FAIRMODE
Forum for air quality modelling in Europe

WG9: STATUS, CHALLENGES AND NEXT STEPS

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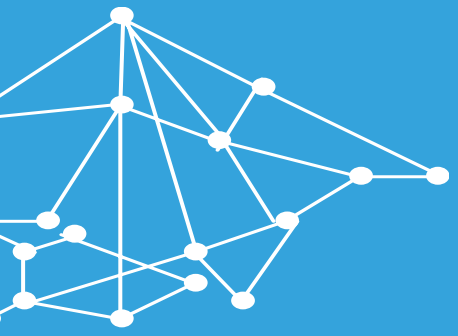


WG9 Status Update

DEVELOPMENT OF A BENCHMARK PLATFORM TO EVALUATE AQ MODEL PROJECTIONS

HOW MODELS BEHAVE ON DELTAS?

$$\Delta = C^{M}_{scen} - C^{M}_{bc}$$

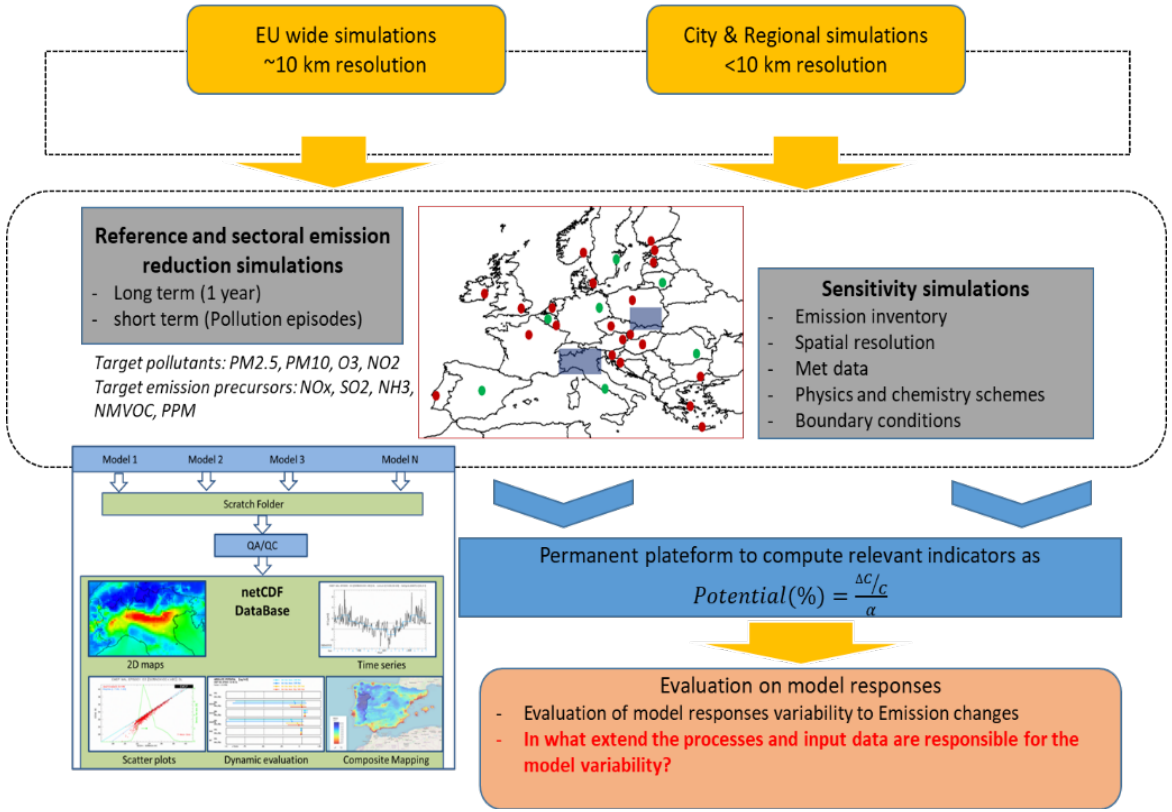
Constraints:

-Meteorology 2015

-Emission reductions 25 and 50%

-Target domains, periods (episodes)

