



**Task Force on Hemispheric
Transport of Air Pollution**

HTAP2: Black Carbon and Ozone Results and Next Steps

Co-Chairs

Heather Morrison (Canada)

Terry Keating (U.S.)

Vice Chairs

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1

TF HTAP Leadership Team

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2

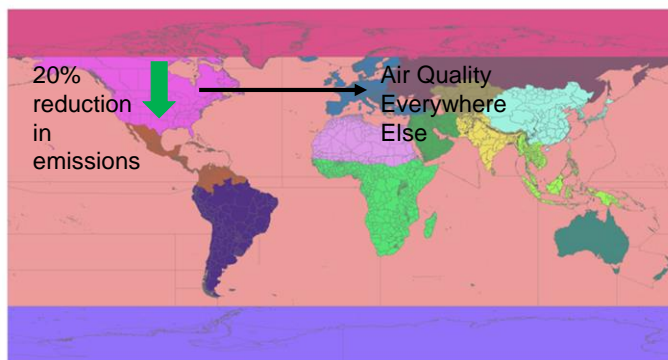
Task Force Goal:

- Foster international scientific cooperation to improve understanding of intercontinental transport of air pollution across the Northern Hemisphere
 - How do changes in emissions in one part of the world affect air quality in other parts of the world?
 - How do extra-regional emissions affect human and ecosystem health within a given region?

3

HTAP2: Suite of Cooperative Experiments to Assess Intercontinental Transport of Air Pollution

- 2010 Global Emissions Inventory
- 2010 meteorology
- ~15 global models
- Examined response of 20% reduction in anthropogenic emissions from one source region on air quality in the other source regions



4

HTAP2

- Of the ~15 models that participated in HTAP2, 10 included a treatment of aerosols
- Stjern et al., used these experiments to assess the impact of a 20% reduction in all anthropogenic emissions from one source region on levels of black carbon (BC), organic aerosols (OA) and sulphate (SO₄) everywhere else (including in the region where the emissions reduction was applied)
- From these BC, OA and SO₄ model outputs, they estimated the effect of reducing emissions on radiative forcing (RF) from the direct aerosol effect

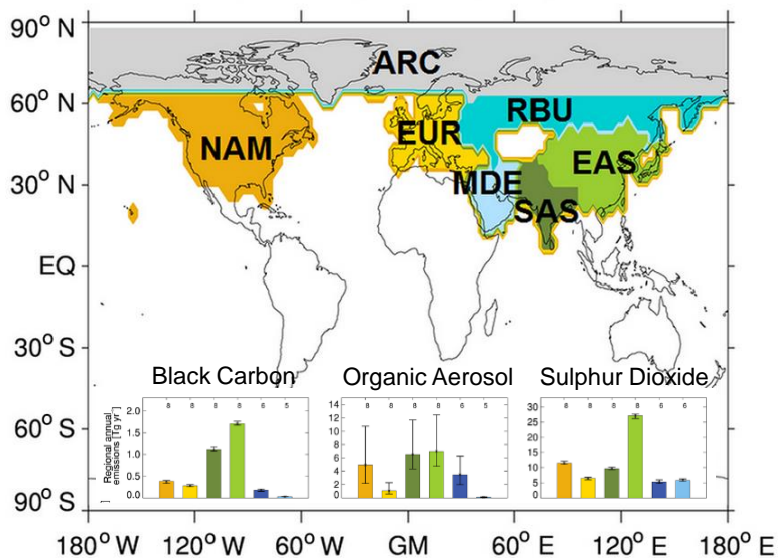
Global and regional radiative forcing from 20 % reductions in BC, OC and SO₄ – an HTAP2 multi-model study

Camilla Weum Stjern¹, Bjørn Hallyard Samset¹, Gunnar Myhre¹, Huisheng Bian², Mian Chin³, Yanko Davila⁴, Frank Dentener⁵, Louisa Emmons⁶, Johannes Flemming⁶, Amund Sovde Haslerud¹, Daven Henze⁴, Jan Eiof Jonson⁷, Tom Kucsera⁹, Marianne Tronstad Lund¹, Michael Schulz⁷, Kengo Sudo¹⁰, Toshihiko Takemura¹¹, and Simone Tilmes⁶

Atmos. Chem. Phys., 16, 13579–13599, 2016
 www.atmos-chem-phys.net/16/13579/2016/
 doi:10.5194/acp-16-13579-2016
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5

