



Task Force on Hemispheric Transport of Air Pollution

Hemispheric Transport of Air Pollution: Status and Workplan 2012-2016

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- Mandate and Objectives
- Past and future Meetings
- Themes of Collaboration and Workplan
- Products

ECE/EB.AIR/GE.1/2012/7 (Hemispheric Transport of Air Pollution)

Mandate:

Renewed mandate (Executive Body decision 2010/1, ECE/EB.AIR/106/Add.1):

- **Examine the transport of air pollution across the Northern Hemisphere, ozone and its precursors, PM and its components (including black carbon)**
- **Assess potential emission mitigation options available inside and outside the UNECE region**
- **Assess their impacts on regional and global air quality, public health, ecosystems, near-term climate change**
- **Collaboration with other groups both inside and outside the Convention.**

Objectives:

1. Deliver Policy Relevant Information to the LRTAP Convention, Other Multi-Lateral Forums, and National Governments; EU

In different (sub)continental scale world regions:

- a. What fraction of air pollution concentrations or deposition can be attributed to sources of contemporary anthropogenic emissions within the region as compared to extra-regional, non-anthropogenic, or legacy sources of pollution?
- b. How do these fractions impact on human health, ecosystems and climate change?
- c. How sensitive are regional pollution levels and related impacts to changes in the sources of the various fractions?
- d. How will the various fractions and sensitivities defined above change as a result of expected air pollution abatement efforts or climate change?
- e. How do the availability, costs and impacts of additional emission abatement options compare across different regions?

2. Improve Our Scientific Understanding of Air Pollution at the Global to Hemispheric Scale

3. Build a Common Understanding by Engaging Experts Inside and Outside the LRTAP Convention

Past and future Meetings

- **Arona, Italy, June 2011**
 - Taking stock of and reflecting on 2010 report
 - Definition of collaborative themes
 - Organisation of follow up in series of teleconferences in fall 2011
- **Pasadena, USA, February 2012, jointly with ACCMIP global modelling group**
 - Further detailed reflection on collaborative themes and priorities
 - Shaping and organizing workplan
- **Vienna, Austria, October 2012, jointly with TF IAM.**
 - Workshop on 2030 global emission scenarios
- **Geneva, Switzerland, March 2013, jointly with WMO/GAW (11-15 March 2013)**
 - Models and Measurements; observational system, first modelling results
- **South Asia (Pune, India?) Fall 2013, tentatively, jointly with WGE, Male Declaration ???**
 - Impact Assessment Methods, outreach+capacity building

Opportunities to Inform Policy Processes

- Currently, a large comprehensive HTAP report is not foreseen.