Team name - Country		Model Name
JRC	(EU)	EMEP
JRC	(EU)	EMEP
JRC	(EU)	EMEP
JRC	(EU)	EMEP
ZAMG	(AT)	WRF-Chem
Met Norway	(NO)	EMEP
Met Norway	(NO)	EMEP + uEMEP
CyI	(CY)	WRF-Chem
NKUA	(GR)	WRF-Chem
DHMZ	(HR)	ADMS-Urban
DHMZ	(HR)	LOTOS-EUROS
LMD/IPSL	(FR)	WRF-CHIMEREv2020r1
UH-CACP	(UK)	WRF-CMAQ
CIEMAT	(ES)	IFS-CHIMEREv2017r4
ENEA	(IT)	WRF-MINNI
IRCELINE	(BE)	CHIMERE + RIO + ATMOSTREET

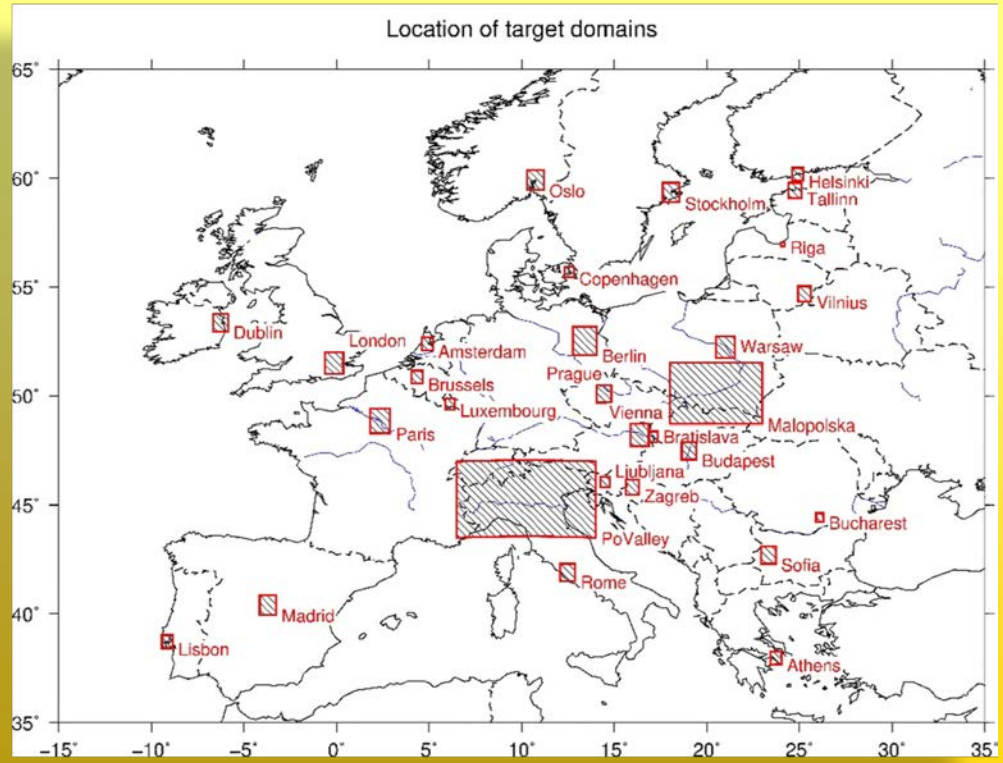


New participants: UOWM, Croatia Control

Set-up

- Short term (ST) on episodes
  - » *Emissions reduced only during 2015 episodes from 00:00 to 23:00*
- Long term (LT) simulations
  - » *Emissions reduced for the whole year 2015*
- Two reductions so far:
  - » 25% and 50% from a base case (BC)
- Reduced species depends on target pollutants
  - » ***PM10***: *PPM, NOx, VOC, NH3, SO2,* ***ALL*** *(All together)*
  - » ***Ozone***: *NOx, VOC,* ***ALL*** *(All together)*

