common improvement suggestion for all models.

There were significant differences between the spatial distributions of the different BC emission inventories and often the agreement between the spatial distributions was completely lacking. These differences also varied between source sectors. The differences indicated that the inventories use different spatial proxies for the emissions. We recommend that spatial proxies should be harmonized and important regions and source sectors for the Arctic area should be addressed as accurately as possible.

References

[1] AMAP Impact of Tropospheric Ozone and Black Carbon on Arctic Climate, in press, technical report, 2015

[2] Bond et al., Journal of Geophysical Research 109:D14203, 2004