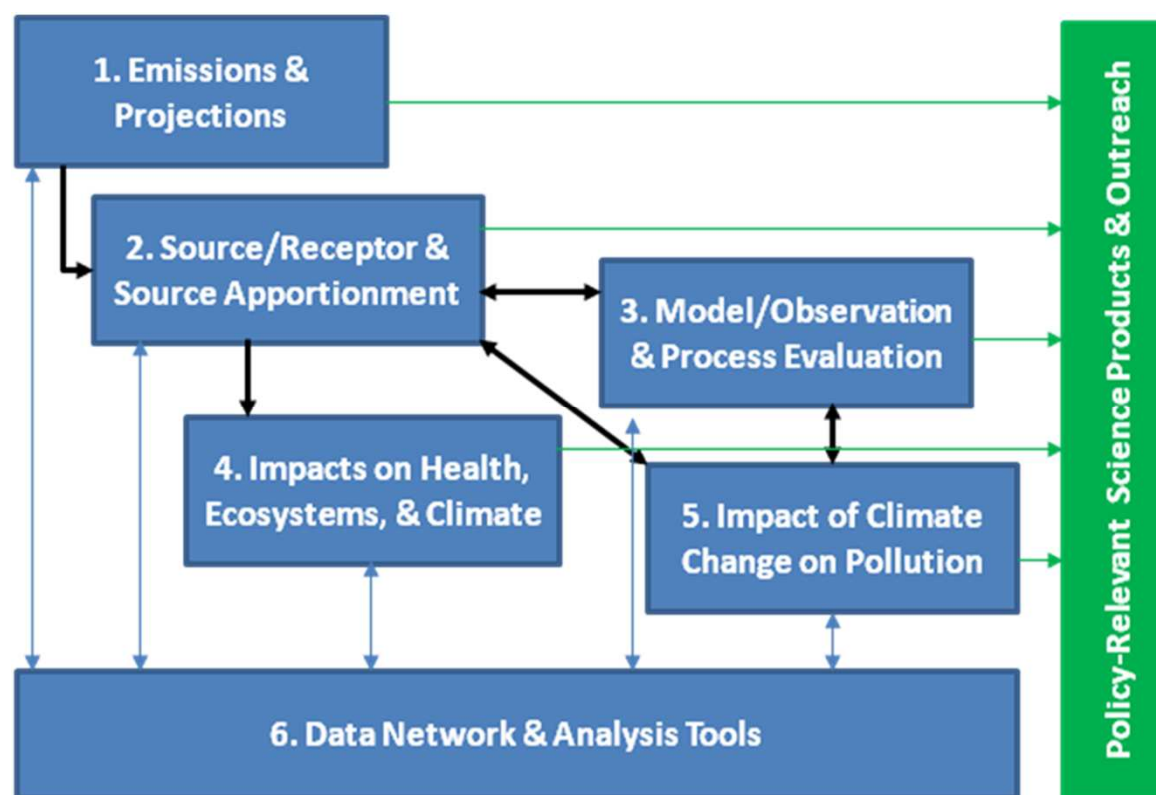


- Want to produce frequent, focused reports or other publications to provide relevant information to policy processes.

	2012	2013	2014	2015	2016	2017
LRTAP Negotiations	GP Amended			New Amendments?		
EU AQ Thematic Strategy		Revised Strategy				
US NAAQS Review		O ₃ NAAQS Revision			O ₃ Implementation Plans	
China 5-Year Plans					New 5-year Plan Begins	
IPCC		AR5 Completed		Scoping AR6?		
Global Hg Negotiations		Completion Target				

- Organize tasks under each activity theme around products.
- Where possible, jointly with other groups/organisations in- and outside of the convention.

Themes of Cooperative Activities (2012-2016)



Themes of Cooperative Activities (2012-2016)

- **Emissions Inventories and Projections**
 - Compile Historical Inventories for 2006-2010
 - Develop Future Baseline and Control Emission Scenarios for 2030
- **Source Apportionment and Source/Receptor Analysis**
 - Compare Alternative Methods for Source Apportionment
 - Investigate Influence of Spatial Resolution and Global-to-Regional Links
 - Build upon SR Experiments to Improve S/R Estimates and Parameterizations
- **Model-Observation Evaluation and Process Diagnosis**
 - Compile Observations from 2006-2010 for Comparison to Models
 - Perform Evaluations Organized by Region or Processes
- **Assessment of Health, Ecosystem, and Climate Impacts**
 - Improve Methods and Resolution of Impact Assessments
- **Assessment of Climate Change Impacts on Pollution**
- **Expansion of the Data Network and Analysis Tools**

Status (September 2012):

Draft workplan, WP leaders identified, further scrutinizing of details and feasibility