Source-Receptor Regions Analyzed

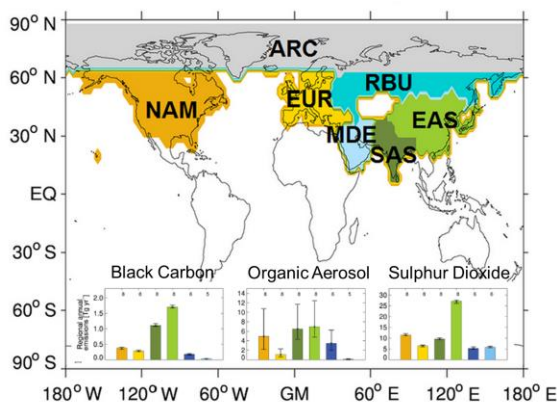


C.W. Stjern et al., 2016

6

Results

- In most cases, the local influence dominates
- But, emission reductions in south (SAS) and east Asia (EAS) have substantial impacts on the radiative budget of all investigated receptor regions, especially for black carbon (BC)
- For North America, BC emission controls on east Asia (EAS) sources are more important than domestic mitigation



7

HTAP2 also looked at intercontinental transport of ozone

Atmospheric Chemistry and Physics
An interactive open-access journal of the European Geosciences Union

Special issue

Global and regional assessment of intercontinental transport of air pollution: results from HTAP, AQMEII and MICS

Editor(s): F. Dentener, S. Galmarini, C. Hogrefe, G. Carmichael K. Law, B. R. D. Denby, and T. Butler

TOAST 1.0: Tropospheric Ozone Attribution of Sources with Tagging for CESM 1.2.2

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Geosci. Model Dev., 11, 2825–2840, 2018

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Source attribution of European surface O₃ using a tagged O₃ mechanism

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Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-225>

Manuscript under review for journal Atmos. Chem. Phys.

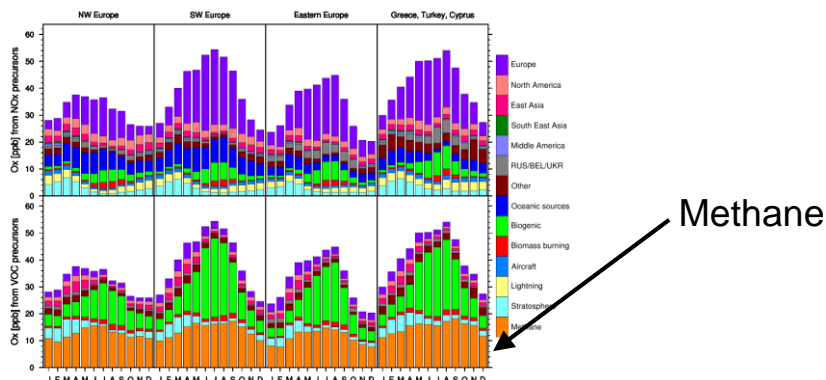
Discussion started: 29 April 2019

8

Key Messages

- Intercontinental transport of ozone dominates over intercontinental transport of particulate matter (PM)
- Background ozone is very sensitive to methane concentration

Seasonal cycle of surface ozone: Europe



9

Next Steps: HTAP3

- 1) Updated Harmonized Global Emission Inventory
 - Global Emissions Mosaic Update (HTAPv3)
 - GEIA Meeting, Chile, November 2019
- 2) Improve our understanding of the relationship between global methane emissions, intercontinental transport of ozone and human and ecosystem health
 - Workshop, Edinburgh, April 2020, with TOAR, ICP Veg, AQMEII, MICS, ...
- 3) Continued Development of the openFASST Tool
 - For Global Scenario Analysis and Uncertainty Assessment
- 4) Foster discussion/scientific work on the following topics:
 - Extra-Regional Attribution of O₃, PM Trends for Gothenburg Review
 - Impacts of Shipping
 - Taking Stock of Progress in Other Forums, Identifying Policy Relevant Needs

10

Conclusions

- Black carbon emissions are transported between source regions and continents; emission reductions from the major source regions in Asia would reduce the black carbon burden in the northern hemisphere
- Intercontinental transport of ozone makes a marked contribution to regional ozone levels; background ozone levels are sensitive to methane
- HTAP3 will develop an updated global emission inventory that will assess how intercontinental transport has changed since 2010