Task Force on Hemispheric Transport of Air Pollution

Status of TF-HTAP activities

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8th joint session of EMEP and WGE
Geneva, 12-16 September, 2022

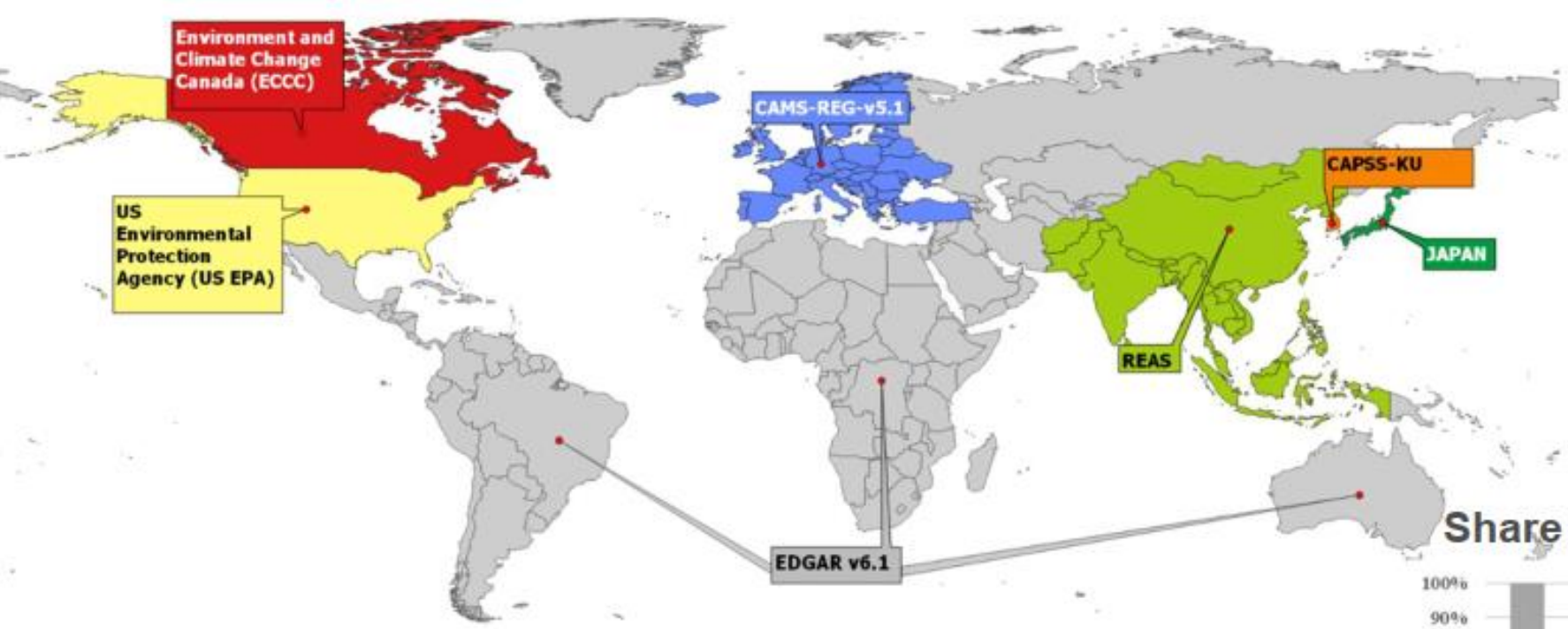
Outline

- 2022 Task Force meetings
- Progress on the work plan
  - Global emission inventory development
    - Updated HTAPv3 global emission mosaic (1.1.4.3)
  - Global and regional model evaluation and intercomparison
    - Comparison of source attribution methods (1.1.3.3)
      - Ship NOx: impacts on ozone (1.1.3.3)
      - Methane: regional ozone response (1.1.3.5)
    - Hg: trend assessment (1.1.4.2, 1.1.4.3)
    - Wildfires: multi-pollutant model intercomparison (1.1.4.2, 1.1.4.3)
- Outlook 2022-2023

