DELTA tool: Updates

A tool to evaluate and benchmark AQ model performances
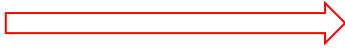
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Background & Outline

FAIRMODE is a Forum for Air Quality Modeling created for exchanging experience and results from air quality modeling in the context of the Air Quality Directives (AQD) and for promoting the use of modeling for regulatory purposes in a harmonized manner between Member States

➤ WG1: Assessment   ⟶   Delta tool

➤ WG2: Emissions

➤ WG3: Source apportionment

➤ WG4: Planning

Acknowledgements to all Fairmode participants who greatly contribute to the development of these tools.

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Background

> DELTA is a JRC tool developed in the frame of FAIRMODE WG1 (Assessment) to support modelers in the evaluation of model performances

> The main objective is to identify a common scale for model evaluation (DELTA serves as a tool to support this process)

> Input: observed and modelled surface time series at selected stations (independence of scale and model type)

> Model quality objectives and performance criteria are one important element of the evaluation methodology

Background
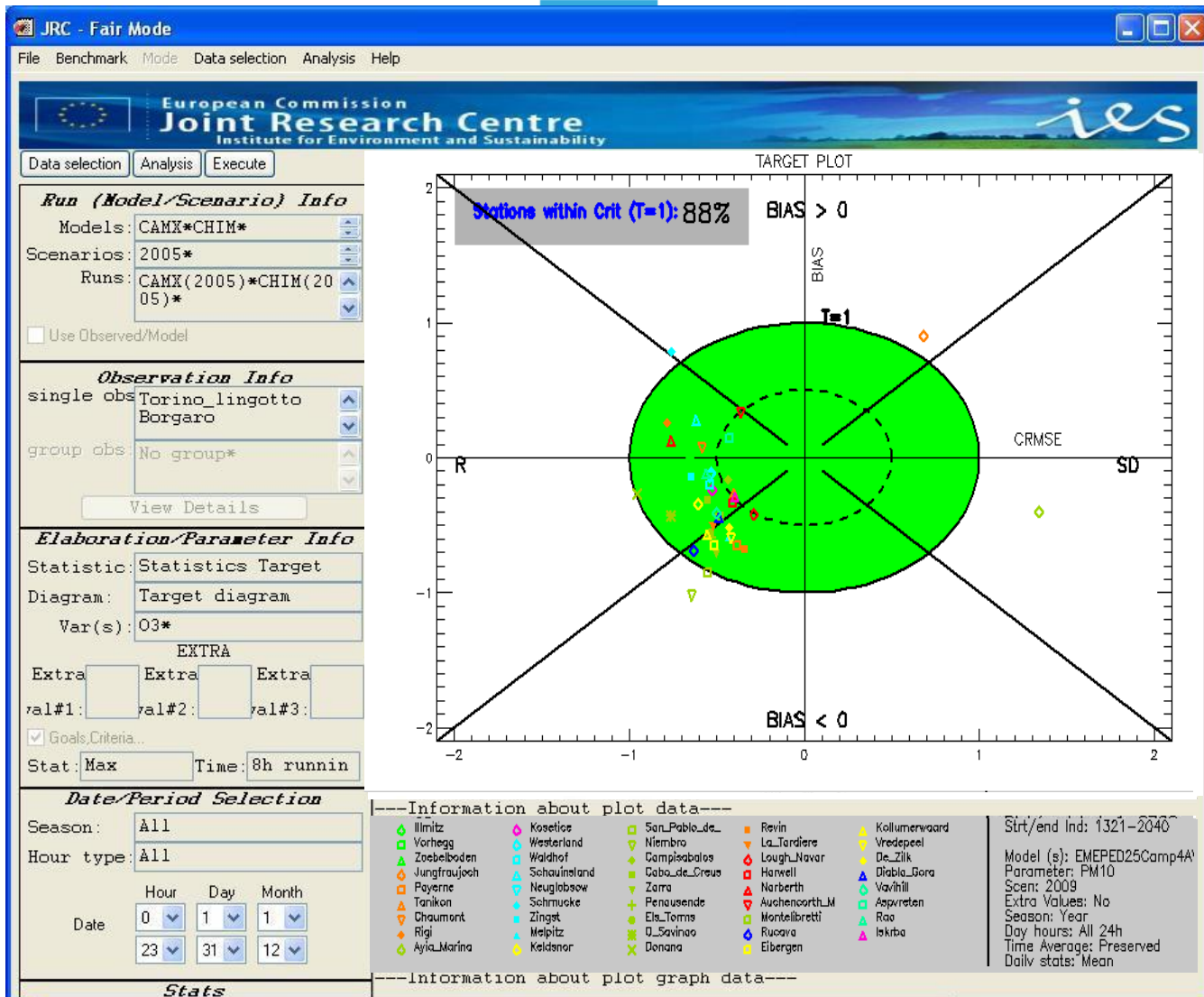
Performance criteria and MQO

- Performance criteria and Model Quality Objective (MQO) are set for some key statistical indices on the basis of observation uncertainty.

- A simplified formulation of the observation uncertainty has been derived for a series of variables (PM10, O3…).

- Composite diagrams have been developed to facilitate the assessment of model performances (Target diagram)

Indicator	Threshold	
RMSE	$RMSE < 2RMS_U$	MQO
Bias	$|BIAS| \leq 2RMS_U$	Perf. Crit.
Correlation	$R \geq 1 - 2(RMS_U/\sigma_O)^2$	Perf. Crit.
Standard dev.	$|\sigma_M - \sigma_O| \leq 2RMS_U$	Perf. Crit.
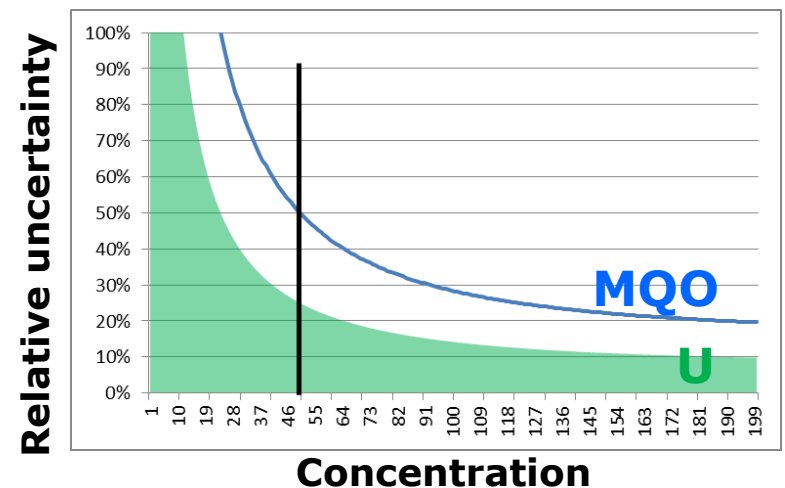
Performance criteria and MQO

- Robustness of the uncertainty parameters (tests on extended datasets)
- Inclusion of MQO for new species (PM2.5) based on extended dataset
- Inclusion of MQO for other variables (first guess – for test purposes)
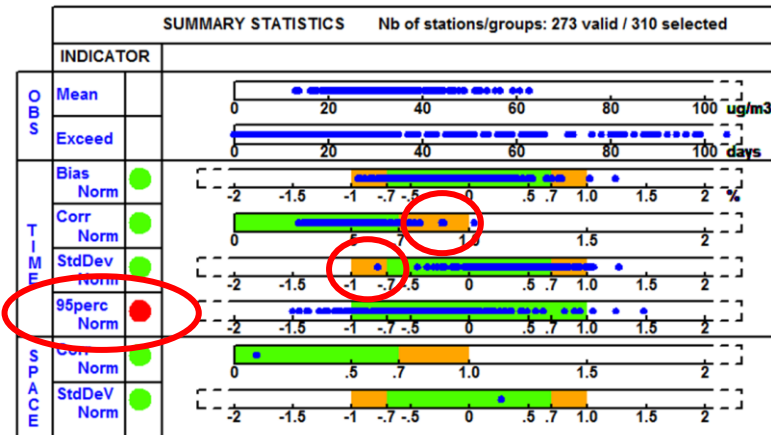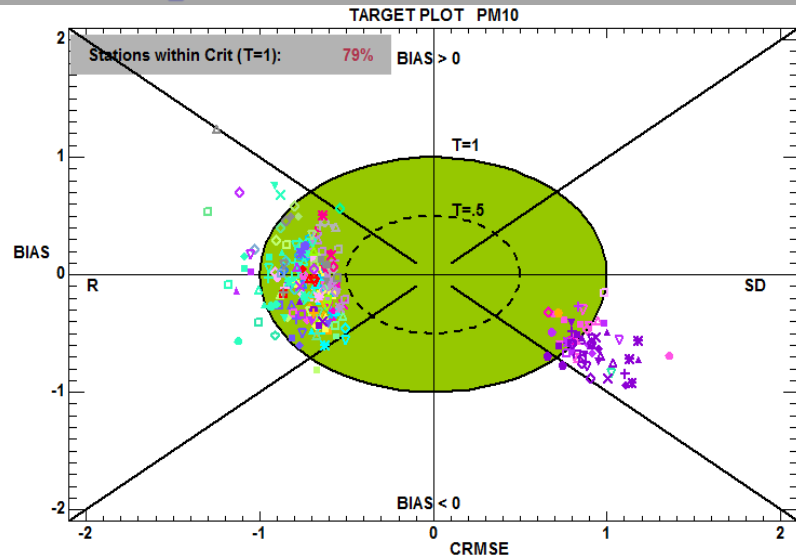

