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LRTAP Long-range Transboundary Air Pollution

Air quality in the European perspective within the context of the CLTAP/EMEP

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Air pollution in Europe - the CLRTAP perspective

Convention on Long-range Transboundary Air Pollution (CLRTAP):

- Provides access to **emissions**, **measurements** and **modelling** data
- Information on the **effects of air pollution** on ecosystems, health, crops and materials
- 8 protocols, e.g. the amended Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone (Gothenburg Protocol), with emissions reduction commitments for 2020 and beyond for SO_2, NO_x, NH_3, VOCs and $PM_{2.5}$

At present: review of the amended Gothenburg Protocol :

- Trends
- Present situation and remaining problems
- Future prospects

EMEP:European Monitoring and Evaluation Programme
Norwegian Meteorological Institute hosts *EMEP/MSC-W*

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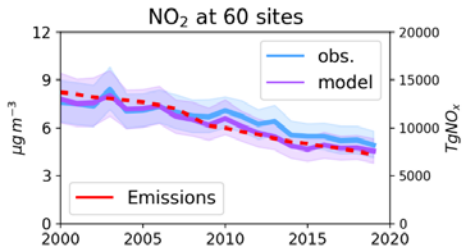
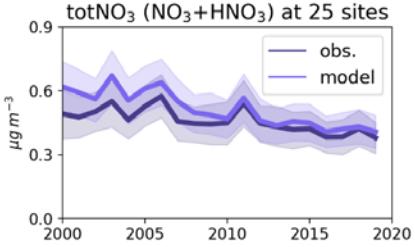


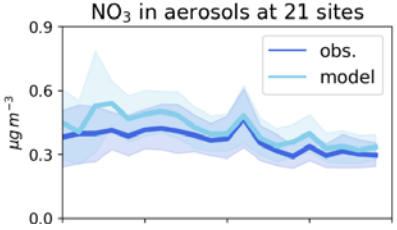
Change in NOx emissions (west EMEP): -48%

NO_2:
Obs: -24%
Mod: -42%

Trends in oxidized nitrogen

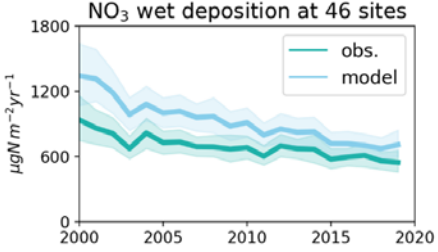


HNO_3+NO_3^-:
Obs: -30%
Mod: -40%



NO_3^- aerosol:
Obs: -38%
Mod: -48%

Substantial reductions in NOx emissions have lead to large reductions in observed oxidized nitrogen - but the changes in observations are not as large as the reported emission reductions



Wet deposition of oxidized nitrogen:
Obs: -26%
Mod: -45%

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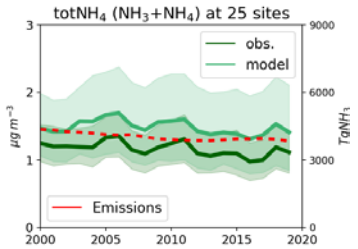
Trends in reduced nitrogen

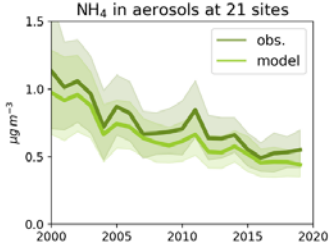


Change in NH_3 emissions**: -12% (west EMEP)**

NH_3+ NH_4^+:

Obs: - 28%

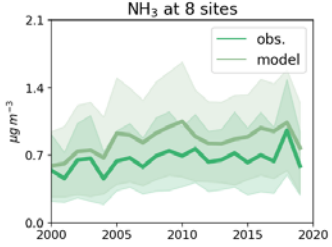
Mod: - 26%



NH_4^+ aerosol:

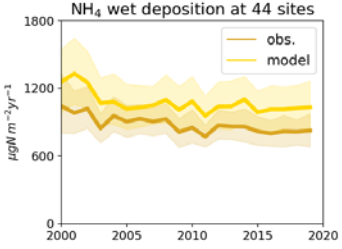
Obs: - 49 %

Mod: - 49 %



NH_3 in air: very few statistically significant trends (and few sites), but on average a positive trends (by ca. 30%)

The modest reductions in reported NH_3 emissions in EMEP west is confirmed by observations and modelling results. Large differences in trends for different reduced nitrogen compounds can be explained by interactions with sulphur and oxidized nitrogen compounds



