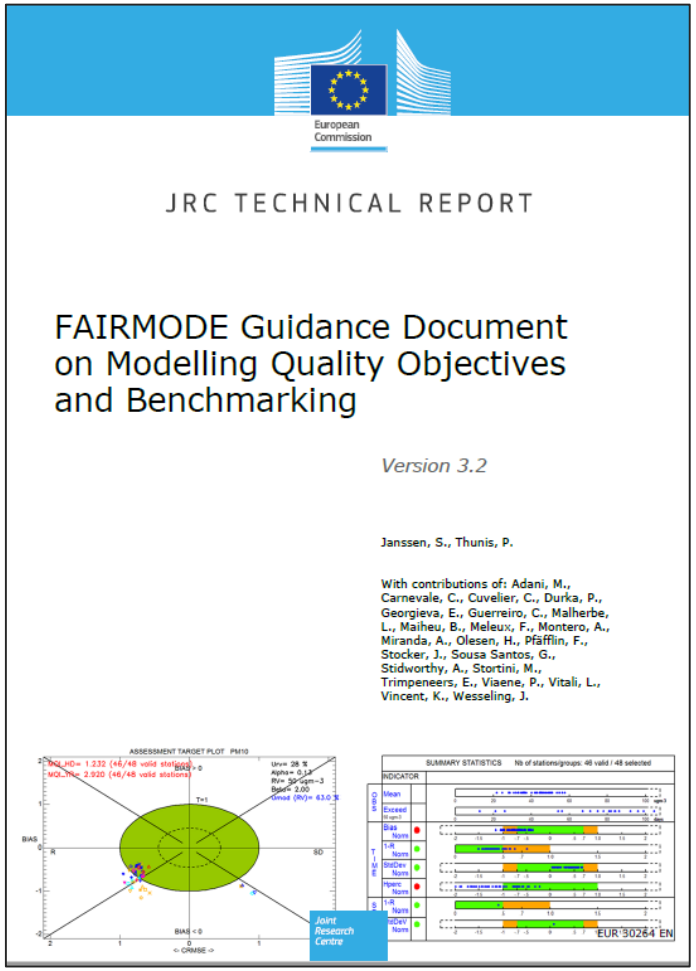
Current status on the QA/QC protocol

October 2021

Fairmode MQO Guidance document (regularly updated)



- Definition of proper modelling quality indicators and criteria to be fulfilled in order to allow sufficient level of quality for a given model application under the AAQD
- All MQI and MPC are based on comparison between modeled and measured values, normalized by the measurement uncertainty
- Presentation and explanation of templates for harmonised reporting of modelling results

