LRTAP Long-range Transboundary Air Pollution

Task Force on Hemispheric Transport of Air Pollution

Status of TF HTAP Activities

Co-Chairs

Terry Keating (U.S.) Tim Butler (Germany)

Vice Chairs

Jacek Kaminski (Poland) Rosa Wu (Canada)

13-17 September 2021

2020-2021 TF HTAP Work Plan Elements (1 of 2)

Contribution to the Gothenburg Protocol Review (1.1.3.2 and 2.1.4)

- March 2021, Virtual Workshop
- April 2021, Summary and Background submitted to GP Review Group
- May 2021, WGSR 59 Presentation and Discussion

- Transient tagging simulations underway with several global models, analysis to be available by January 2022

Hg and POPs (1.1.4.3)

- April 13 and 15 virtual workshops organized with MSC-E. Recommended:
    - Reconciling differences between existing historical global emissions inventories, exploring incorporation into HTAPv3 data set.
    - Incorporating Hg and combustion-related POPs into future emissions scenarios for other air pollutants
    - Performing an intercomparison of Hg air-surface exchange fluxes estimated by current global and regional models.
    - Performing a combustion-related POPs model intercomparison at the global scale to build on TFMM/EuroCarb B(a)P modeling intercomparison at the regional scale.

2020-2021 TF HTAP Work Plan Elements (2 of 2)

Global Emissions Mosaic Update (HTAPv3) (1.1.4.5)

- Led by JRC-IES EDGAR group, Internal Review Version now circulating
- October 2021 Virtual Meeting Being Planned
- Public Version expected by December 2021

Continued Development of the openFASST Tool (1.1.4.6, 1.1.4.1)

- Resuming work now after an interruption in funding.

Ozone Benefits of Methane Mitigation (1.1.4.7)