Domains of emission reductions



VARIABILITY OF MODEL RESPONSES

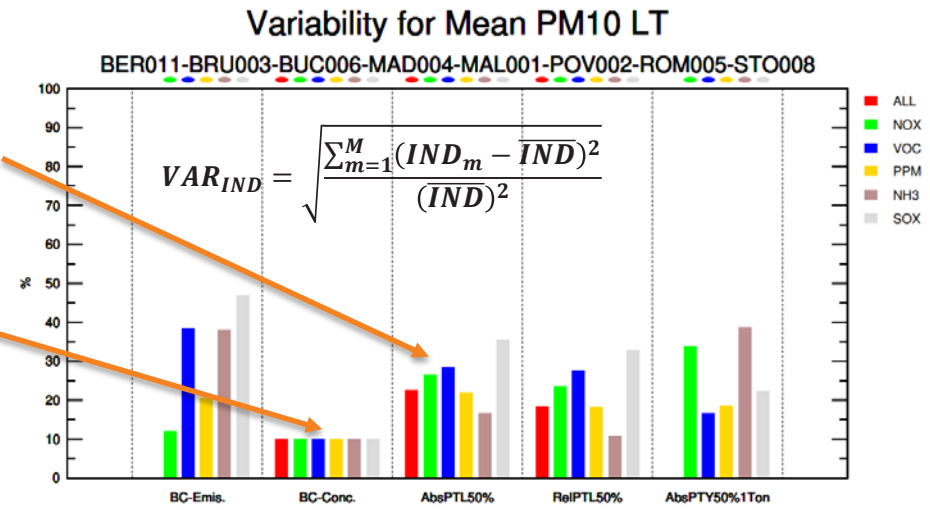
Indicators:

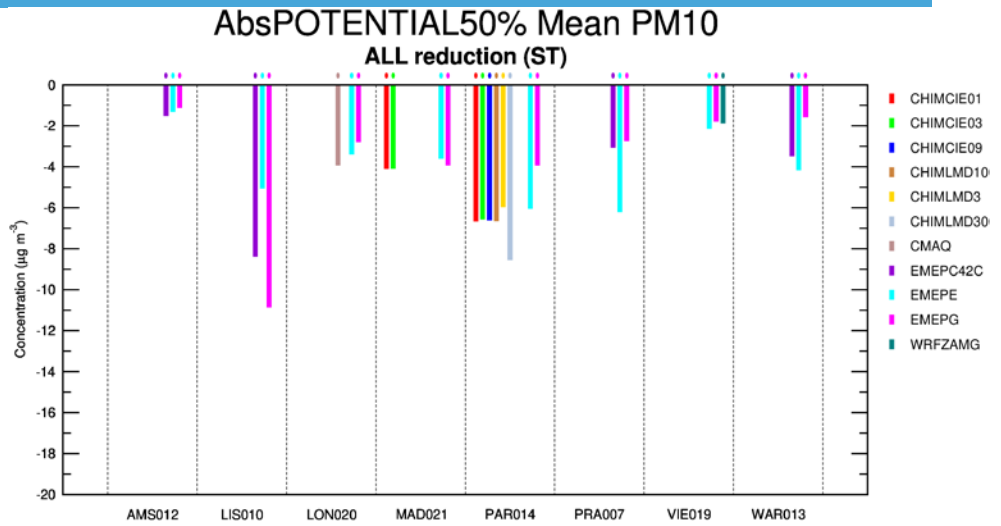
Absolute Potential	$\Delta C / \alpha$
Relative Potential	$\Delta C / \alpha C$
Potency	$\Delta C / \alpha E$

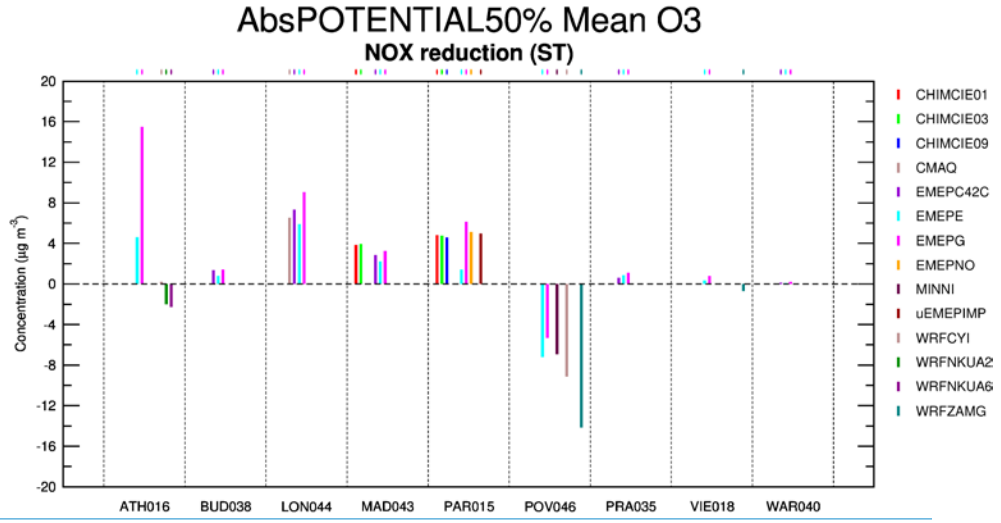
» Less variability on O3 base case concentrations than for PM10