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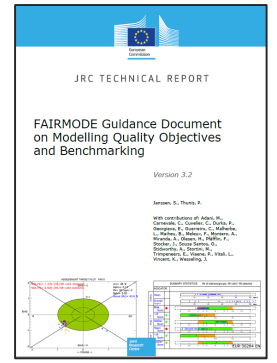
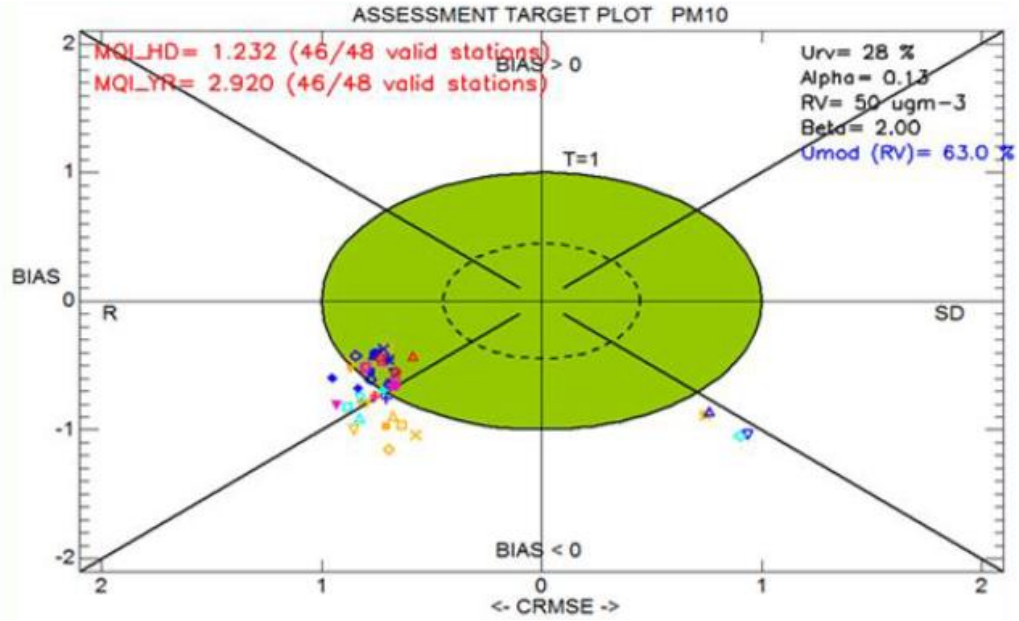
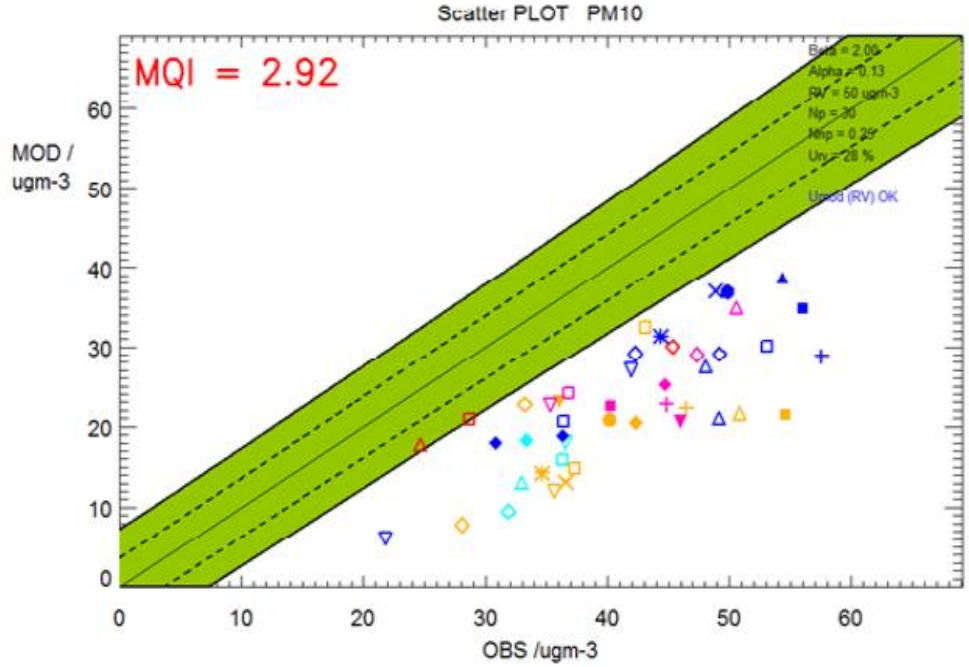
“Mandatory” MQI & MQO



Daily/hourly MQO



Yearly MQO



$$MQI_{HD} = \frac{RMSE}{\beta RMS_U} \leq 1 \quad AND \quad MQI_Y = \frac{BIAS}{\beta \bar{O}} \leq 1$$

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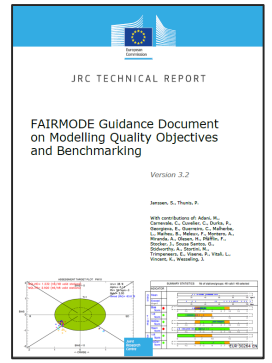
“Informative” MPI & MPC



