

HTAP3-OPNS

OPNS: Ozone, Particles, and the Deposition of N and S

Global to regional downscaling

January 21, online

Agenda for this meeting

- Motivation for HTAP3-OPNS
- GAINS LRTAP emission scenarios
- Overview of model runs
- Questions and discussion

Motivation for HTAP3-OPNS

- Revision of the CLRTAP Gothenburg Protocol
- New GAINS LRTAP future scenarios
- Assessment of long-range air pollution transport under the GAINS scenarios
- Special focus on methane as an ozone precursor
- Motivation for global-regional downscaling in HTAP3-OPNS
 - **An ensemble of regional models including the MSC-W EMEP model will provide a more robust assessment of future air quality than just the results from a single model system**
- For further information, the HTAP3-OPNS white paper:
 - <https://docs.google.com/document/d/1CYgWl2ZzrQVlbcOHU9gcOSMNwCIFBmGT>
- Technical guidance document for regional modelling
 - <https://docs.google.com/document/d/1wQFd29yCqeNkoCGZdJQvelB-SjULTyFi>

GAINS LRTAP scenarios (1990-2050)

- Scenarios developed by IIASA to inform the review of the Gothenburg Protocol
 - **CLE (Current Legislation)**
 - Includes all current air quality policies and implementation plans
 - Climate forcing broadly consistent with SSP2-4.5
 - **MTFR (Maximum Technical Feasible Reduction)**
 - Same activity datasets as the CLE scenario
 - Full implementation of all proven measures for all pollutants regardless of cost effectiveness
 - **“HILO”**
 - Methane from CLE and air pollutants from MTFR
 - What if we take strong action to reduce traditional air pollutants, but do nothing on methane?

HTAP3 philosophy

- **Model experiments should be accessible as possible**
 - Maximise participation, minimise barriers to entry
- Minimal “must have” aspects of model configuration
 - Specified emission datasets for anthropogenic activities and biomass burning
 - Specified years for CTM meteorological forcing
 - Minimum requirements for output data fields
- All other aspects of model configuration can be freely chosen, for example:
 - Resolution
 - Choice of reanalysis dataset
 - Natural emissions
 - All NMVOC speciation

Emission data

- Prescribed emissions for this exercise
 - Anthropogenic emissions from GAINS LRTAP
 - <https://doi.org/10.5281/ZENODO.14748815>
 - Aircraft emissions from the “corrected CMIP6” dataset
 - <https://zenodo.org/records/13257451>
 - Biomass burning from GFAS4HTAP
 - <https://doi.org/10.5281/zenodo.13753451>
- All other emissions at the discretion of each group

Regional model setup

- One-year simulations with 2015 meteorology (plus spinup)
- Boundary conditions from a global model “direct” scenario run
 - CLE2015
 - CLE2040
 - MTFR2040
 - HILO2040
- Model domain:
 - EMEP domain (encouraged)
 - CAMS domain (acceptable)