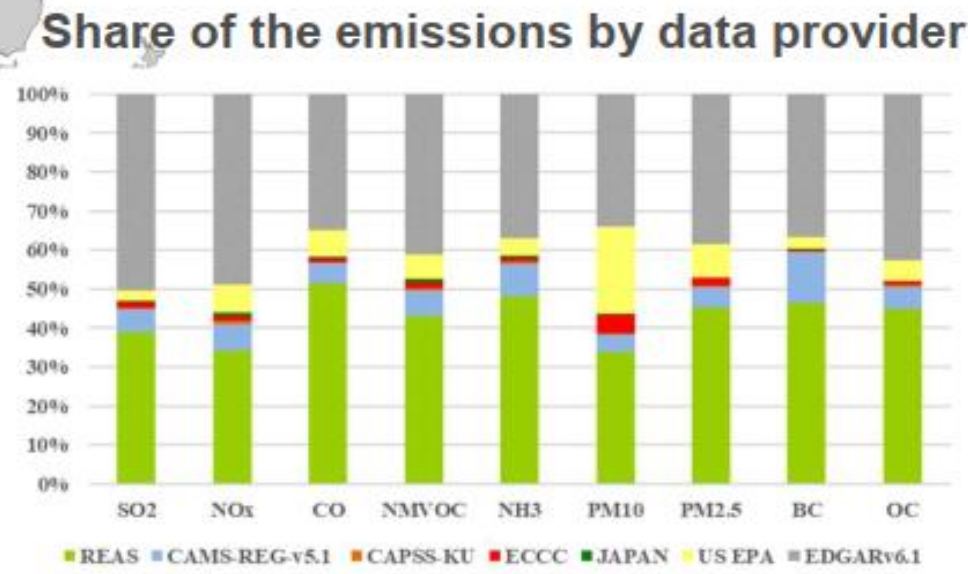
2022 Task Force meetings (online)

- **17 May: Global PM and ozone precursor and emissions**
  - 136 participants
  - GEIA, CAMS, MICS-Asia
- **18 May: Global Hg emissions and modelling**
  - 66 participants
  - Minamata Convention, AMAP, GEO/GOS4M
- **19 May: Global ozone and PM modelling and scenarios**
  - 85 participants
  - TOAR-II, WMO/MMF-GTAD, CCMI, IGAC/PACES
- **25 May: Global POPs and CECs emissions and modelling**
  - 62 participants
  - AMAP, Stockholm Convention, GESAMP