- Discussion at WGSR 59
- Reviewing CCAC/UNEP Global Methane Assessment

2021 Global Methane Assessment

Benefits and Costs of Mitigating Methane Emissions

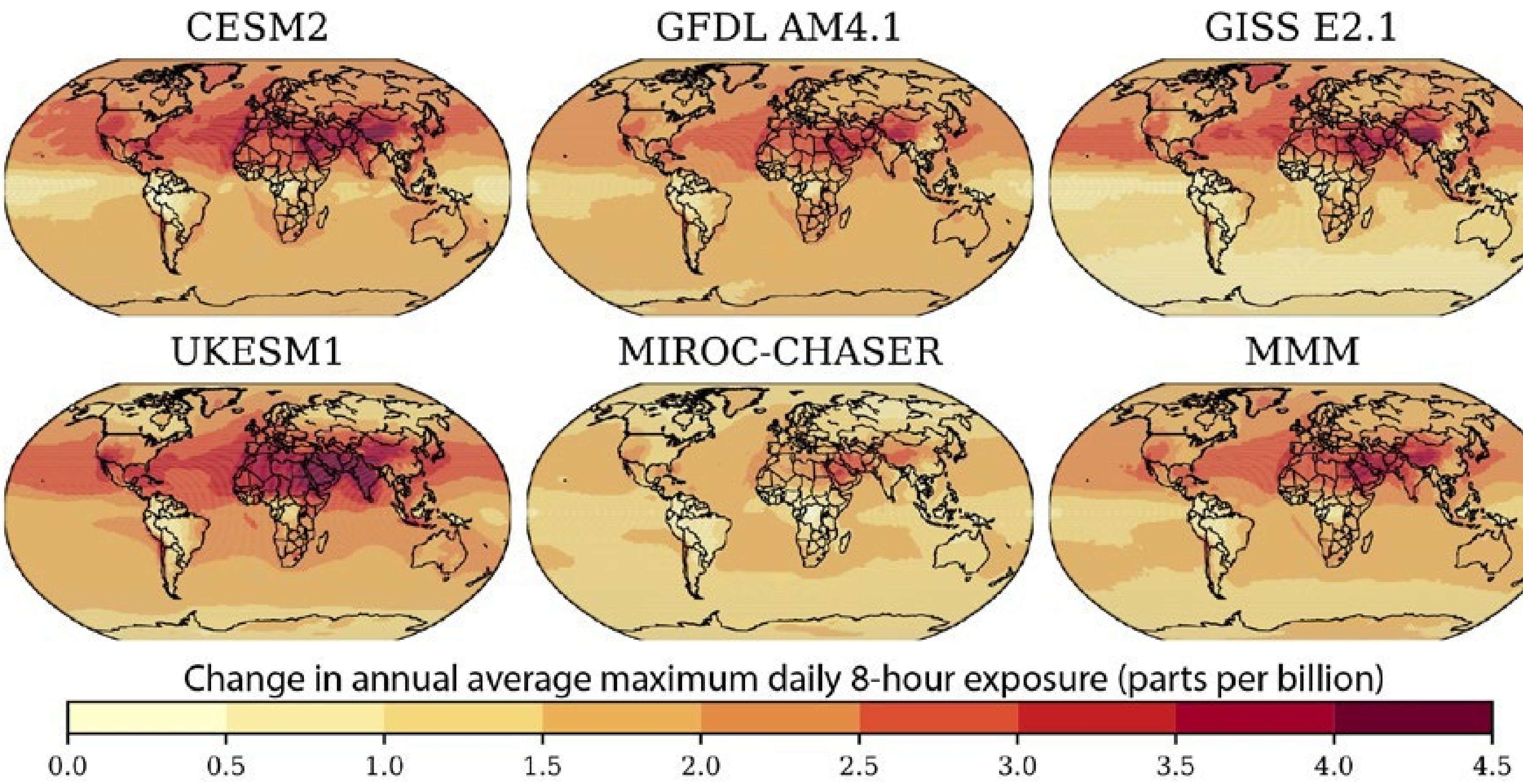
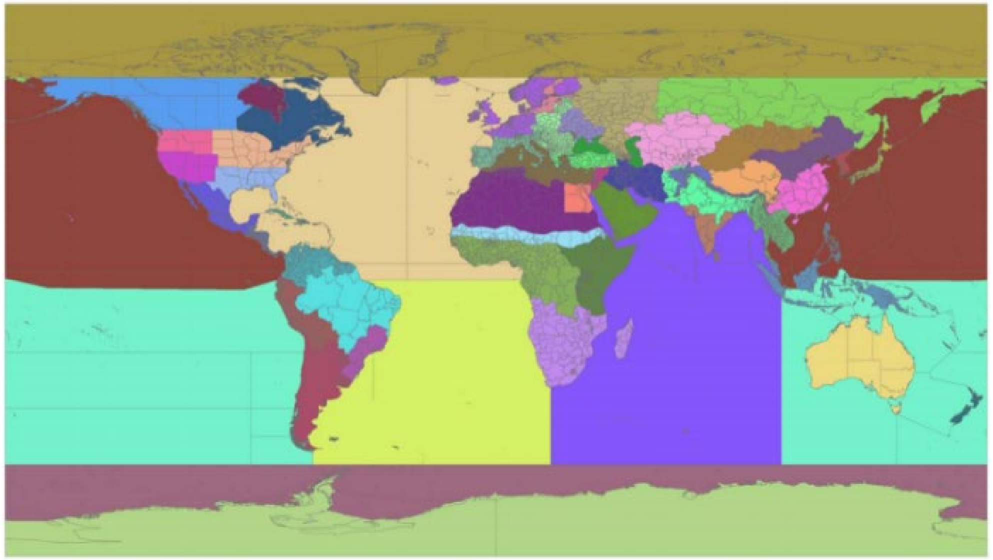
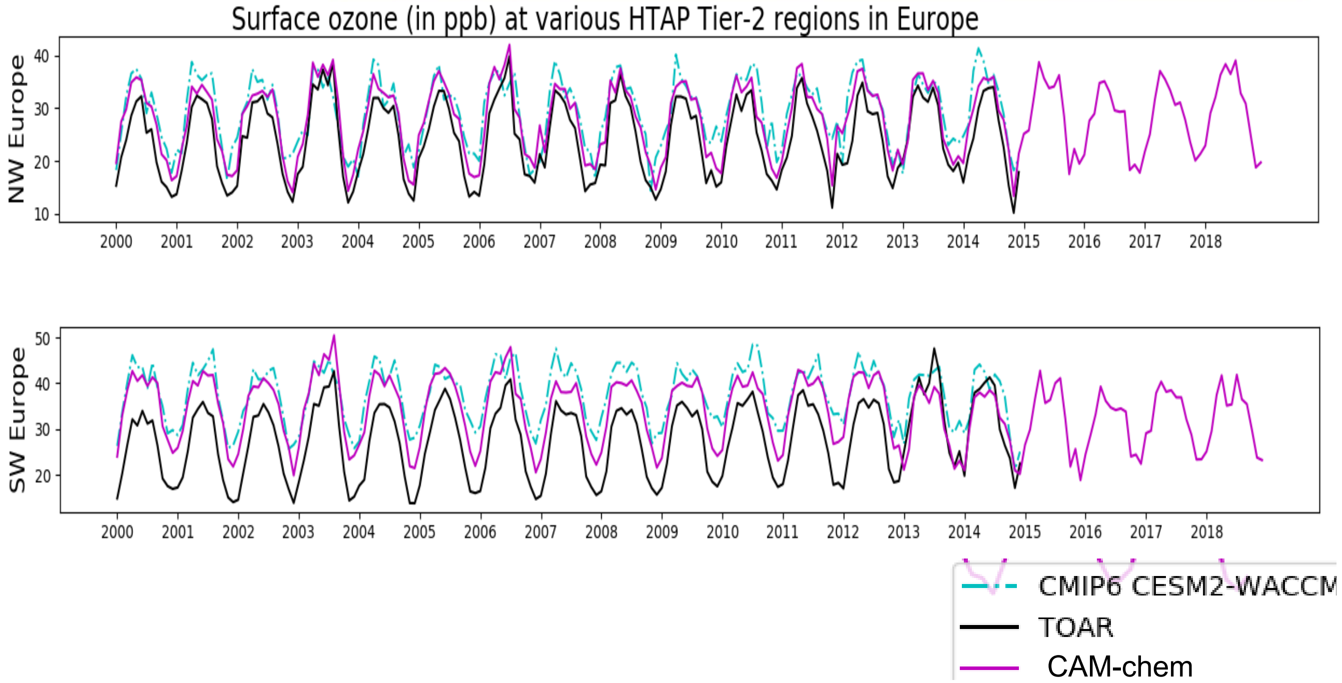