Two possible modelling domains: EMEP and CAMS

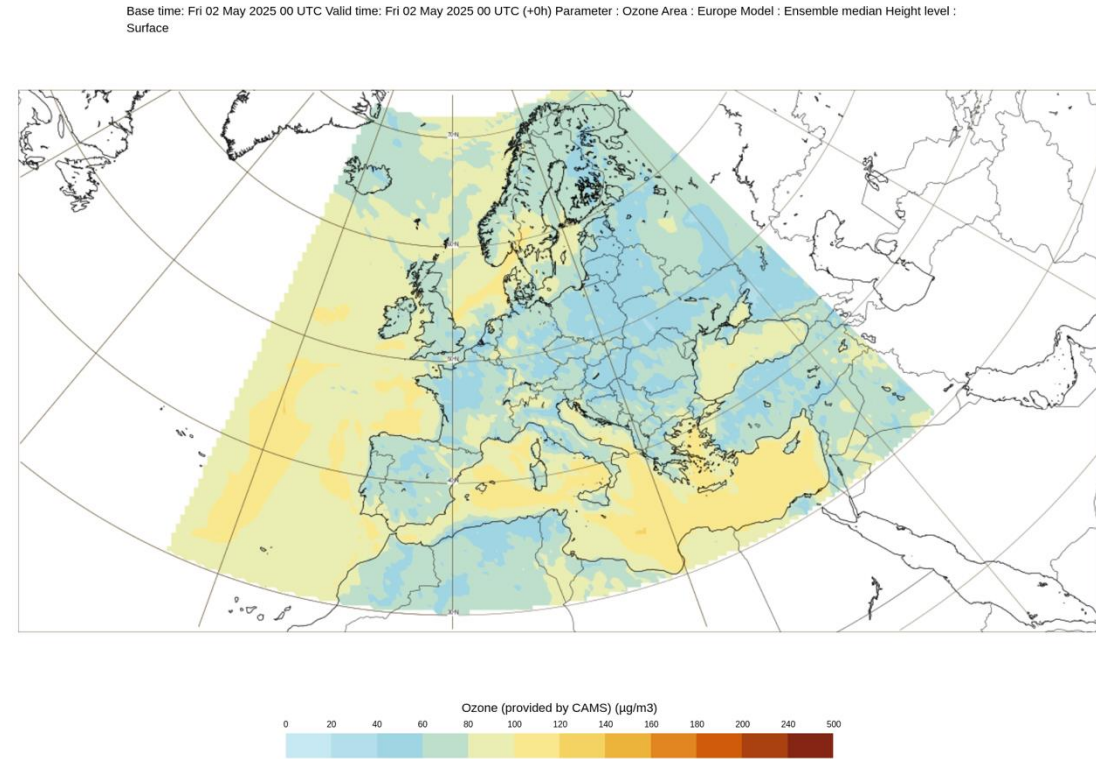
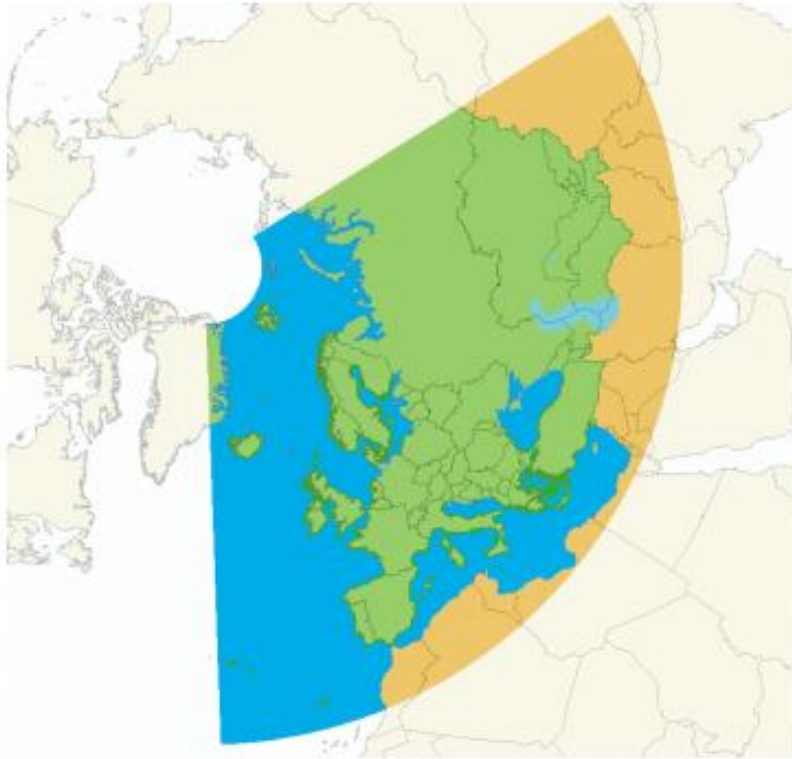


Figure 1.1: The EMEP domain covering the geographic area between 30° N-82° N latitude and 30° W-90° E longitude.



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Boundary conditions from global models

- Several global modelling groups have indicated an interest in providing boundary conditions
 - MSC-W EMEP model (EMEP and CAMS domains)
 - Preliminary data available on the Aerocom server
 - Final dataset coming soon
 - CAMS IFS (CAMS domain)
 - See the technical guidance document
 - NCAR CAM-chem (global coverage)
 - More information coming soon
- Groups with both global and regional modelling capacity are welcome to contribute both global and regional simulations
 - And to make their global simulations available to other regional modellers

Question: which BC data do groups plan to use?

- Data source:
 - IFS-COMPO or EMEP?
 - Interest in CAM-chem (NCAR)?
 - Own global model?
 - Interest in running more experiment sets with different BCs?
- Domain:
 - CAMS or EMEP?