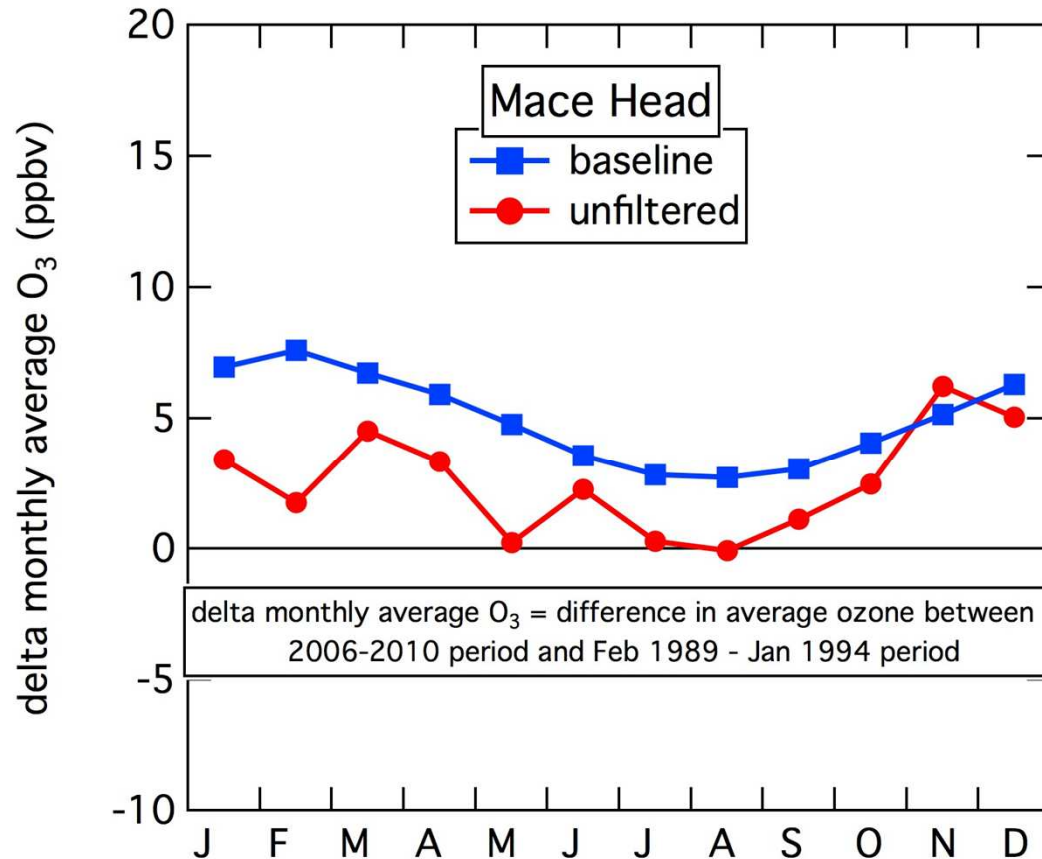


Achievements during 2012

- Publication of EDGAR-HTAP global compilation of emission inventories: Maenhout et al., 2012 EUR report.
- Parameterisation of HTAP results; Wild et al., ACP, 2012
- Estimate of RF due to world regions; Fry et al, 2012
- Impact of Climate Change on global SR.; Doherty et al, submitted, 2012
- On-going study reviewing change in O3 boundary conditions and impact on Europe

OZONE AT MACE HEAD, WEST COAST IRELAND:

Change in O₃ between 1989-1994 and 2006-2010



Change in global baseline O₃?

Global Emissions?