Estimated relative uncertainties (U)

Estimated absolute uncertainties
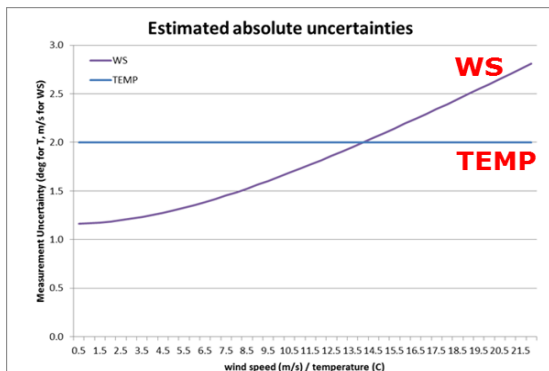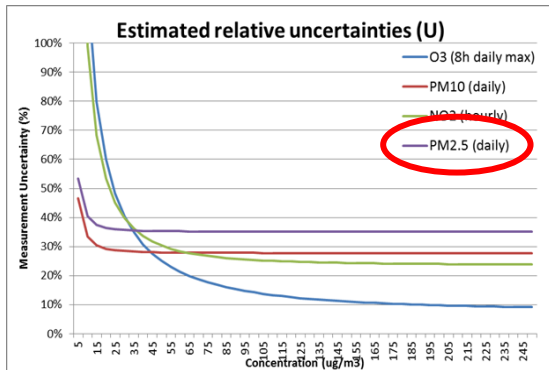
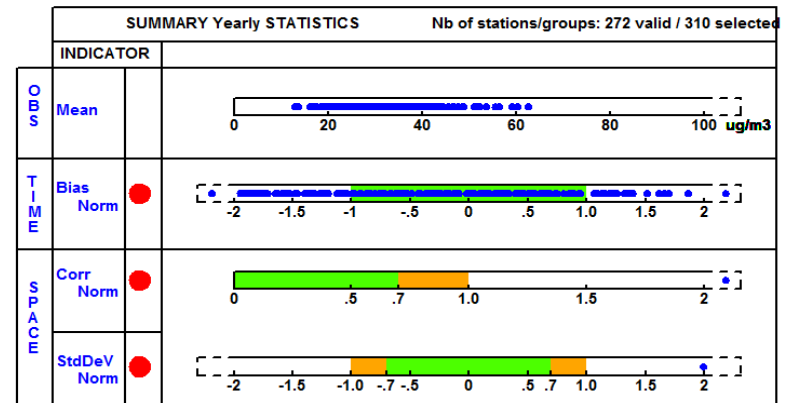|	k	u_r^{LV}	RV	α	N_p	N_{np}
NO2	2.0	0.120	200	0.040	5.2	5.5
O3	1.4	0.090	120	0.620	NA	NA
PM10	2.0	0.140	50	0.018	40	1
PM25	2.0	0.180	25	0.050	40	1
WS	2.0	0.130	5	0.800	NA	NA
TEMP	2.0	0.025	25	1.000	NA	NA
SO4	2.0	0.150	7	0.018	40	1
NO3	2.0	0.150	8	0.018	40	1
NH4	2.0	0.225	4	0.018	40	1
EC	2.0	0.375	5	0.018	40	1
TOM	2.0	0.375	10	0.018	40	1