Figure 3.2 Change in annual average maximum daily 8-hour ozone exposure between the present day (2015) and half anthropogenic methane simulations in various models and the multi-model mean (MMM)

Impacts of Shipping (1.1.4.4)

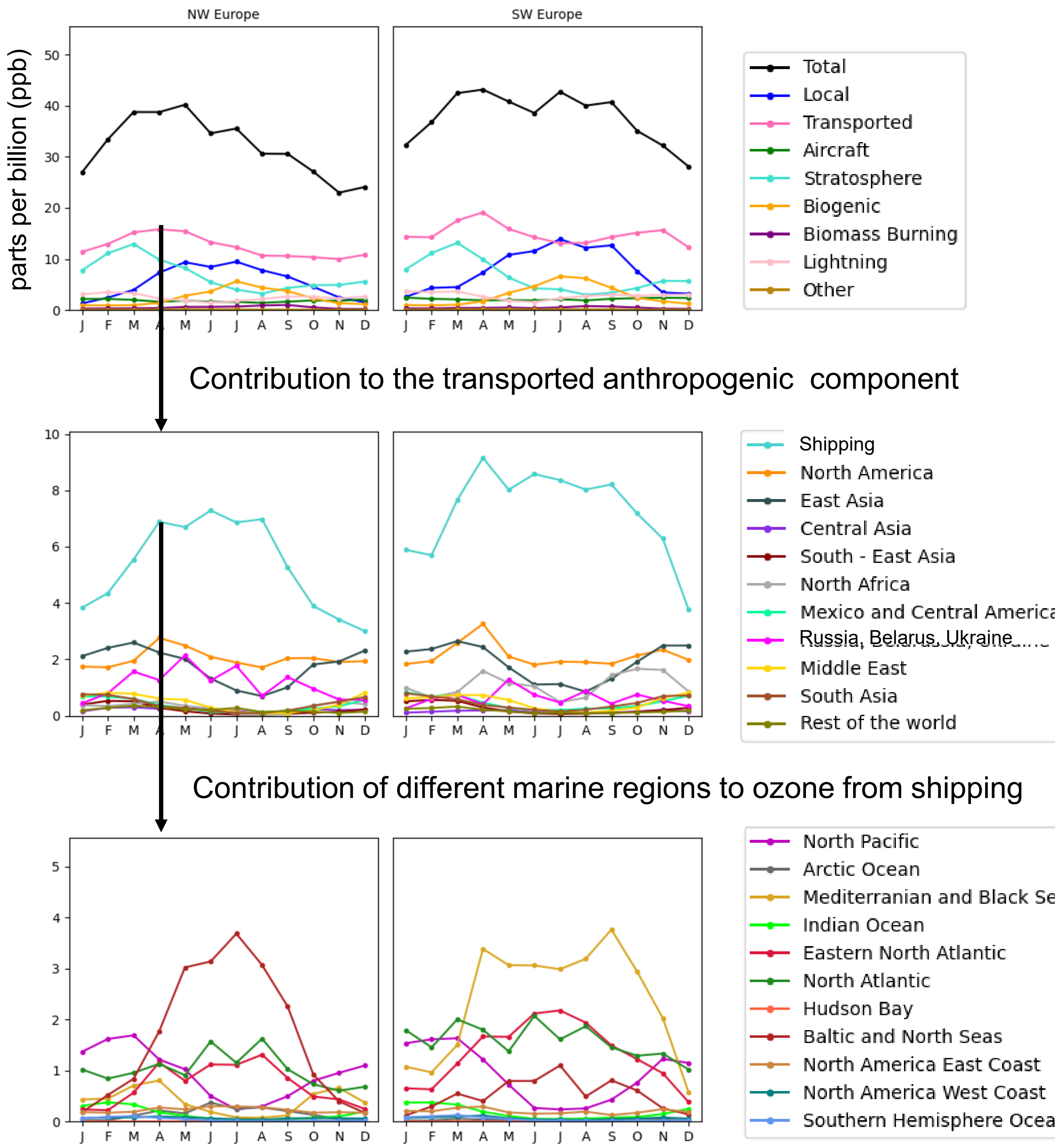
- **Transient model simulations from 2000-2018**
  - Comparison of ozone source attribution methods
  - CAMS-Global emissions
  - HTAP2 continental source regions, higher detail in shipping source regions
- **Status of runs:**
  - CAM-chem (IASS Potsdam) completed
  - ECHAM5-MESSy (DLR) in progress
  - EMEP Model (MSC-W) in progress
    - Will only simulate 2010 and 2018
    - Focus on sensitivity to changes in shipping NOx
- **CAM-chem:**
  - ~2x2 degree global simulation
  - Ozone tagging as in Butler et al. (2020)
    - Attribution of ozone to NO_x and VOC precursors
    - Two runs: NOx-tagged and VOC-tagged
    - https://doi.org/10.5194/acp-20-10707-2020
  - Results are preliminary!





Seasonal cycle of monthly average ozone with attribution to NO_x emissions: Europe 2018

- **Large long-range contribution to springtime ozone**
- **Stronger local contribution to summertime ozone**
- **Ship NO_x emissions dominate the transboundary ozone component**
- **Nearby shipping has a stronger influence in summer**
  - **Baltic and North seas influence NW Europe**
  - **Mediterranean sea influences SW Europe**
- **Remote shipping has a stronger influence in spring**
  - **Strong influence of the North Pacific on springtime ozone in Europe**