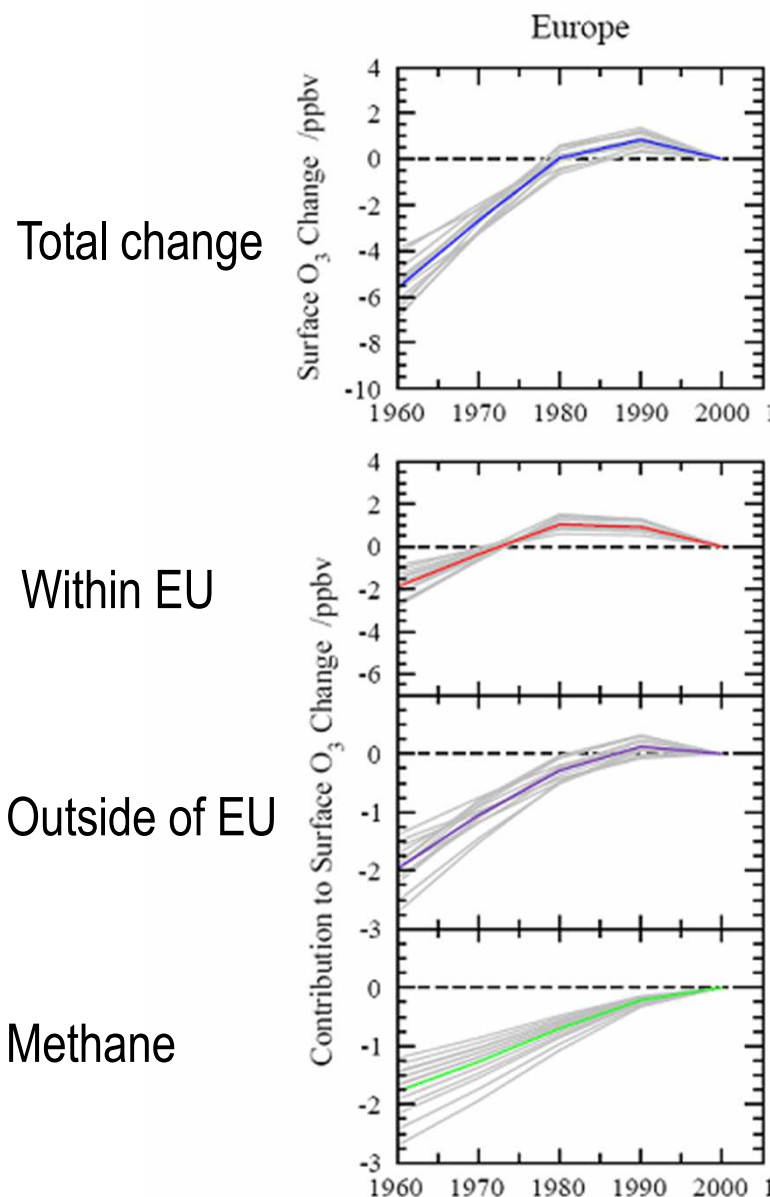
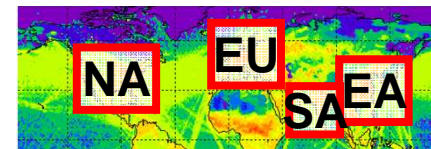
Change in meteorological conditions?

Is this happening everywhere along the borders of Europe?

How does this impact air quality in Europe?

Courtesy D. Derwent, K. Law, D Parrish

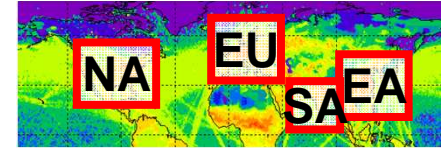
HTAP reconstruction of O₃ changes in EU: attribution of drivers.



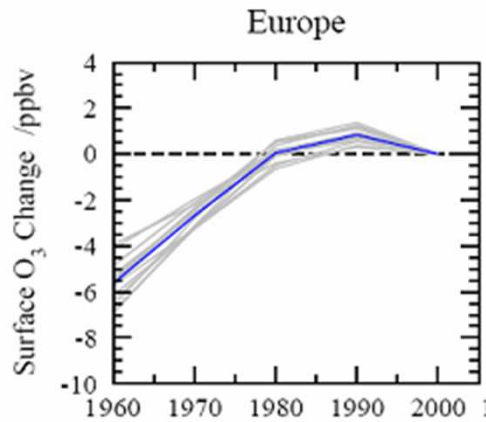
- Annual average - large region
- Small reductions in O₃ during 1980-2000, largest changes (6 ppb) happened before.
- O₃ reductions attributable to EU emissions partly compensated by increasing emissions elsewhere
- Important role for (global) CH₄ 30-50 %