Performance reports & Target diagram

Hourly PM10

Yearly PM10
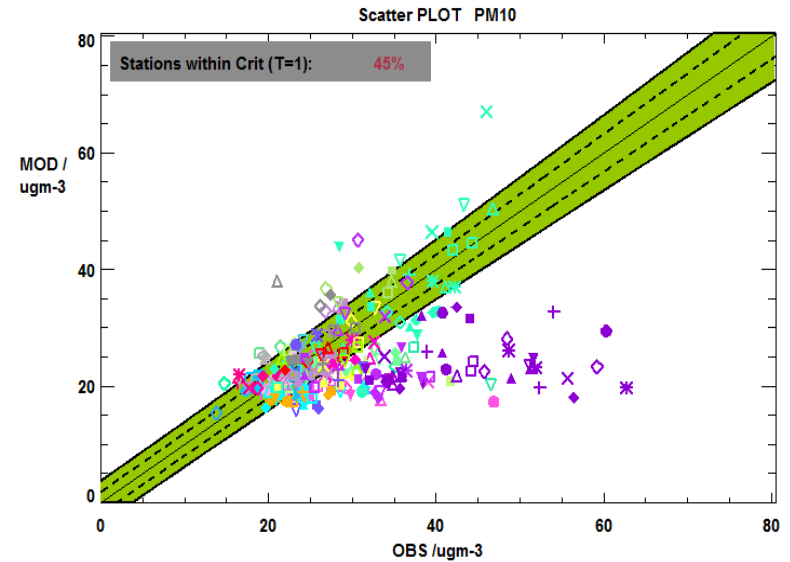
Geomap: a target companion

Other and next updates

- Improved management of input data (multiple datasets)

- Include information (OU param, version) on diagrams

- Improved quality control and error messaging

- Update the design and naming of menu

- Review of user's guide

- Adapt the methodology for forecast applications

- Adapt the methodology for data-assimilated results

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➢ WG4: Planning

Benchmarking for Planning applications

❑ <u>Dynamic evaluation approach</u>: Focus on model reponses resulting from a change in a given model input (emissions, meteorology). We here focus on the response to emission changes (planning)

❑ Challenge: Difficulty to identify adequate measurements for the assessment of the model performances

❑ Three possible approaches identified

   ❑ Trends analysis
   ❑ Segregation periods
   ❑ Model inter-comparison → common template (indicators and diagrams)