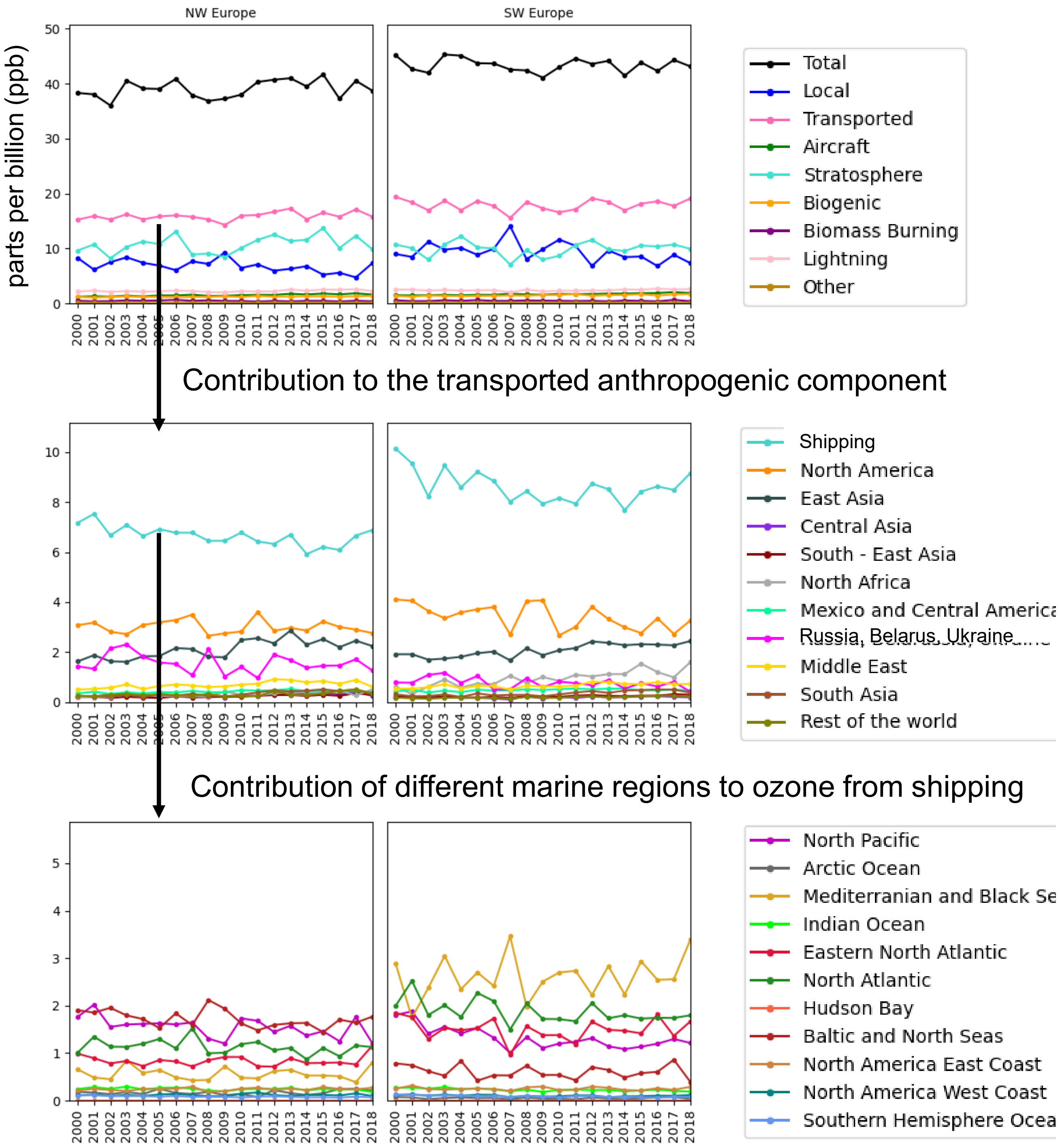
Preliminary results: do not cite!

2000-2018 April average ozone with attribution to NO_x emissions (and the stratosphere)

- **No noticeable trend in April ozone over Europe**
- **Contributions of different NO_x source regions quite stable from 2000-2018**
- **Remote anthropogenic NO_x contributes approximately 2x the ozone as from local anthropogenic NO_x in April**
  - **About half of this is NO_x from shipping**
  - **Contribution from both high seas and coastal shipping**