Wild et al., ACP, 2012

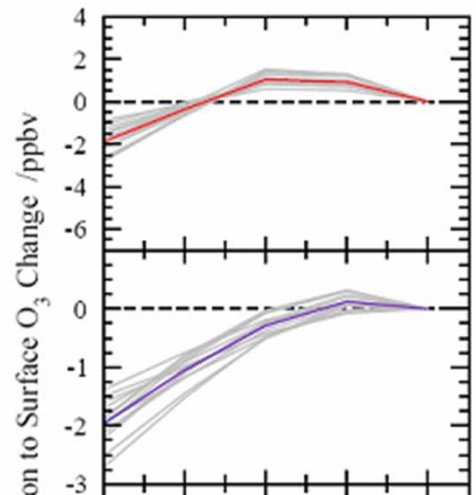
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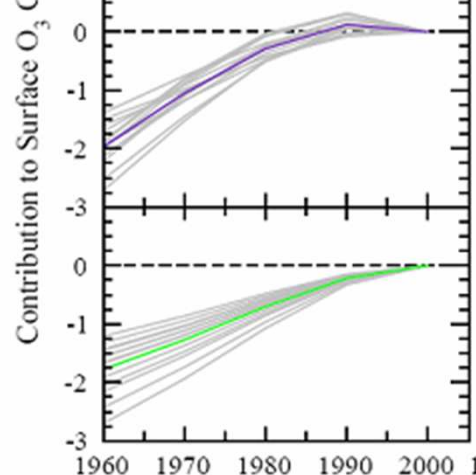
Total change