Reduced N wet deposition: few statistically significant trends

Obs: - 6%

Mod: - 5%

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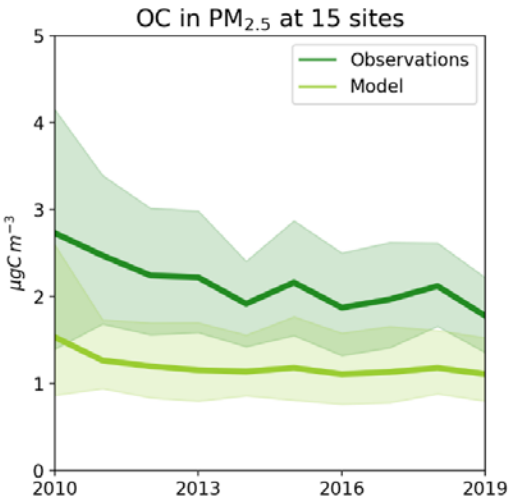
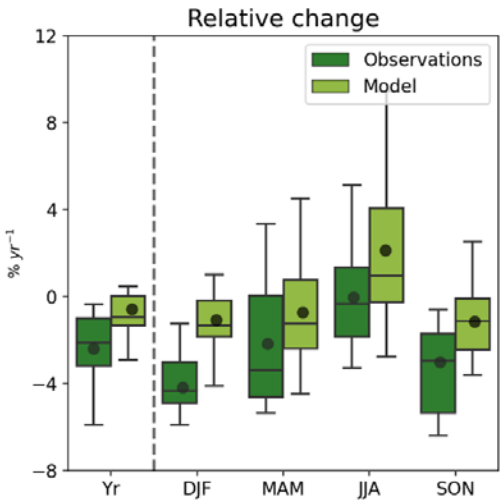
OC 2010-2019





OC:

- Only 2 sites show statistically significant trends in observations
- More pronounced downward trends in winter time OC in observations (6/15), only 1/15 in the model
- Trends in summertime OC were much less clear in both the model and observations (biogenic sources).
- The model underpredict OC, both in terms of absolute values and trends at least partly due to condensables

Efforts are needed to separate and understand natural and anthropogenic components of OC, in order to get a quantitative overview of the abatable fractions

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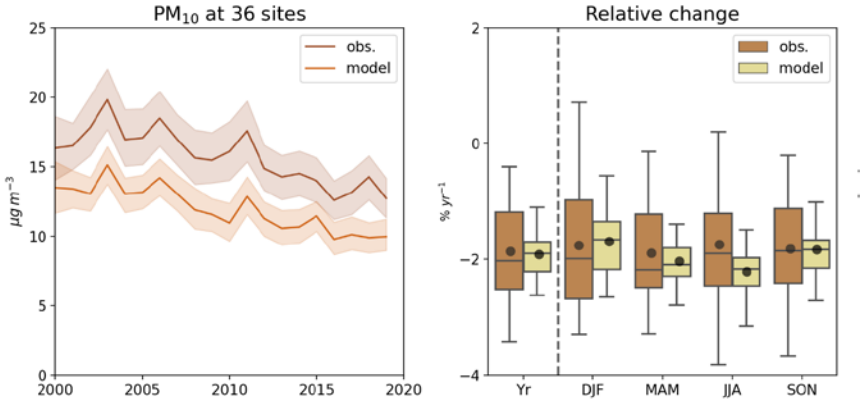
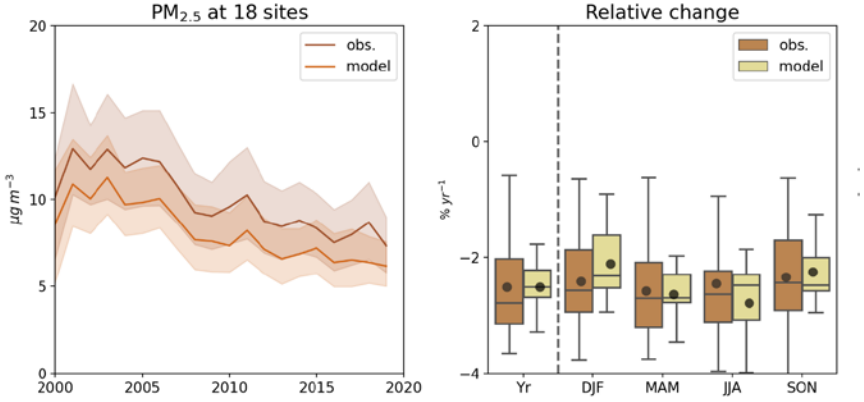
PM_{10} and $PM_{2.5}$ 2000-2019