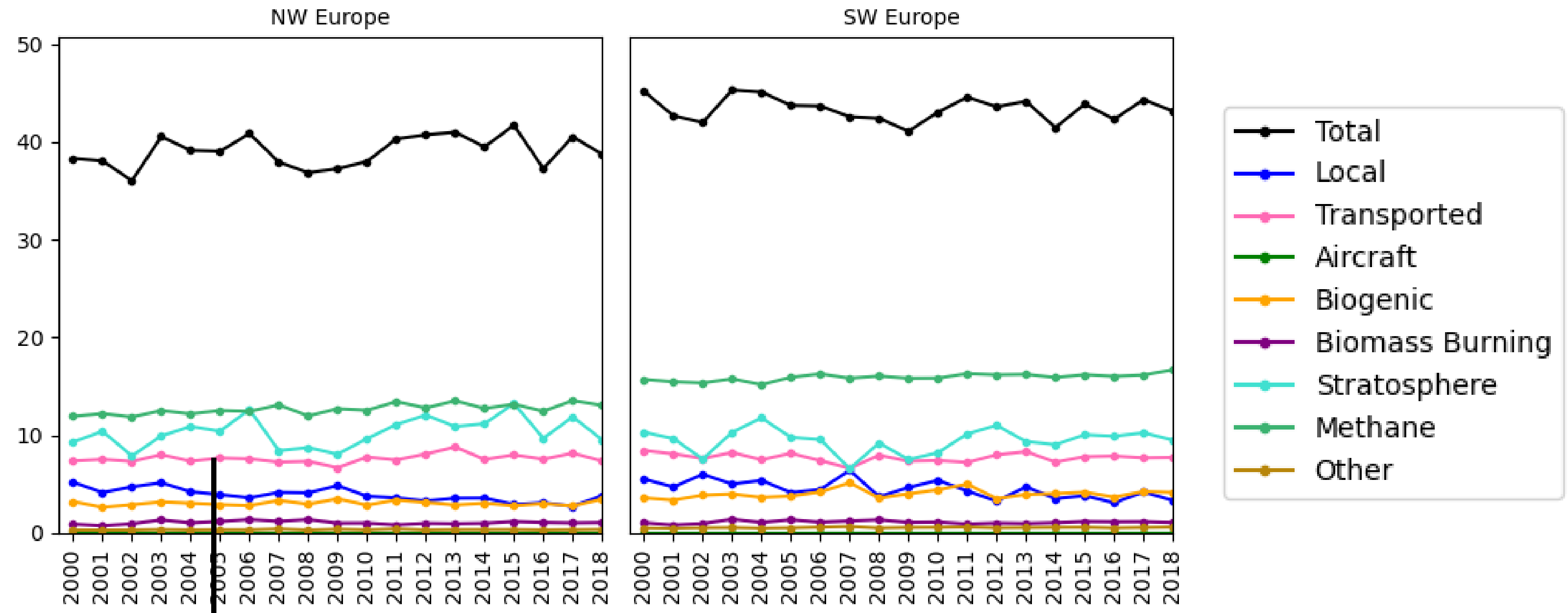
- **Model high bias over SW Europe might be partly due to overactive local ozone production**

Preliminary results: do not cite!