Updated HTAPv3 global mosaic emission inventory

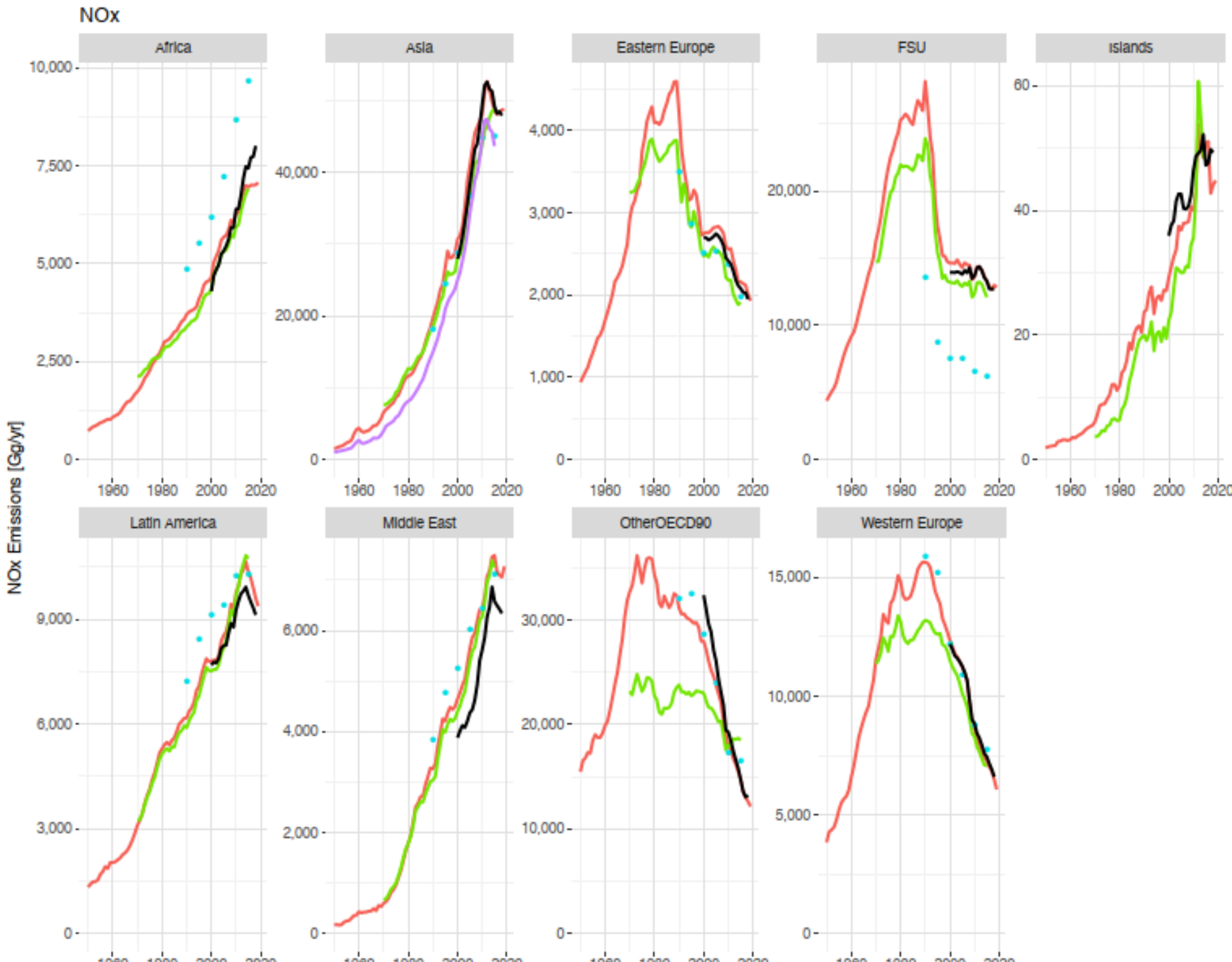


- Explicit spatial distribution with gap filling
- Timeseries 2000-2018
- High number of emission sectors (16)
- Dataset released April 2022
- Available at https://edgar.jrc.ec.europa.eu/dataset_htap_v3