» Variability of indicators
  » Very high, depending on the indicator
  » Lower variability on Potency

Higher variability on indicators than Base Case







BENCHMARKING PLATFORM – NEXT STEPS

Continuation of the ongoing exercise

- Goal:
  - Assessing the sensitivity of the model responses to emission reductions when input data (emissions, meteorology…) or the model itself is changed, with a focus on short-term model responses
  - Assessing the influence of various processes (e.g. meteorology, emissions, resolution…) in the observed differences

- Two papers to be submitted soon
- Development of specific exercizes to isolate the impact of:
  - Emissions
  - Resolution
  - Chemistry scheme
  - Numerical settings
- Go on engage new teams focussing first on episodes and existing cities and enlarge the dataset:
  - UOWM over Athens
  - Croatia Control over Zagreb
- Creation of an online version to increase the use of the platform
- We reflect on an indicator to position a model response of a given model among an ensemble of responses

IMPACT OF CHEMISTRY

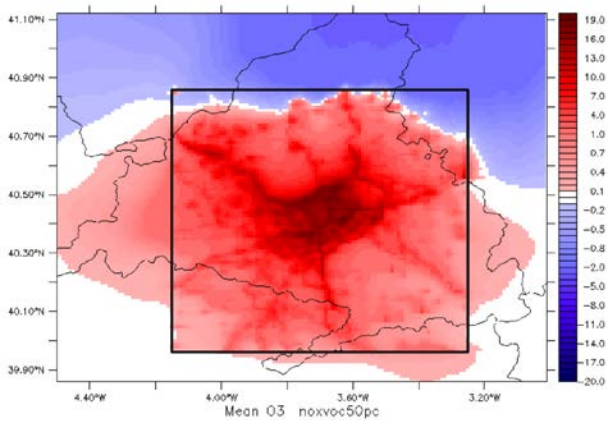
CHIMERE run by CIEMAT to highlight the role of chemistry