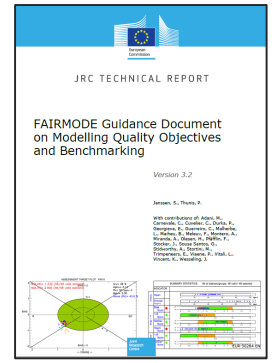
Daily/hourly MPI & MPCC

Temporal	Bias	$MPI = \frac{\lvert BIAS \rvert}{\beta RMS_U}$
	Correlation	$MPI = 2\sigma_O\sigma_M \frac{1-R}{(\beta RMS_U)^2}$
	Std. Deviation	$MPI = \frac{\sigma_M - \sigma_O}{\beta RMS_U}$
Spatial	Correlation	$MPI = 2\sigma_O\sigma_M \frac{1-R}{(\beta RMS_{\bar{U}})^2}$
	Std. Deviation	$MPI = \frac{\sigma_M - \sigma_O}{\beta RMS_{\bar{U}}}$

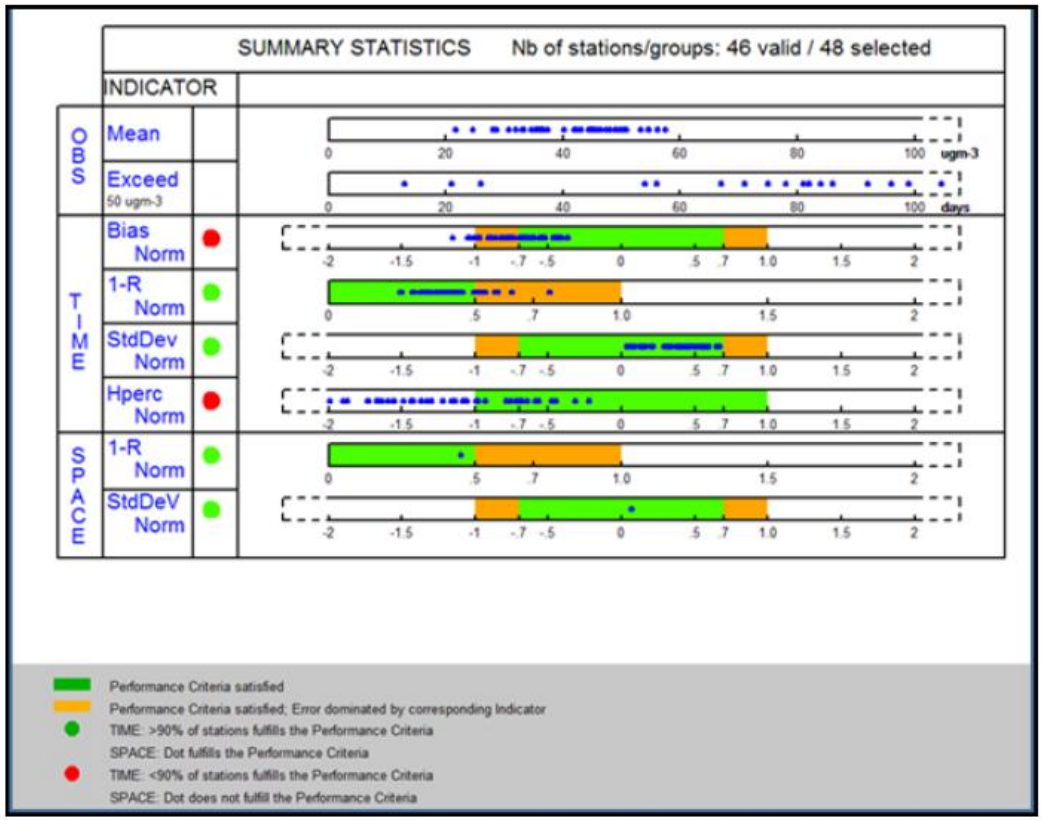
Yearly MPI & MPC

Spatial	Correlation	$MPI = 2\sigma_O\sigma_M \frac{1-R}{(\beta RMS_{\bar{U}})^2}$
	Std. Deviation	$MPI = \frac{\sigma_M - \sigma_O}{\beta RMS_{\bar{U}}}$