Slide from Monica Crippa, JRC

NO_x - HTAPv3 comparisons with other global datasets

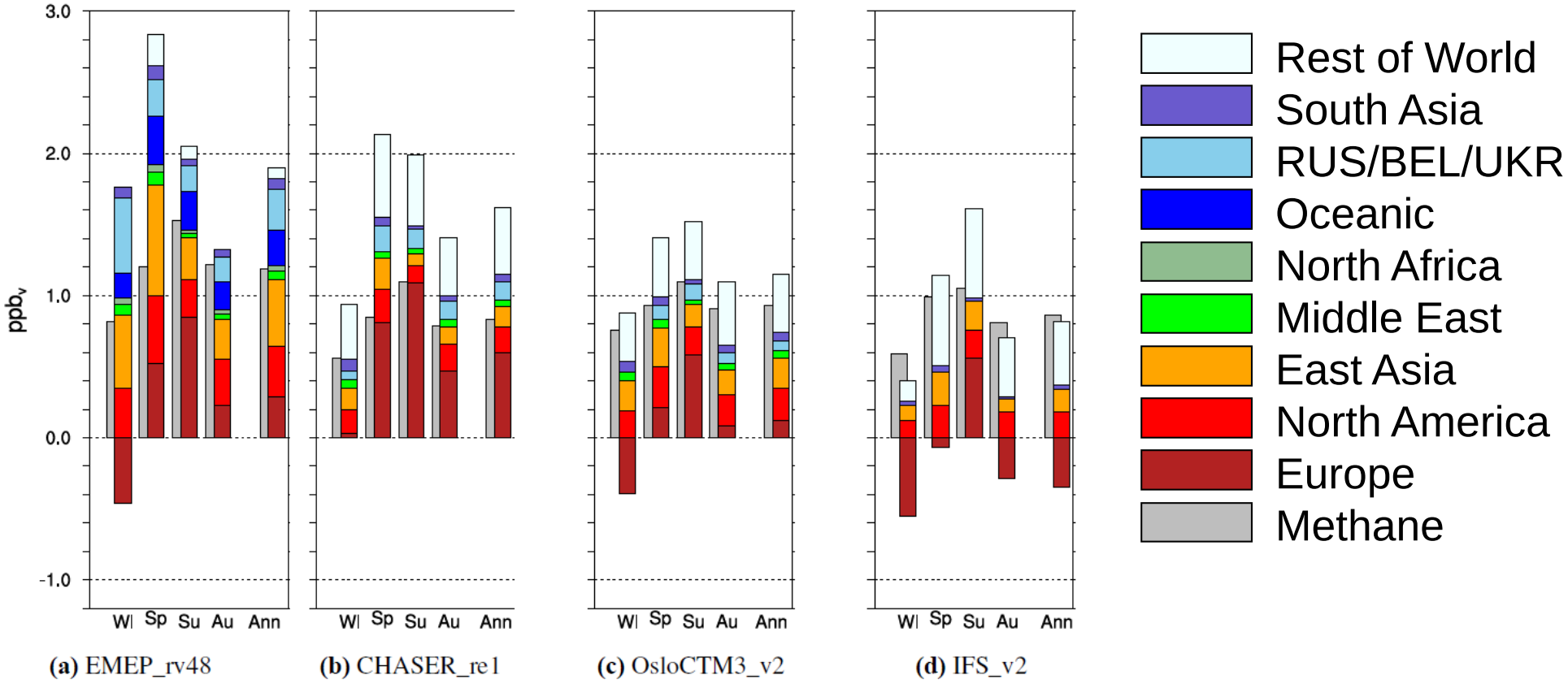


Slide from Steve Smith, PNNL

The effects of intercontinental emission sources on European air pollution levels

Atmos. Chem. Phys., 18, 13655–13672, 2018
https://doi.org/10.5194/acp-18-13655-2018

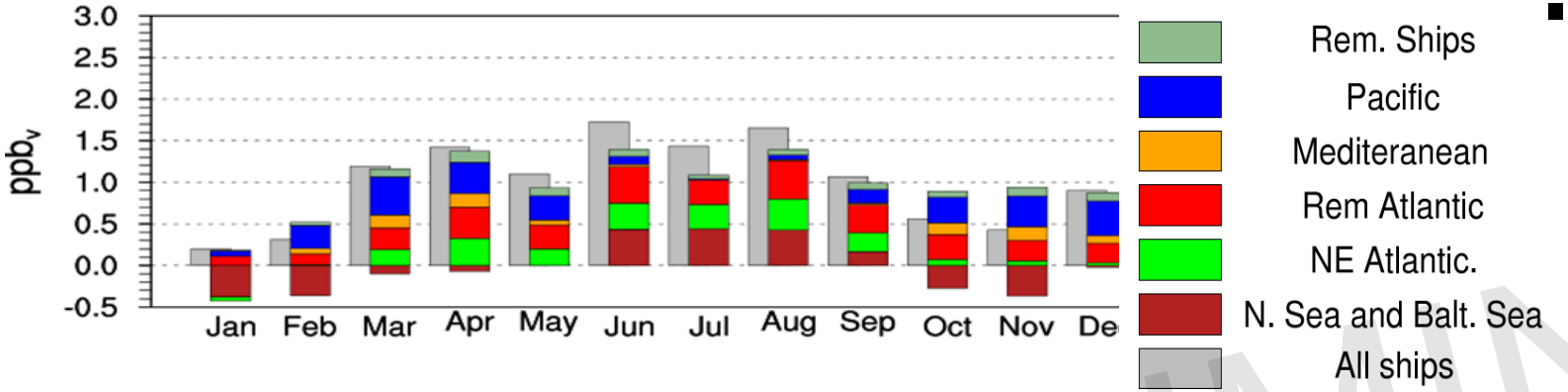
Jan Eiof Jonson[1], Michael Schulz[1], Louisa Emmons[2], Johannes Flemming[3], Daven Henze[4], Kengo Sudo[5], Marianne Tronstad Lund[6], Meiyun Lin[7], Anna Benedictow[1], Brigitte Koffi[8], Frank Dentener[8], Terry Keating[9], Rigel Kivi[10], and Yanko Davila[4]