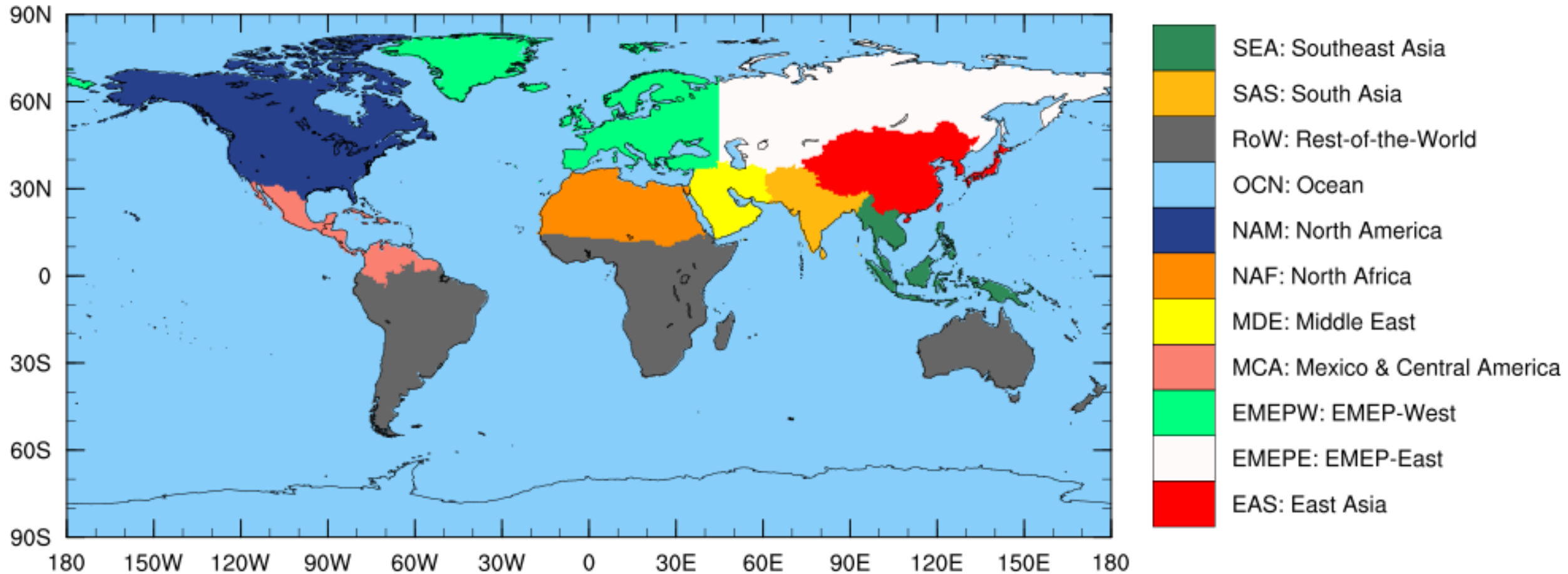
Overview of regional model simulations (Europe)

- Five simulations requested
 - Present day (2015)
 - 2040 CLE and MTFR
 - Difference between CLE and MTFR in 2040
 - Contribution of global methane
 - #4 - #3
 - Contribution of European emissions
 - #5 - #3

Simulation number	Simulation name	Emissions in the EMEP West region	Emissions in all other regions	Boundary conditions from global model
1	CLE2015	CLE2015	CLE2015	CLE2015
2	CLE2040	CLE2040	CLE2040	CLE2040
3	MTFR2040	MTFR2040	MTFR2040	MTFR2040
4	HILO2040	MTFR2040	MTFR2040	HILO2040
5	EMEPWLO2040	MTFR2040	CLE2040	CLE2040

HTAP3 regions

<https://doi.org/10.5281/zenodo.12654036>



Output format and data submission

- All data submission should follow CF conventions
- File naming:
 - htap3_<ModelName>_<ExperimentName-Perturbation-Realisation>_<VariableName>_<VerticalCoordinateType>_<Period>_<Frequency>.nc
- Data should be submitted to the AeroCom server:
<https://aerocom.met.no/>
- Further details in the technical guidance document for data submission (including requested fields)
 - <https://docs.google.com/document/d/1AV7Nh8bWrtxKtqWeN-b9S-juKgSouJlm>

Priority output fields

- Hourly surface fields of O₃, NO₂, PM_{2.5}
- Hourly fields related to ozone deposition
- Further details in the white paper and technical guidance documents

Timeline

- Model simulations to be completed ideally by June 30, 2026
- Initial results presented to the EMEP Steering Body in September 2026
- Late submissions accepted until the end of the year
- Full report in 2027

- HTAP spring meeting, April 8-10, 2026, in Hamburg
- Regular online check-in meetings

Remaining questions and discussion