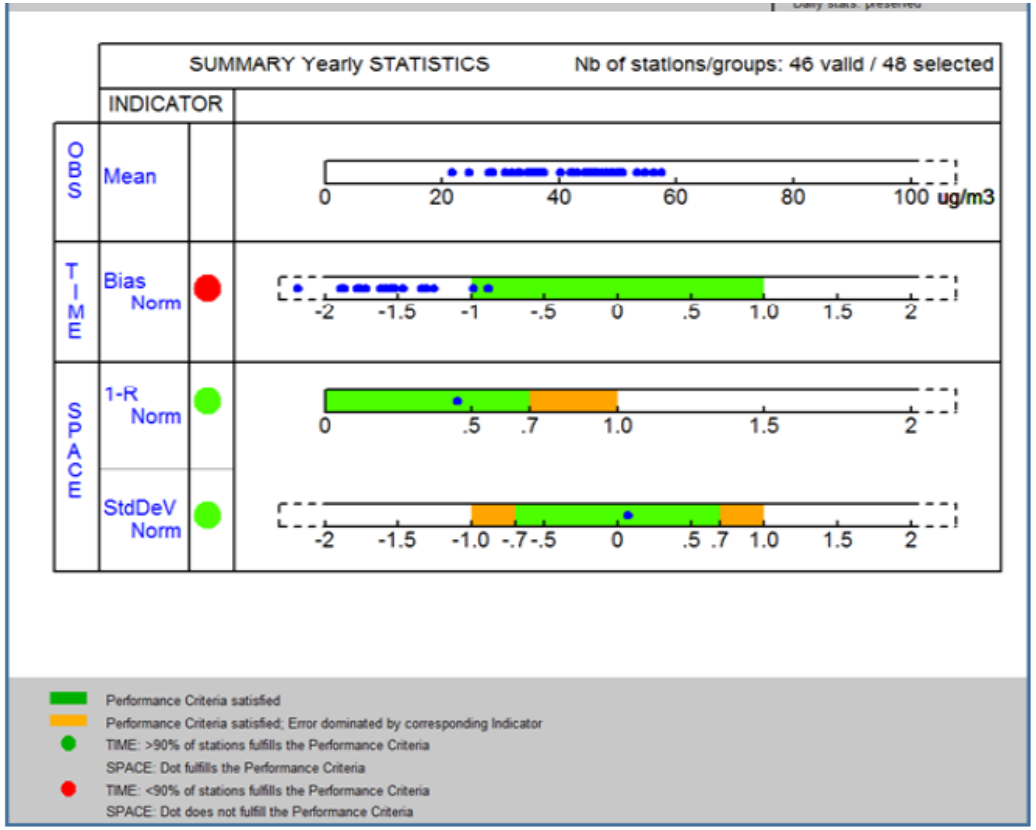
“Informative” MPI & MPC (graphical)



Daily/hourly MPC



Yearly MPC



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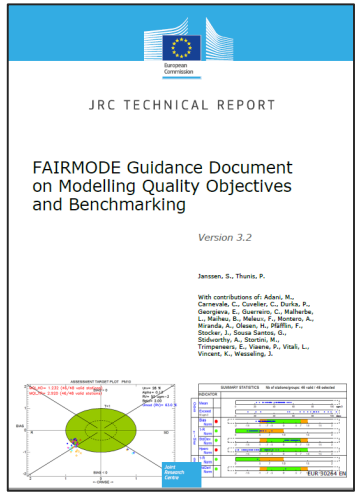
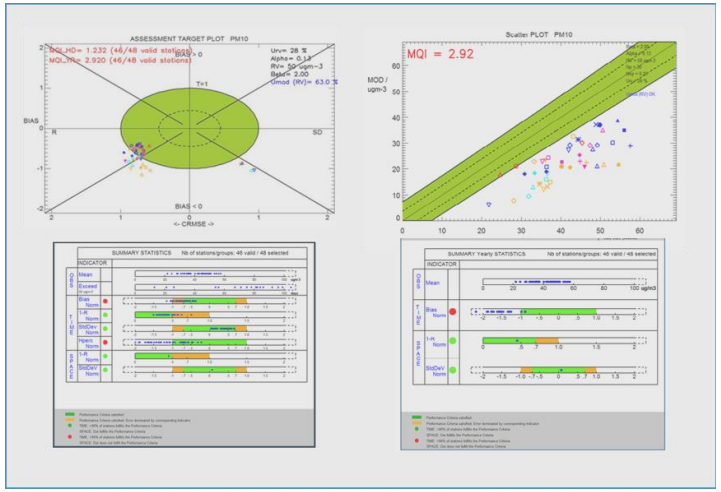
In conclusion