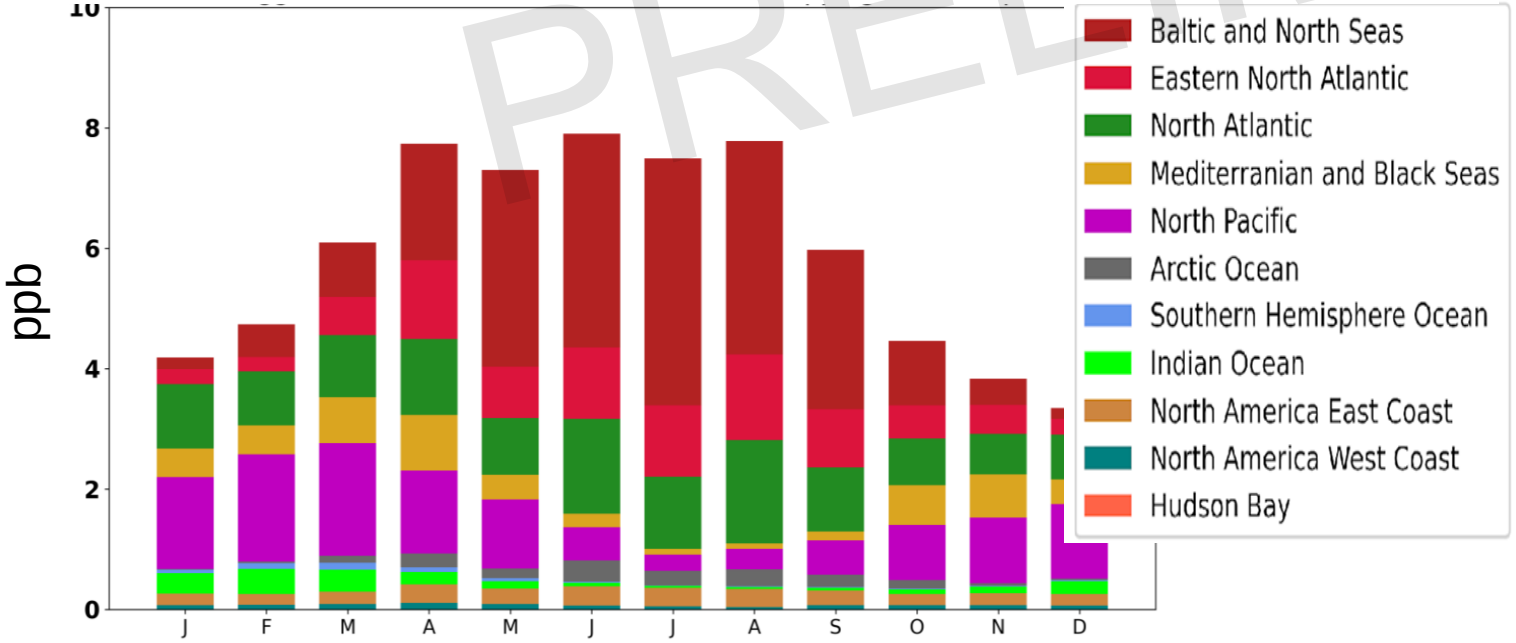
- Anthropogenic emissions of NO_x and VOCs outside of Europe contribute a comparable amount of ozone as local emissions
- International shipping contributes a similar amount as remote continental regions (where included)
- Methane drives ozone formation in Europe to the same extent as non-European NO_x and VOCs
- Large inter-model variability