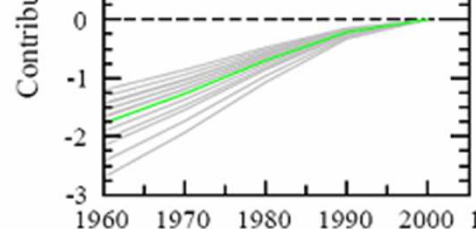
Within EU



Outside of EU

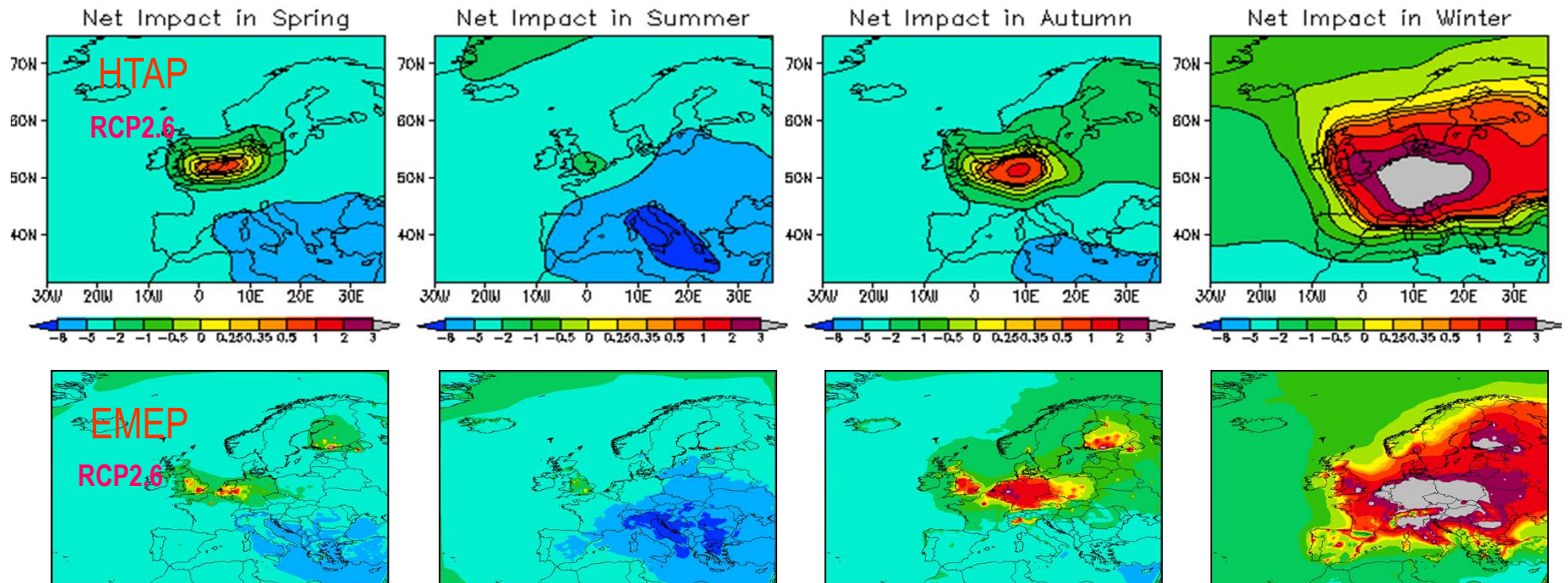


Methane



- Annual average - large region
- Small reductions in O₃ during 1980-2000, largest changes (6 ppbv) happened before.
- O₃ reductions attributable to EU emissions partly compensated by increasing emissions elsewhere
- Important role for (global) CH₄ 30-50 %
- Taken together changes in O₃ from outside EU and CH₄ are larger than within EU (60-70 % of total)
- External O₃ becomes more important when 'local' sources are more regulated.
- More important at 'lower' concentrations

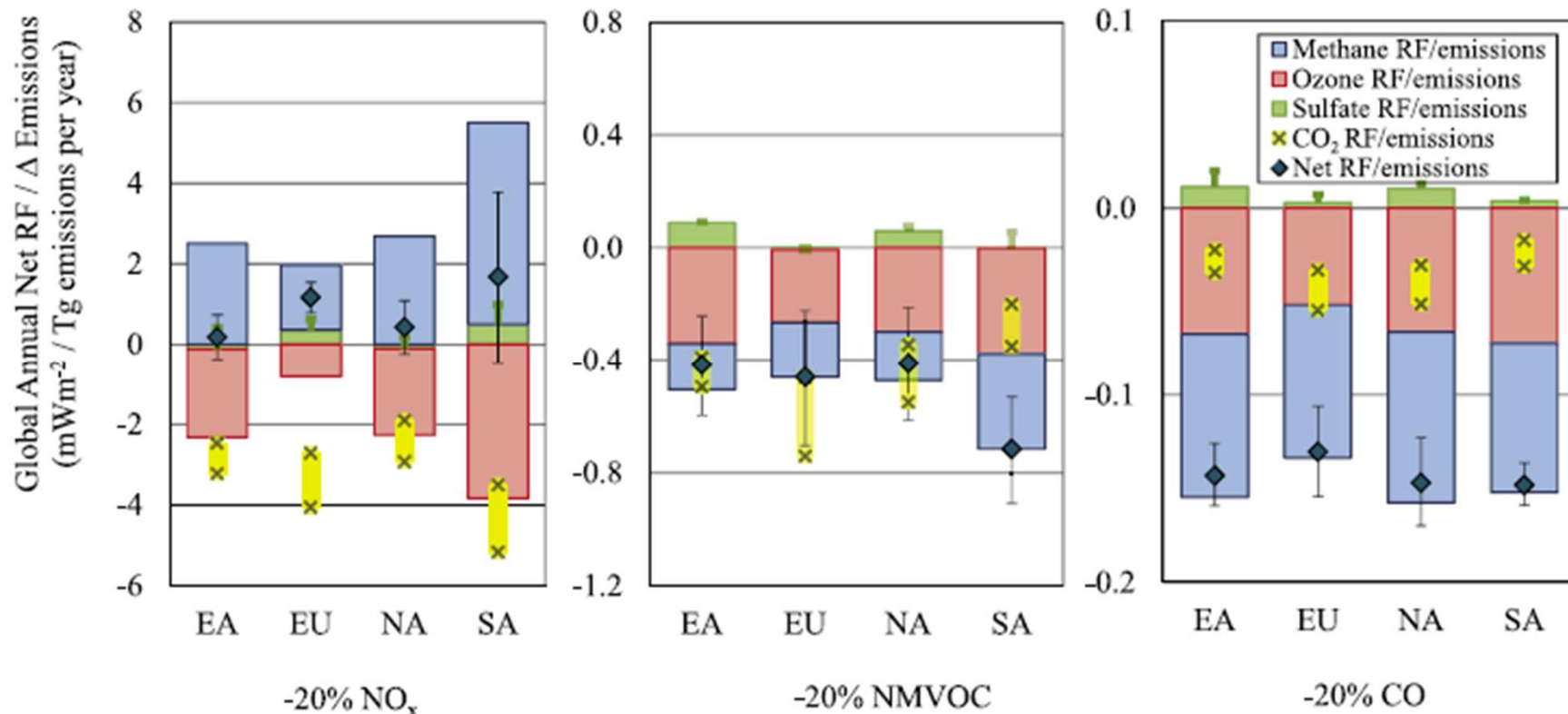
HTAP parameterization as boundary's for EMEP: RCP 26 in 2030