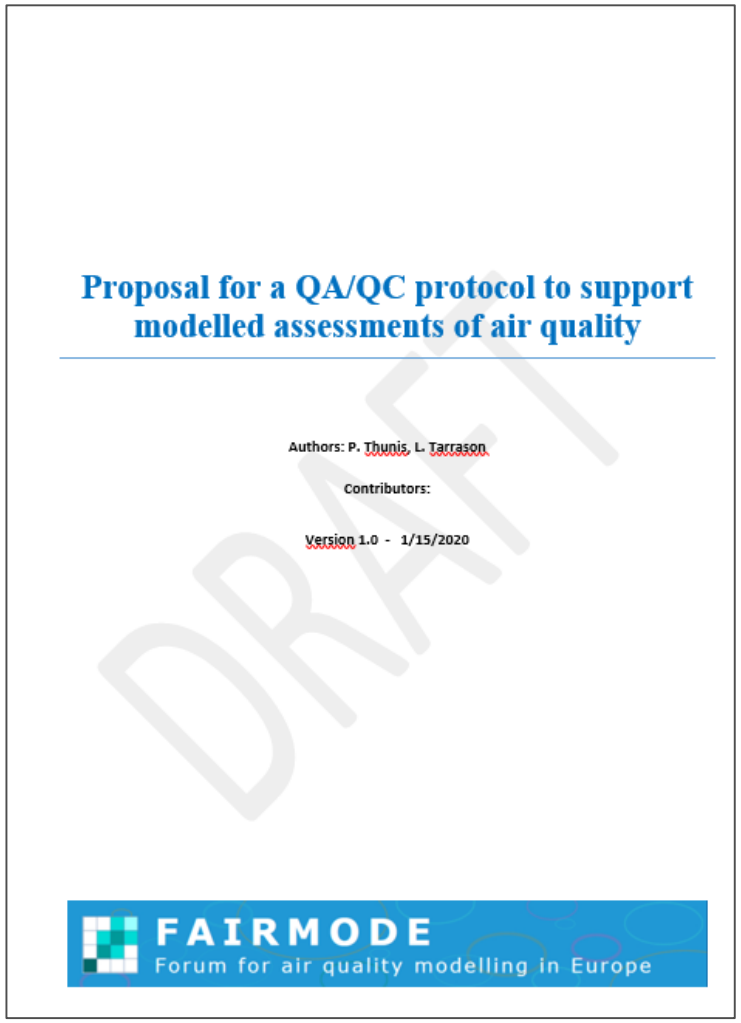
Is this sufficient to ensure quality of modelling applications?

The main drawback of the MQOs is that they provide a **single summary pass/fail** information.

It provides limited information on the capability of the model to reproduce **hot spot areas** (spatial variability) or the timing of the **pollution peaks** (temporal variability).

This key information for the AAQD is only partially addressed with the current MQO proposal.