PM_{10}:
Obs: - 35%
Mod: - 37%

$PM_{2.5}$:
Obs: - 46%
Mod: - 48%

Smaller trends in PM_{10} than $PM_{2.5}$ due to large natural contributions to the coarse fraction

Reductions in SIA (SO_4^{2-}, NO_3^-, NH_4^+) contributed substantially. Considerable reductions in EC and winter time OC (at least in 2010-2019).

Relative trends are well reproduced by the model, although absolute levels and trends are somewhat underestimated (partly due to condensables)

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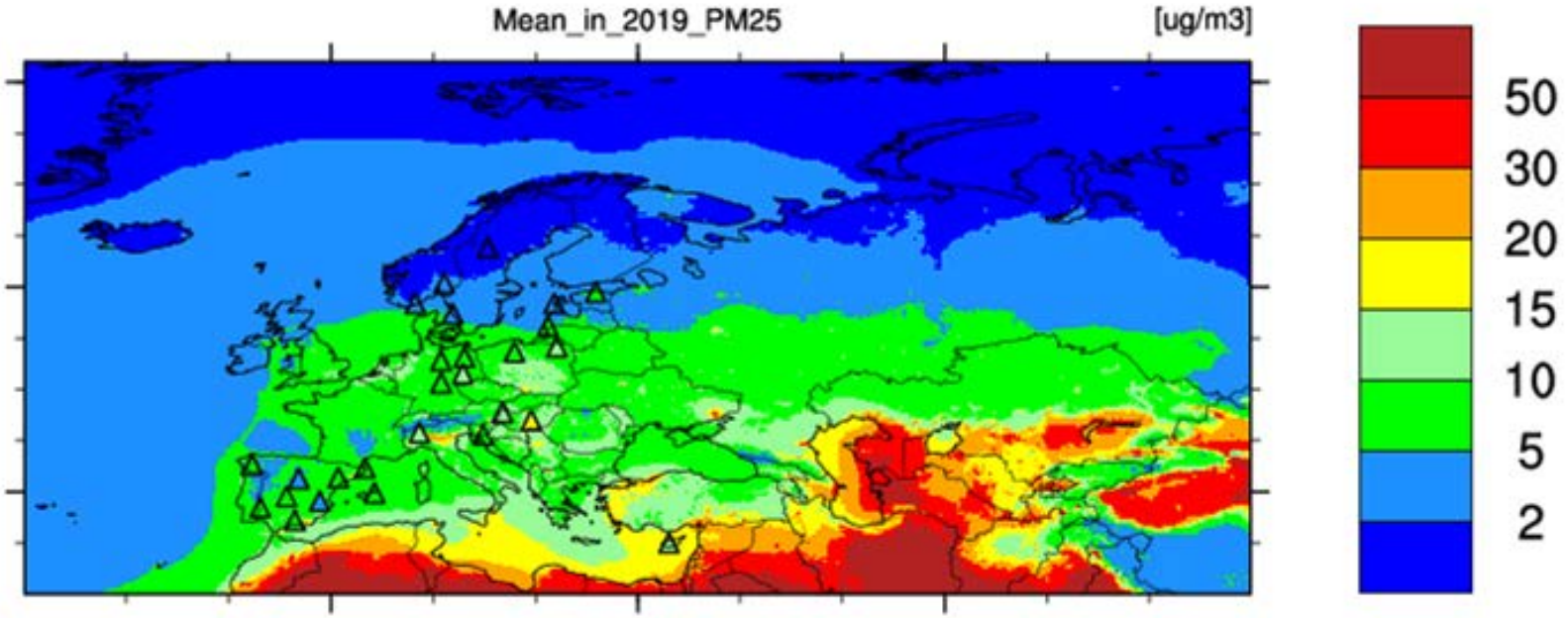
$PM_{2.5}$ in 2019