Absolute Potential on ST episodes

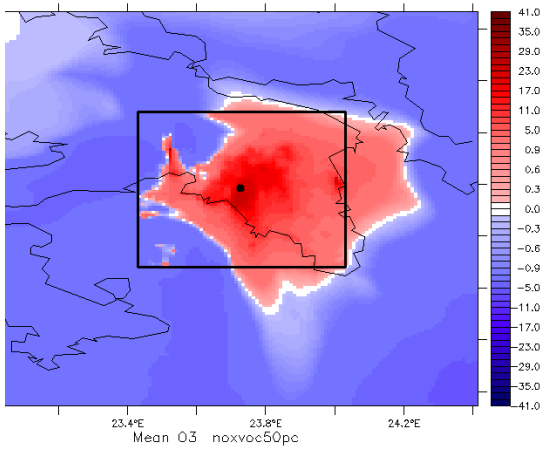
MELCHIOR

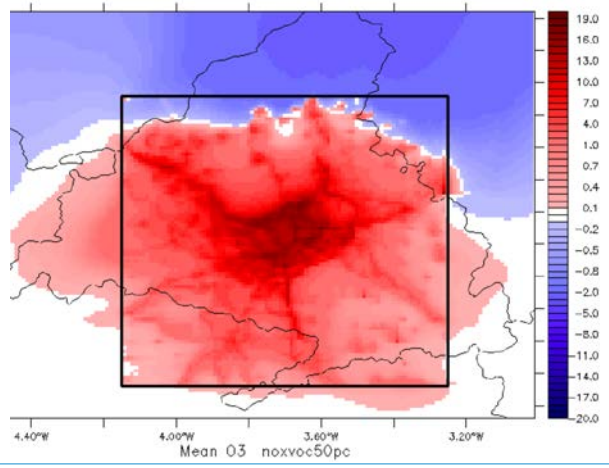
SAPRC07

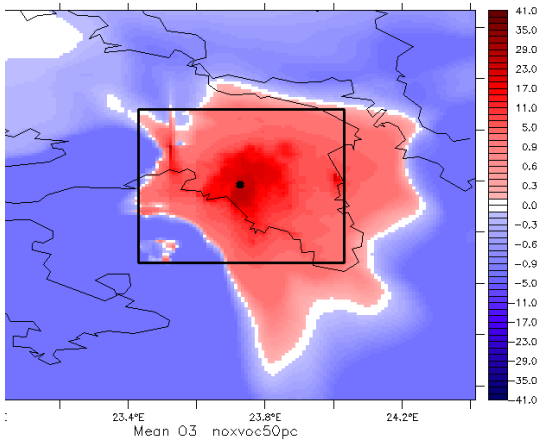
MADRID

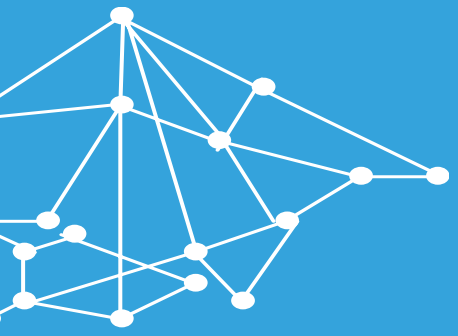


ATHENS

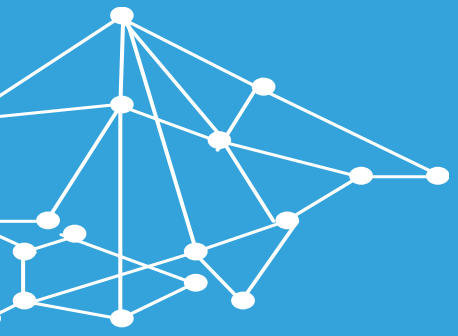








AQ/AC of CAMS Planning products



WG9: Link with the AAQD & road map

PLANNING UNDER THE (NEW) AAQD

Article 19 increases the effectiveness of air quality plans to ensure compliance with air quality standards as soon as possible. This will be achieved by (a) requiring air quality plans to be drawn up before air quality standards enter into force in cases of non-compliance prior to 2030, (b) specifying that air quality plans must aim to keep the exceedance period as short as possible, and in any case no longer than 3 years for limit values, and (c) mandating regular updates of air quality plans if they do not achieve compliance.

A final amendment will require that air quality plans analyse the risk of exceeding alert thresholds. This will lead to greater integration of short-term action plans – required to address alert threshold exceedances – with longer-term action plans, saving resources and improving the measures taken.

Article 21 further clarifies and strengthens the arrangements for cooperation between Member States to address breaches of air quality standards due to transboundary air pollution, notably requiring swift exchange of information between Member States and with the Commission.

6. Annex 1: Details of measures to reduce air pollution under point 5

(a) listing and description of all the measures set out in the air quality plan, including the identification of the competent authority in charge of their implementation;

(b) quantification of emission reduction (in tonnes/year) of each measure under point (a);

(c) timetable for implementation of each measure and responsible actors;