Proposal for a complementary QA/QC protocol



Proposal for a QA/QC protocol to support modelled assessments of air quality

Authors: P. Thunis, L. Tarrason

Contributors:

Version 1.0 - 1/15/2020

DRAFT

FAIRMODE
Forum for air quality modelling in Europe

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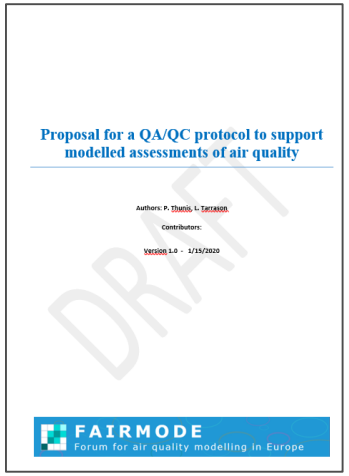
Complementary QA/QC protocol: purpose



The document proposes a QA/QC protocol to

- (1) ensure that sufficient information (metadata) is associated to the modelling results for their interpretation and

2nd Part of session

- (2) supplement the quality of the modelling results with different QA/QC tests to account for the variability of the air quality modelled situation.

1st Part of session

The proposed QA/QC protocol is NOT intended to be mandatory

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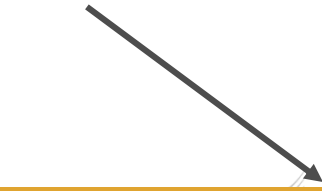
Complementary QA/QC: main steps

1. MQO - Passing the Modelling Quality objective
2. Spatial variability - How accurate is the representation of spatial variability?
   - Fulfilling the spatial Model Performance Criteria (MPC) as currently developed in CEN
   - Introducing a new Incremental assessment (rural vs. urban vs. street)
3. Temporal variability – Is the temporal variability well captured?
   - Fulfilling current percentile MPI for high concentrations
   - Introducing indicators for each station type to assess the seasonal, day/night and week/week-end behavior when appropriate
4. Input consistency - concerning meteorology, BC and **emissions**
5. Ex-post assessment
6. Multi-pollutant checks



See CT7 & CT2 Friday sessions

FAIRMODE QA/QC evaluation (indicators)

	Model Performance Indicator (MPI) (to be implemented)	Model Performance Criteria (MPC)
Urban - rural	$\mathrm{MPI} = \frac{INC^{model}_{urb}}{INC^{observed}}$ **Urban – rural gradients**	
traffic - urban	$\mathrm{MPI} = \frac{INC_{}}{}$ **Urban – Traffic gradients**	

Spatial indicators, normalised by measurement uncertainty

		Model Performance Indicator (MPI) (to be implemented)	Model Perf. Criteria (MPC)
Seasonal	Urban	$\mathrm{MPI} = \frac{SeasDiff^{mod}_{urban} - SeasDiff^{obs}_{urban}}{\beta RMS_U}$	
	Traffic	$\mathrm{MPI} = \frac{SeasD}{}$ **Seasonal variability**	
	Rural	$\mathrm{MPI} = \frac{SeasDiff_{rural} - SeasDiff_{rural}}{\beta RMS_U}$	
Week / weekend	Urban	$\mathrm{MPI} = \frac{WeekDiff^{mod}_{urban} - WeekDiff^{obs}_{urban}}{\beta RMS_U}$	
	Traffic	**Week-week-end variability**	
	Rural	$\mathrm{MPI} = \frac{WeekDiff^{mod}_{rural} - WeekDiff^{obs}_{rural}}{\beta RMS_U}$	
Day/night	Urban	$\mathrm{MPI} = \frac{DayDiff^{mod}_{urban} - DayDiff^{obs}_{urban}}{\beta RMS_U}$	
	Traffic	$\mathrm{MPI} = \frac{Dayl}{}$ **Day-night variability**	
	Rural	$\mathrm{MPI} = \frac{DayDiff^{mod}_{rural} - DayDiff^{obs}_{rural}}{\beta RMS_U}$	

Temporal indicators, normalised by measurement uncertainty

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Agenda

1. Feedback session
   - EMEP (Eivind)
   - IRCEL (Elke)
   - CERC (Jenny)
   - Discussion
2. Metadata associated to the MQO
   - Introduction (Leonor)
   - Discussion (All)

Thank-you

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