- Joint effort of HTAP and EMEP to review knowledge on past and future of changing O₃ boundary conditions at Europe's border, in support of Thematic Review Air Pollution.
- Consider a range of emission and climate scenarios

HTAP Radiative Forcing for NO_x, VOC, CO per Tg/yr emission

11 models; GFDL forcing calculations



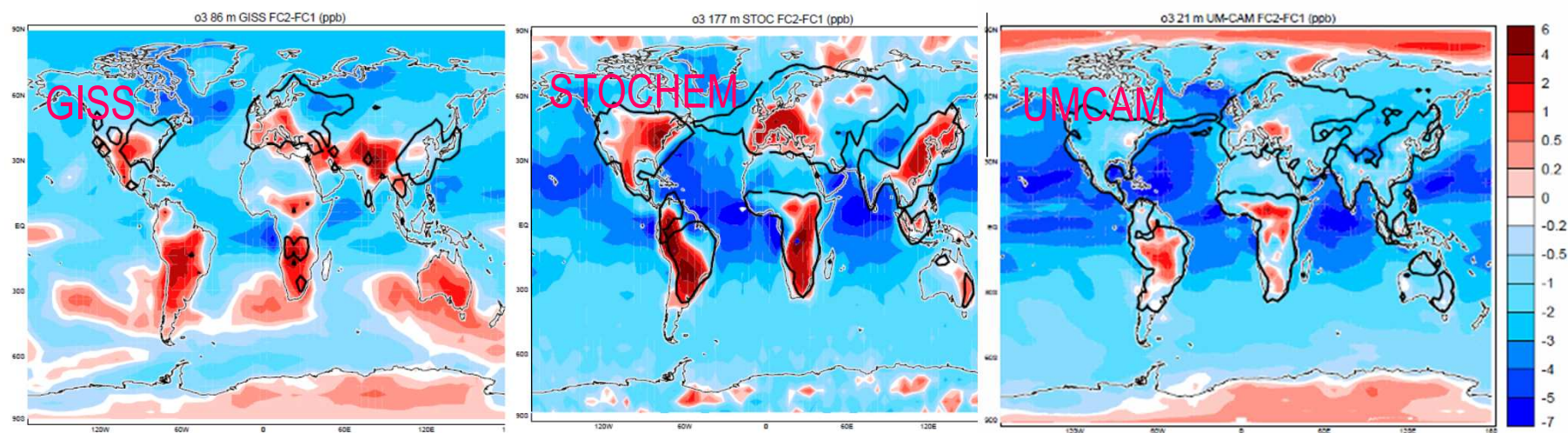
NO_x ↓ OH down ↓ =>CH₄ ↑

CO/VOC ↓ OH ↑ =>CH₄ ↓

NO_x > VOC > CO opposing signs

Vegetation feedback potentially important (Collins et al. 2010)

