

Differences between new & old MQO DELTA-TOOL v5.2 vs v5.4: Oslo case

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FAIRMODE
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Changes in U

Short-term uncertainty:

$$U^2 = U_{RV}^2 (1 - \alpha^2) C^2 + U_{RV}^2 \alpha^2 R V^2$$

Long-term uncertainty:

$$U^2 = \frac{U_{RV}^2 (1 - \alpha^2) C^2}{N_p} + \frac{U_{RV}^2 \alpha^2 R V^2}{N_{np}}$$

	β	U_r^{RV}	RV	α	N_p	N_{np}
→ NO₂	2	0.25	200 µg/m ³	0.20	5.2	5.5
O₃	2	0.18	120 µg/m ³	0.79	11	3
→ PM₁₀	2	0.28	50 µg/m ³	0.13	30	0.25
→ PM_{2.5}	2	0.36	25 µg/m ³	0.30	30	0.25

Daily / Hourly MQO & MPC

	MQI	MQO	MPI	MPC
RMSE	$\frac{RMSE}{\beta RMS_U}$	$MQI \leq 1$		
BIAS			$\frac{ \bar{M} - \bar{O} }{\beta RMS_U}$	
R			$\frac{\sqrt{2\sigma_O\sigma_M(1-R)}}{\beta RMS_U}$	$MPI \leq 1$
SD			$\frac{ \sigma_M - \sigma_O }{\beta RMS_U}$	
Spatial R			$\frac{\sqrt{2\sigma_O\sigma_M(1-R)}}{\beta RMS_{\bar{U}}}$	$MPI \leq 1$
Spatial SD			$\frac{ \sigma_M - \sigma_O }{\beta RMS_{\bar{U}}}$	
Exceedances			$\frac{ M_{perc} - O_{perc} }{\beta (O_{perc})}$	$MPI \leq 1$

Yearly MQO & MPC

	MQI	MQO	MPI	MPC
RMSE	$\frac{ \bar{M} - \bar{O} }{\beta RMS_{\bar{U}}}$	$MQI \leq 1$		
Spatial R			$\frac{\sqrt{2\sigma_O\sigma_M(1-R)}}{\beta RMS_{\bar{U}}}$	$MPI \leq 1$
Spatial SD			$\frac{ \sigma_M - \sigma_O }{\beta RMS_{\bar{U}}}$	

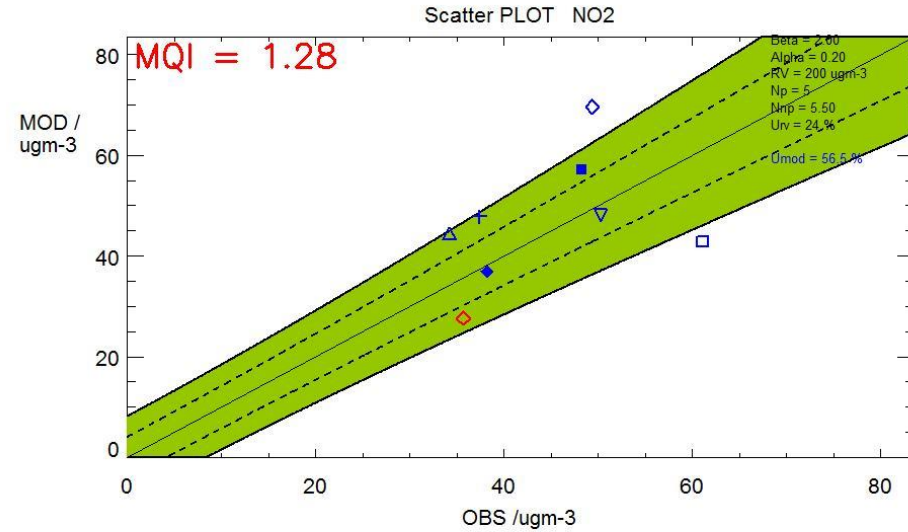
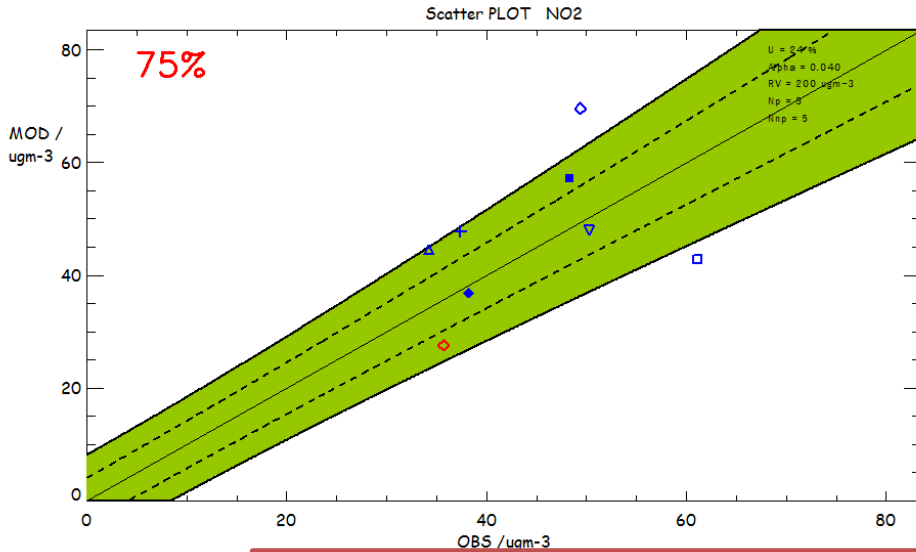
- Both short-term and long-term MQI are now calculated for the 90th percentile station and used as performance indicator.