Benchmarking for Planning applications

Trends analysis
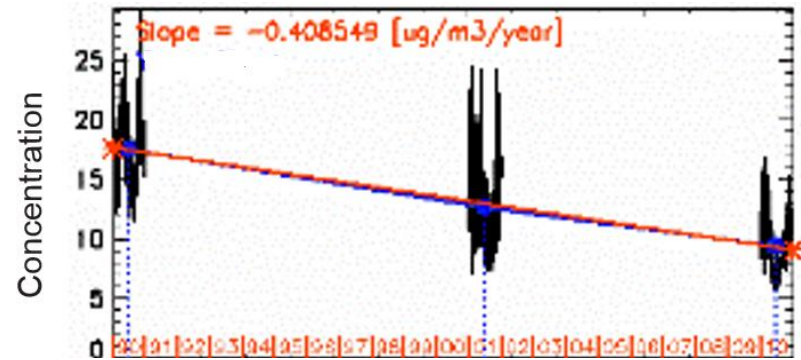
+ measurements

— Effects of meteo and emissions mixed
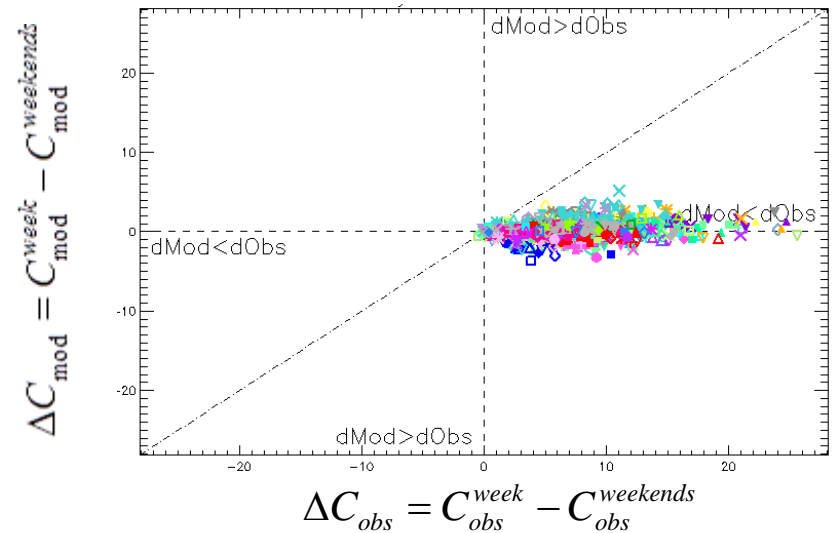Intensive work required
(measurements, emissions…)

Segregation periods

+ Measurements
Easy to set-up
Meteo and emissions partly dissociated

— No control on abatement intensity

$$\Delta C_{obs} = C_{obs}^{week} - C_{obs}^{weekends}$$

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Benchmarking for Planning applications

European Commission

Intercomparison → **Need for a common template**

+
Relatively easy set-up
Dimensionless indicators → facilitating inter-comparison
Control of abatement
Effect of emission isolated
Understanding of model processes