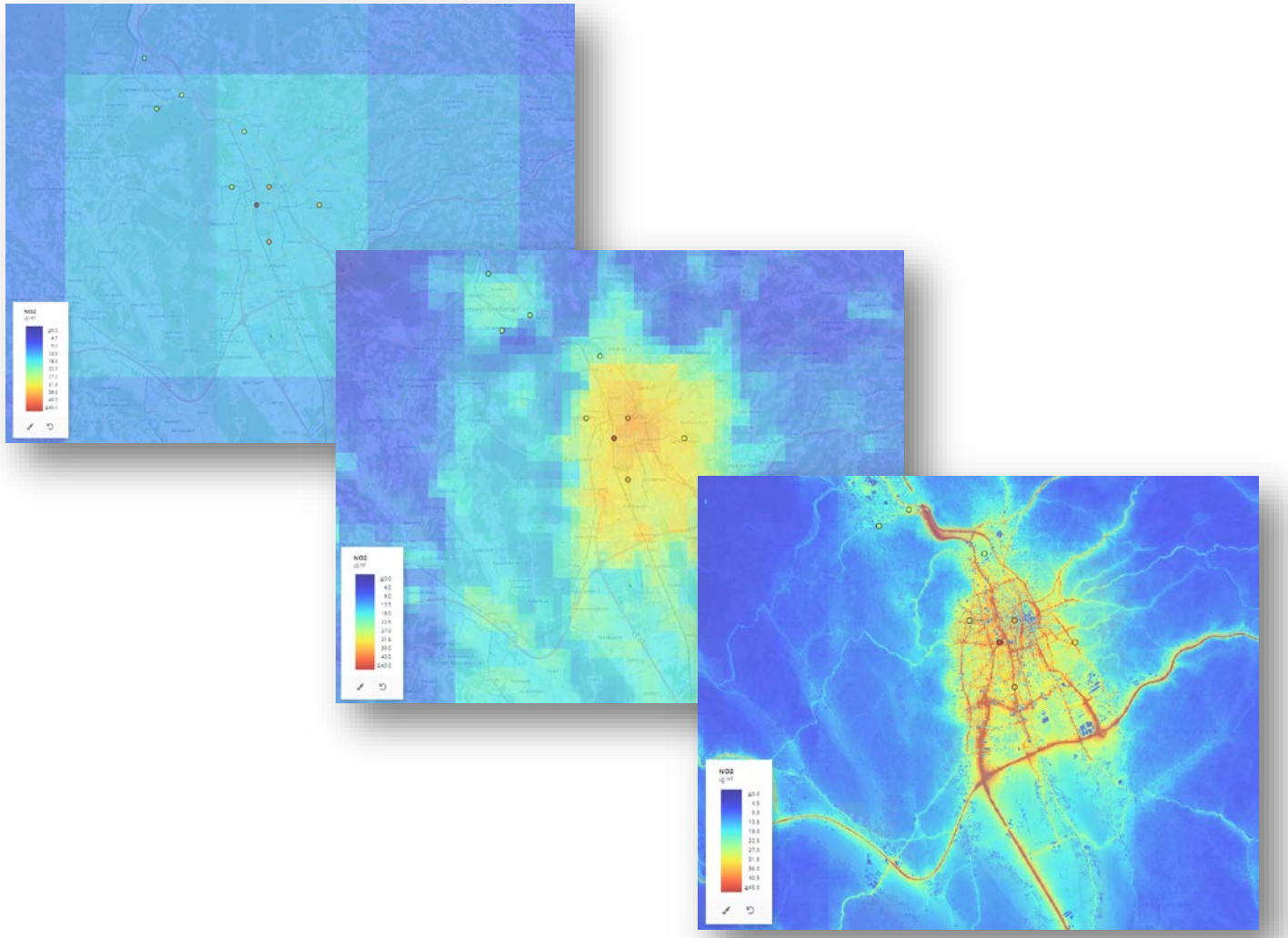
(d) estimate of the concentration reduction as a consequence of each air quality measure, in relation to the exceedance concerned;

(e) list of the information (including modelling and assessment results of measures) to reach the air quality standard concerned in accordance with Annex I.

- Ensure compliance as soon as possible:
  - Assessment of “hot spot” locations at all spatial scales
  - Assessment of absolute concentration levels in the future (Y+1 → Y+3; 2030)
- Integrate various spatial scales
- Integrate short-term and long term action plans
- Evaluate impact of individual measures on:
  - Quantification of emission reduction
  - Estimation of concentration reduction