WHO (2005): 10 ug/m^3 annual mean
WHO (2021): 5 ug/m^3 annual mean

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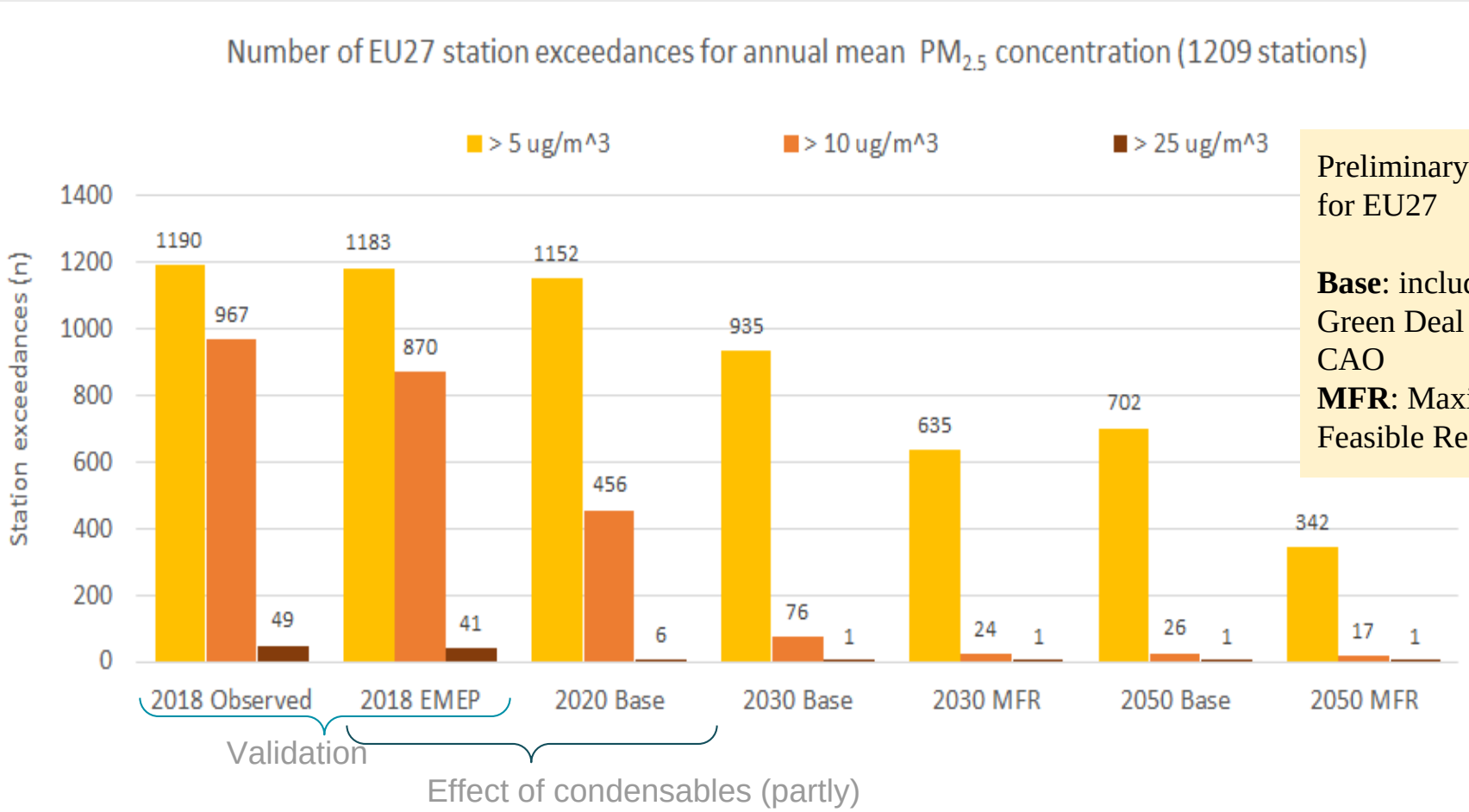
Future scenarios, calculated at Airbase monitoring sites



Preliminary results for EU27

Base: including Green Deal and 2nd CAO

MFR: Maximum Feasible Reductions

Summary

- Reported emissions of SO_2 and NO_x have declined significantly the last decades, while NH_3 emissions have remained at almost the same level - resulting in significantly reduced SIA (SO_4^{2-}, NO_3^-, NH_4^+).
- Since 2000, there has been significant reductions in concentrations in PM_{10} and $PM_{2.5}$. In addition to SIA reductions, there has been considerable reductions in EC and winter time OC (at least in 2010-2019), although OC trends are less clear
- There are still large still large exceedances of the WHO Air Quality Guidelines, but baseline scenario calculations for 2030 show significant reductions in exposure

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