Ship NOx impact on ozone in NW Europe: comparison of source attribution

EMEP: Ozone (MDA8) contribution from sensitivity analysis

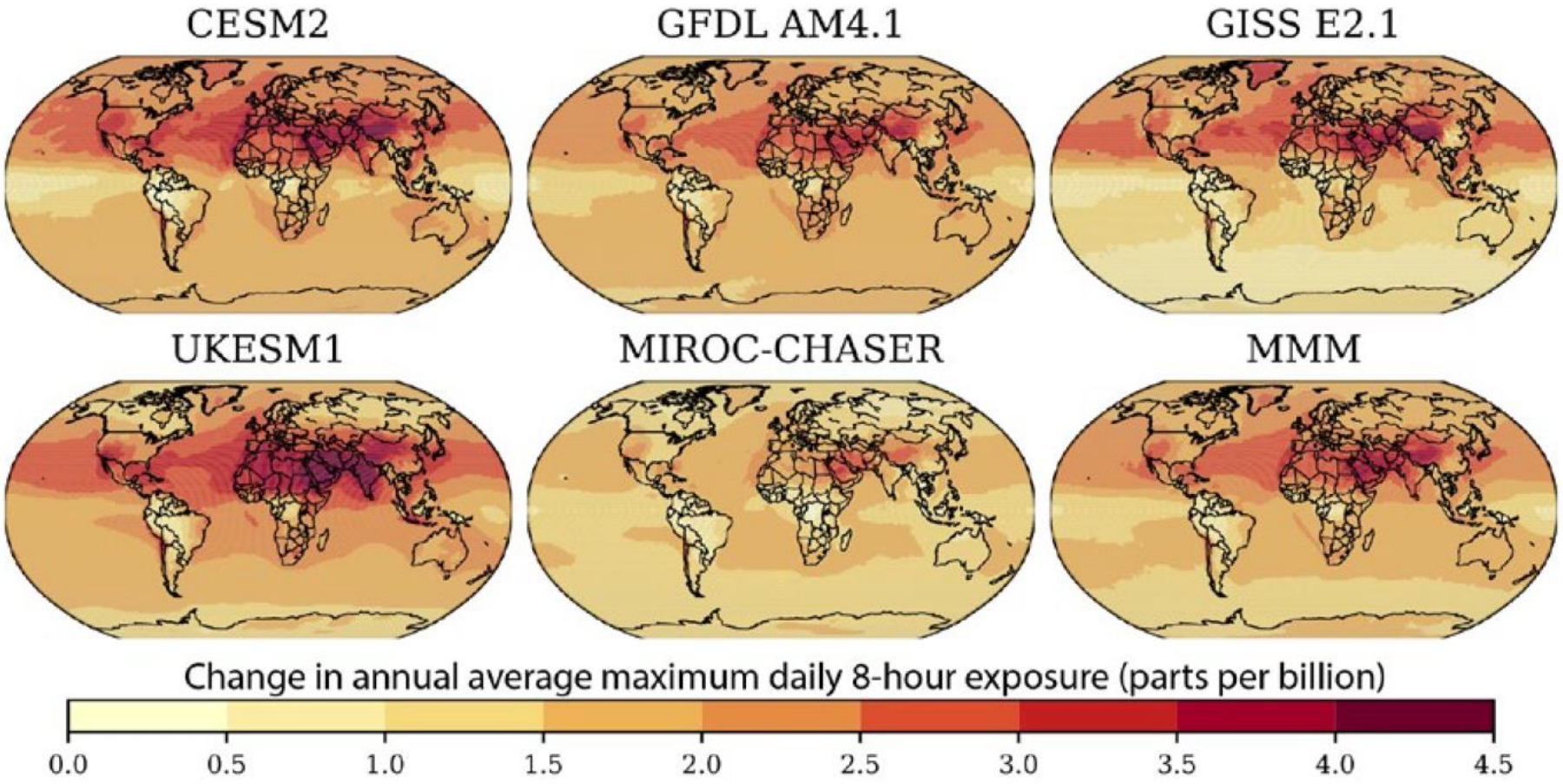


CAM-chem: Ozone (MDA8) contribution from source apportionment



- "Sensitivity" and "attribution" show qualitatively similar results, although there are important quantitative differences
  - Magnitude of the derived contributions from sensitivities is much smaller than the source attribution
  - Sum of the contributions derived from sensitivities is smaller than the total ozone
  - Chemical nonlinearities: the ozone production efficiency of remaining NOx sources increases when a single source is reduced
- **The results demonstrate that international shipping on the high seas contributes to impacts in Europe**