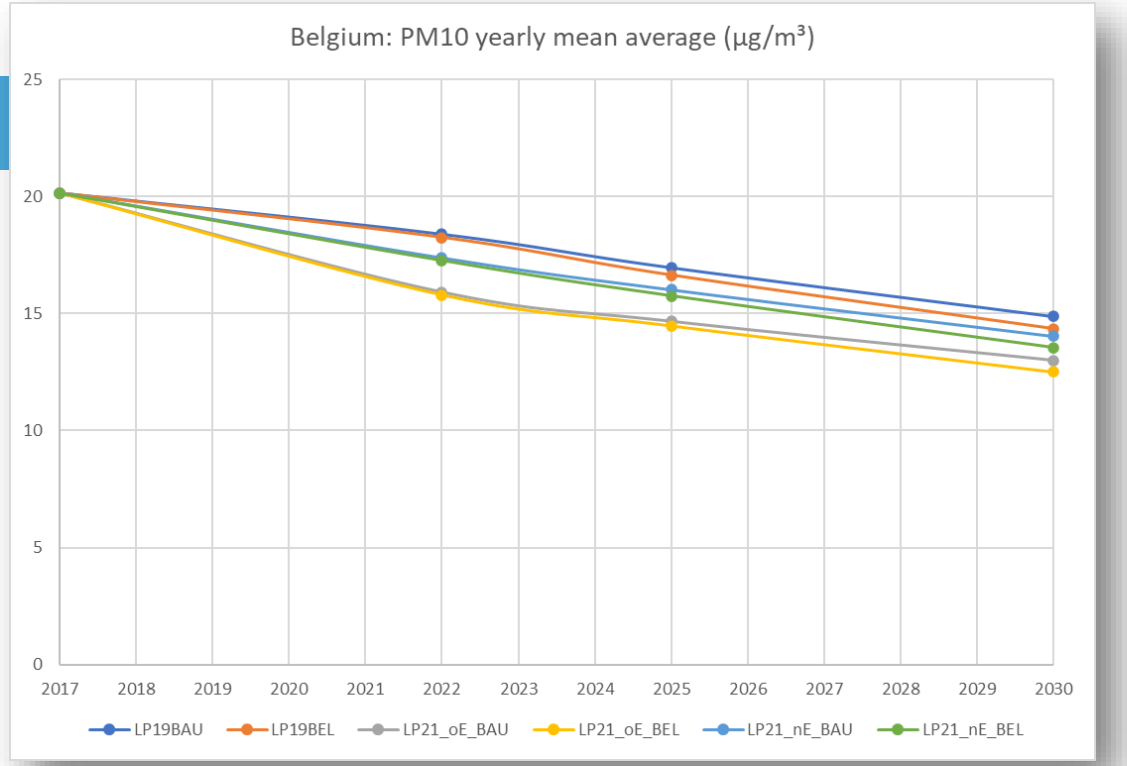
CHALLENGES FOR WG9

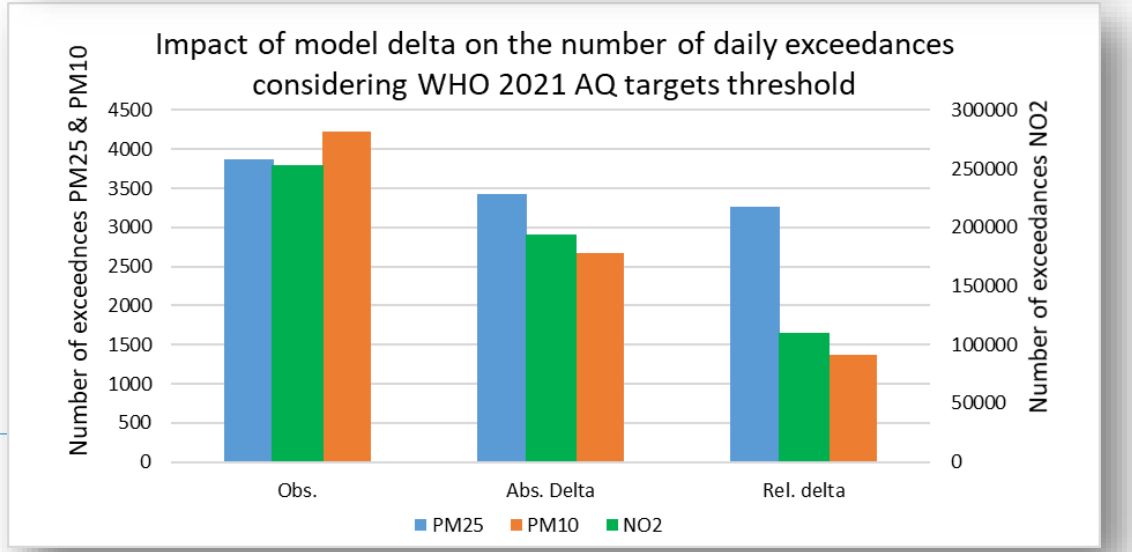
- How to couple all relevant spatial scales in an AQ Plan?
  - How to couple regional and local AQ models in planning mode?
  - How to integrate policies at EU, regional and local level in one AQ Plan?



CHALLENGES FOR WG9

- How to assess absolute concentration levels in the future?
  - Calibration of the base case
  - How to apply the ΔC on the measured base case? → absolute Δ, relative δ, combination…?