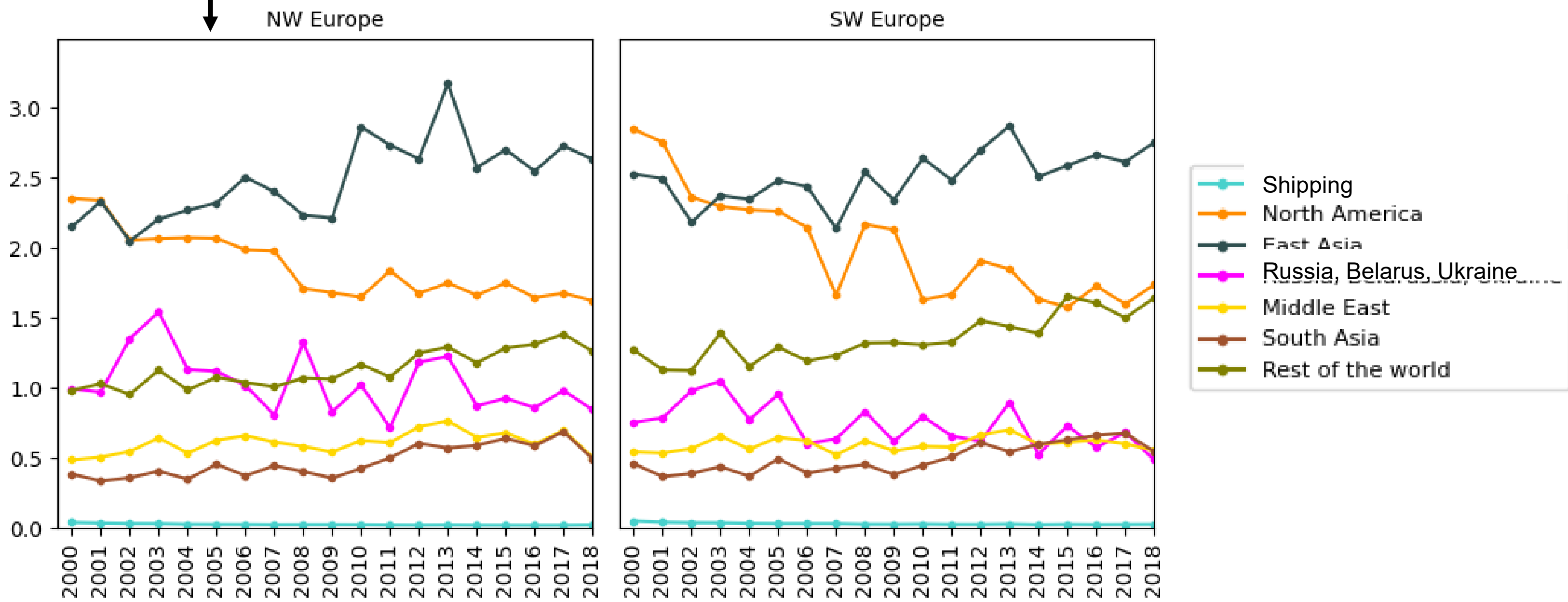


2000-2018 April average ozone with attribution to VOC emissions

- **Clearer trends in the contribution of VOC source regions to European April ozone**
  - **Reductions in the North American and Russian contribution balanced by increases from elsewhere**
- **Significant contribution of methane to April ozone over Europe**
  - **Higher methane contribution over SW Europe is consistent with overactive local ozone production**



Contribution to the transported anthropogenic component



Preliminary results: do not cite!

Next steps for this work

- **Continued evaluation, analysis, and publication of CAM-chem results**

- **Waiting for results from DLR and MSC-W**
  - **Multi-model intercomparison of ozone source attribution, with initial focus on ship NO_x (1.1.4.4, with TFIAM)**

- **Contribution to the draft 2022-2023 workplan**
  - **1.1.3.7: Global to regional downscaling of the methane impact on ozone (with TFMM, TFIAM, MSC-W)**
  - **1.1.4.3: Informing scenarios of international shipping (with TFIAM)**

2022-2023 Draft Work Plan Elements

Global Emissions Inventory Development

- Complete updated HTAPv3 emissions mosaic (w/JRC, TFEIP) [1.1.4.4a]
- Incorporate emissions estimates for Heavy Metals and POPs (w/TFEIP, MSC-E) [1.1.4.4b]

Global Regional Model Evaluation and Intercomparison

- Comparison of global ozone source attribution using tagging [1.1.3.3a]
- Intercontinental impact of marine shipping emissions (w/TFTEI, CIAM, MSC-W) [1.1.3.3b]
- Regional ozone response to global methane reduction (w/TFMM, MSC-W) [1.1.3.7]
- Air-surface exchange rates for Hg (w/MSC-E) [1.1.4.6]
- Source/receptor relationships for combustion-related POPs (w/TFMM, MSC-E, MSC-W) [1.1.4.7]

Global Scenario Assessment

- Development of Future Global Scenarios (w/CIAM, TFIAM, MSC-W, MSC-E) [1.1.4.3, 1.1.4.2]
    - To support analyses of the impact of air pollution and climate change mitigation policies on O3, PM, Hg, and combustion-related POPs
- Ozone benefits of methane mitigation inside and outside the Convention, including vegetation impacts (w/TFTEI, CIAM, ICP Veg) [1.1.4.3, 1.1.3.7, 1.3.2]
- Continued development of openFASST (w/JRC) [1.1.4.5]

Emerging Issues

- Long range transport of Chemicals of Emerging Concern (w/TFMM) [1.1.1.6]
- *Long range transport of microplastics (w/TFMM)*
- *Impacts of wildfires on PM, O3, Heavy Metals, and POPs (w/TFMM)*
- *Lessons learned from emissions reductions associated with the COVID-19 pandemic (w/TFEIP, TFMM, TFIAM)*

2022-2023 Draft Work Plan Elements

Related to GP Review

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