Variability in the surface ozone sensitivity to methane



- Large spread between different global models, but clear general pattern
- Regional response related to local photochemical activity and NOx emissions
- Initial TFMM/CAMS multi-model results showed differences in model behaviour for peaks.
- **TF HTAP is organizing further work to understand how global CH_4 changes affect local O_3 concentration**

CCAC/UNEP Global Methane Assessment (2021)

Mercury Model Evaluation and Intercomparison (1.1.4.2, 1.1.4.3)

- In March, the Minamata Convention created an Open Ended Science Group (OESG) for Effectiveness Evaluation.
- One task of the OESG is to prepare and implement a plan for analyses to assess whether observed trends of Hg levels in air, biota, and humans can be attributed to global implementation of the Minamata Convention.
- In May, to better align TF HTAP and OESG activities, TF HTAP decided to draft an options paper to identify model experiments and analyses that will meet the needs of both the LRTAP and Minamata Convention. Ashu Dastoor (Canada) is leading the effort with input from MSC-E and other experts from inside and outside the LRTAP Convention, including China.
- The options paper will be provided as input to the OESG in early 2023. We hope to have a completed plan and begin implementation by fall 2023. The OESG-specific analyses will need to be completed in 2024. TF HTAP-specific analyses can continue after that.

Fire ~~POPs~~ Model Evaluation and Intercomparison (1.1.4.2, 1.1.4.3)

- Prior to our May meeting, TF HTAP was working towards a model intercomparison focused on anthropogenic PAHs.
  - The concept was to compare global POPs and aerosol models to results from TFMM's recent modeling of PAH at the European scale (Eurodelta-BaP) and a national PAH case study in Poland.
- After reviewing the TFMM and Polish case study results at our May meeting, we decided to shift our focus to a source with a larger global footprint: fires.
- We are planning to draft an options paper for a design of an intercomparison that is:
  - **Multi-Pollutant:** Comparing the results of models that may have been developed to look individually at aerosols, ozone, persistent organic pollutants, mercury, or other contaminants of concern.
  - **Multi-Impact:** Characterizing the range of impacts that wild and agricultural fires have on human health, ecosystems, and climate.
- We are organizing an **online meeting on 8 November** to launch our planning effort and build connections to other ongoing efforts on fire impacts (e.g. IGAC/BBurned, ...).

Outlook 2022-2023

- Global emission inventory development
  - Promote the use of the HTAPv3 inventory in the community
  - Explore future development of mosaic inventories (GEIA, CAMS)
- Global and regional model evaluation and intercomparison
  - Continue source apportionment comparisons
    - NOx from international shipping (MSC-W, DLR, IASS/GFZ Potsdam)
    - Effect of global methane on local ozone (TNO, UC Davis, IASS/GFZ Potsdam)
  - Improved modelling of ozone deposition and vegetation impacts (AQMEII, TOAR-II, WMO/MMF-GTAD, and ICP Vegetation)
  - New model intercomparisons
    - Hg trends (Minamata Convention OESG)
    - Multi-pollutant effects of fires: PM, O3, Hg, and POPs (modelling community, **online meeting November 8**)
- Global scenario assessment
  - Development and assessment of global scenarios (TFIAM, CIAM)
  - Continued development of the openFASST scenario evaluation tool

Suggested Text for Meeting Report

Hemispheric transport of air pollution

- Mr. Tim Butler (Germany), Co-Chair of the Task Force on Hemispheric Transport of Air Pollution (TFHTAP), provided an overview of the Task Force's progress on elements of the 2022–2023 workplan, including outcomes of its online meetings in May 2022 and ongoing work on global emissions inventory development, global and regional model evaluation and intercomparison and global scenario assessment.
- The Steering Body and Working Group:
  - Welcomed continued progress on the workplan elements related to the Gothenburg Protocol, including the intercontinental impacts of marine shipping and methane sources;
  - Appreciated the contributions of the European Commission's Joint Research Centre to the completion and release of the updated global emissions mosaic for 2000-2018;
  - Welcomed the ongoing work to coordinate model evaluation and intercomparison efforts for mercury with the Minamata Convention and to organize a multi-pollutant intercomparison, including persistent organic pollutants, focused on fires.