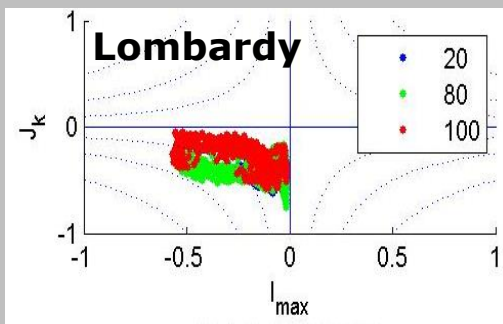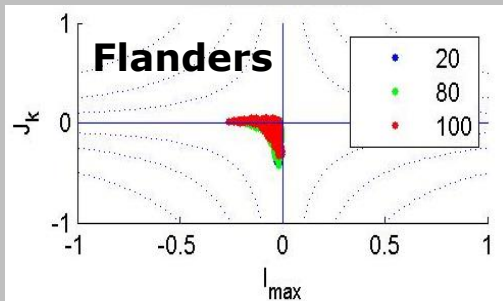No measurements
Relatively easy set-up
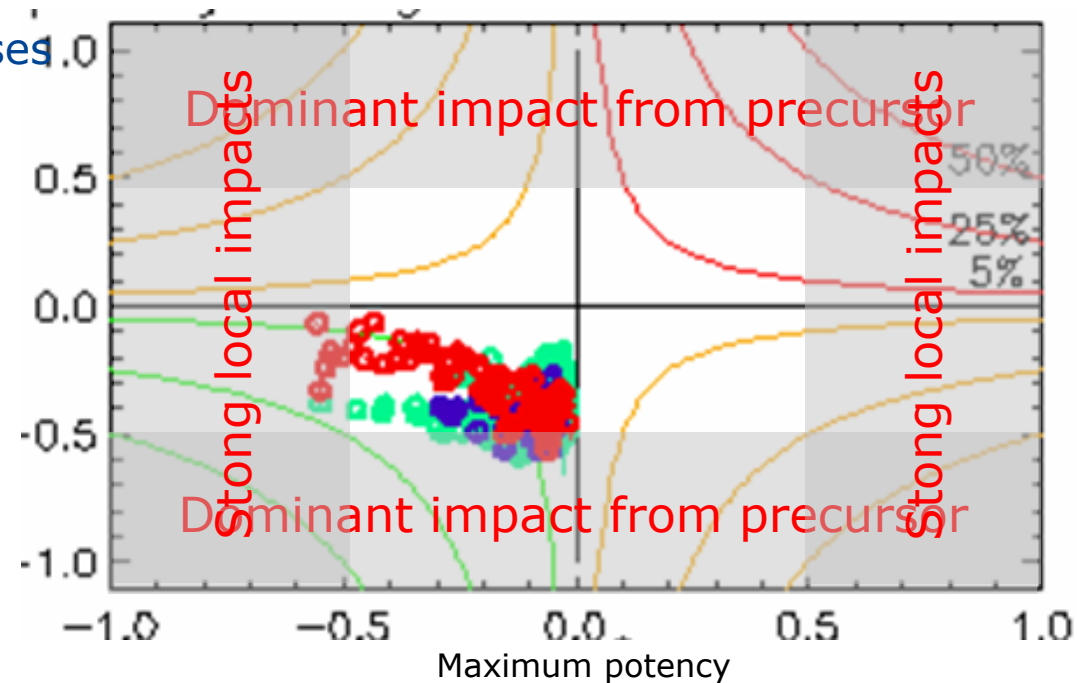
Thunis, P. and A. Clappier, 2014: Indicators to support the dynamic evaluation of air, Atmos. Environment, quality models, 10.1016/j.atmosenv.2014.09.016
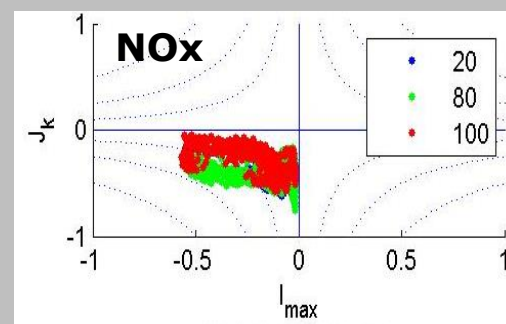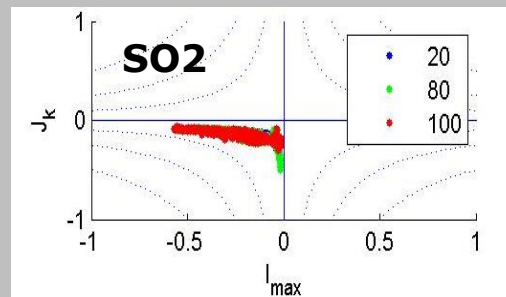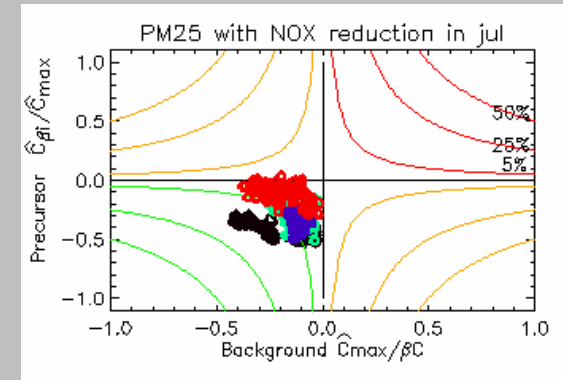
Benchmarking for Planning applications
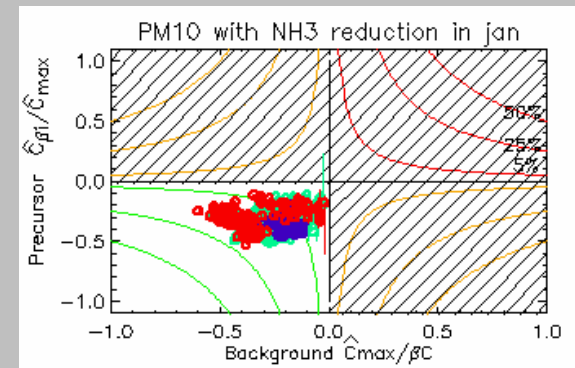

Location vs. location

Precursor vs. precursor

Model vs. model

Robustness & Non-linearity

Conclusions

➢ DELTA tool (Assessment) 4.0 will be delivered in Sept 2014 and version 4.1 in December 2014

➢ Planning tool component will be available to Fairmode WG4 participants by end Sept 2014

➢ Emission tool component to be discussed in October and possibly released by the end of the year to Fairmode WG2 participants

http://fairmode.jrc.ec.europa.eu/

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