Impact of climate change on Hemispheric Transport



3 Chemistry Climate models 2090s versus 2000s; large inter-model and spatial variability

In source regions positive relationship between Climate Change and O₃.

Analysis of drivers; PAN-water vapor-isoprene emissions

Small changes in intercontinental SR relationships; chemistry is more sensitive

Large regions in Europe need emission reductions of more than 20 % to compensate for

Climate change (Climate penalty for current emissions, and future climate)

ACCMIP (IPCC) will give more opportunity for analyzing climate effects on transport/chemistry

Detailed WPs

workplan themes and work packages

1. Emissions and projections
 - 1.1 HTAP harmonized emissions database 2006–2010
 - 1.2 2030 baseline emissions scenarios and control options
2. Source apportionment and source/receptor (S/R) analysis
 - 2.1 Common set of source and receptor regions
 - 2.2 Specification of simulation experiments
 - 2.3 Generate boundary conditions for regional simulations
 - 2.4 Coordination of base and sensitivity simulations
 - 2.5 Parameterization of S/R relationships
 - 2.6 Comparison of S/R and source attribution methods
3. Model-observation evaluation and process analysis
 - 3.1 Inflow conditions influencing air quality over Europe
 - 3.2 Inflow processes influencing air quality over western North America
 - 3.3 Coordination with analysis activities of AQMEII
 - 3.4 Coordination with analysis activities of MICS-Asia
 - 3.5 Coordination with analysis activities of the Aerosol Comparisons between Observations and Models (AeroCom) project
 - 3.6 Coordination of model evaluation analyses with IGAC/SPARC9 hindcast of ozone and precursors
 - 3.7 Coordination of model evaluation analyses with POLMIP10
 - 3.8 Global ozone and other air quality relevant surface concentrations
 - 3.9 Model evaluation using satellite observations
 - 3.10 Coordination of model evaluation analyses with the Global Mercury Observation System (GMOS)¹¹
 - 3.11 Model evaluation of persistent organic pollutants simulations

- 4. Assessment of health, ecosystem, and climate impacts
 - 4.1 Assessment of hemispheric scale pollution on human health
 - 4.2 Assessment of hemispheric scale pollution on ecosystems
 - 4.3 Assessment of hemispheric scale pollution on climate
- 5. Assessment of impacts of climate change on hemispheric pollution
 - 5.1 Analysis of Future Scenario (Climate and Emissions) simulations
 - 5.2 Analysis of related studies on impacts of climate change
- 6. Expanding the data network and analysis tools
 - 6.1 HTAP website, wiki, and listservs
 - 6.2 Naming conventions and metadata coordination
 - 6.3 Forschungszentrum Jülich modelling archive and HTAP wiki
 - 6.4 AeroCom modelling database and analysis tools¹²
 - 6.5 EBAS¹³-HTAP observations archive
 - 6.6 Aircraft Data for Atmospheric Modeling (ADAM) database
 - 6.7 Access to satellite observations
 - 6.8 HTAP emissions and projections at the Community Initiative for Emissions Research and Applications (CIERA) and the Emissions of Atmospheric Compounds and Compilation of Ancillary Data (ECCAD) project
 - 6.9 ENSEMBLE
 - 6.10 Expanding the community network
 - 6.11 Coordination of visualization and analysis tool development

SR relationships; global and regional models;
First and second priority simulations.