CHALLENGES FOR WG9

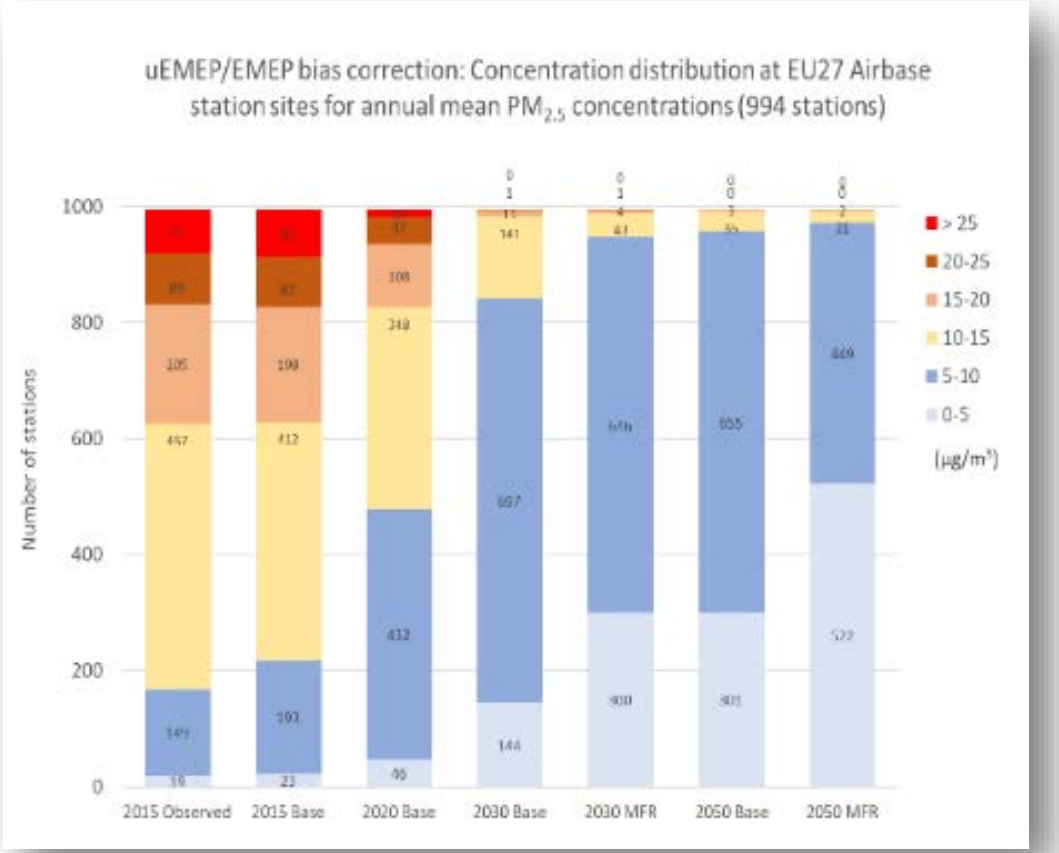
- How to deal with “as soon as possible”?
  - Model every Year+N up to compliance is reached?

- How to evaluate impact of individual measures?
  - Develop new strategies to easily assess impact of measures on future compliance

CHALLENGES FOR WG9

» How to take quantify the impact of EU and neighbouring Member State policies?

→ Can we identify a default set of future European emissions and background concentrations to be used in national/local AQ Plans?



CHALLENGES FOR WG9

- What is the natural background? Can we model down to 5µg/m³? What is the impact of natural sources? What is clean air?

- And… eventually the elephant in the room: How to validate $\Delta C = f(\Delta E)$?

CHALLENGES FOR WG9

- Evaluate consequences for e-Reporting of planning data
  - Provide input for the revision of the IPR → what is relevant/useful information to be reported?

- Providing overall support to model users (SHERPA, air quality models…) in their planning activities (measures, emission and model scenarios)
  - SHERPA
  - RIAT+
  - ATMO-Plan
  - …

CONCLUSION

- Air Quality Planning is becoming mature under the new AAQD
- Challenges for WG9 are substantial and clear
- But… the modelling community also became mature
- So…

Quality assurance, quality check and fitness for purpose of AQ planning modelling applications

- Assessing the sensitivity of the model responses to emission reductions when input data (emissions, meteorology…) or the model itself is changed, with a focus on short-term model responses
- Assessing the influence of various processes (e.g. meteorology, emissions, resolution…) in the observed differences
- Providing recommendations on the combined use of models and observations for planning purposes
- Evaluate consequences for e-reporting of planning data
- Providing overall support to model users (SHERPA, air quality models…) in their planning activities (measures, emission and model scenarios)

DISCUSSION: WHICH NEW TOPICS ARE MOST URGENT TO TACKLE?

- Coupling of spatial scales
- Calibration of the base case & absolute future conc.
- The “as soon as possible” requirement
- Integration of short- and long-term action plans
- Evaluation of impact of individual measures
- Definition of a generic EU data set (emissions, background concentrations)
- Contributions of natural sources
- Validation of $\Delta C = f(\Delta E)$