The AQD approach is currently used, i.e. the MQO must be fulfilled for at least 90% of the available stations.

Changes in MQO

		LV µg/m ³	AQD			Fairmode	
			DQO %	MQO %	MQO µg/m ³	MQO %	MQO at LV µg/m ³
NO₂	Hour	200	15%	50%	100	48%	96
	Year	40	15%	30%	12	29%	12
O₃	8h	120	15%	50%	60	26% → 36%	31 → 43
PM₁₀	day	50	25%	-	-	56%	28
	year	40	25%	50%	20	13% → 20%	5 → 9
PM₂₅	Day	25	25%	-	-	72%	18
	year		25%	50%	12.5	20% → 24%	5 → 6

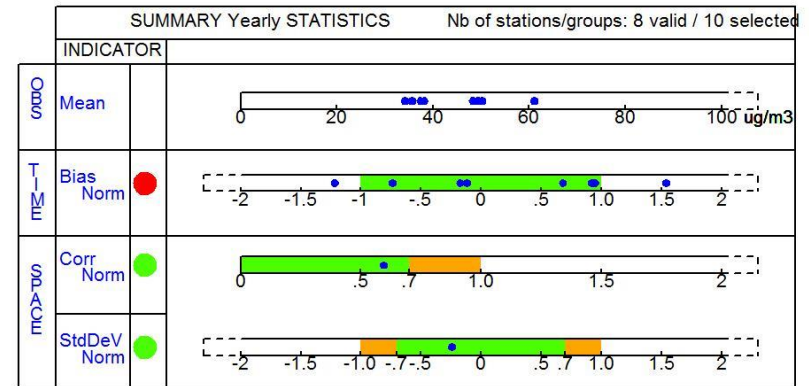
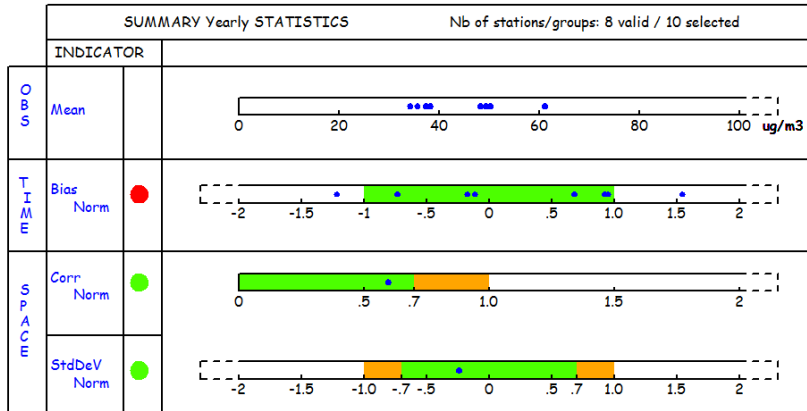
Benchmarking (NO₂ annual means $\mu\text{g}/\text{m}^3$)



Same results in v5.2 and v5.4!

Strt/end Ind: 1-8760
Model (s): EPISODE
Parameter: NO2
Scen: 2013
Extra Values: No
Season: Year
Day hours: All 24h
Time Average: Preserved
Daily stats: preserved

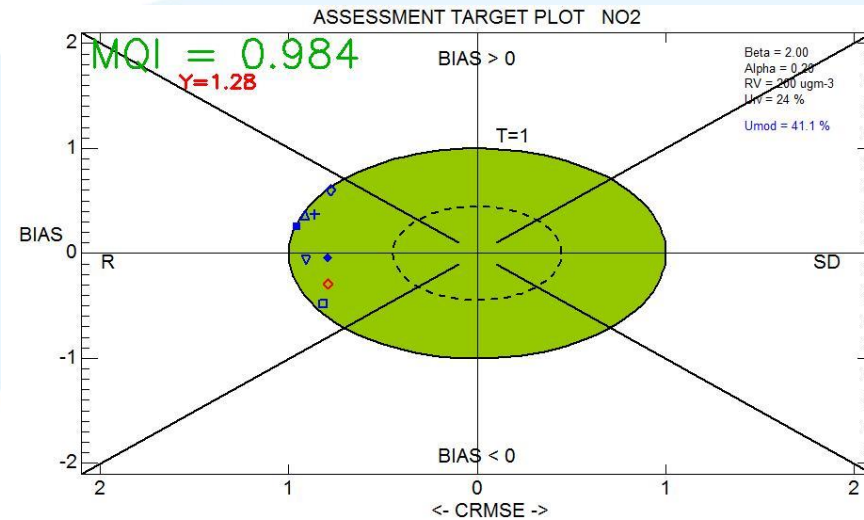
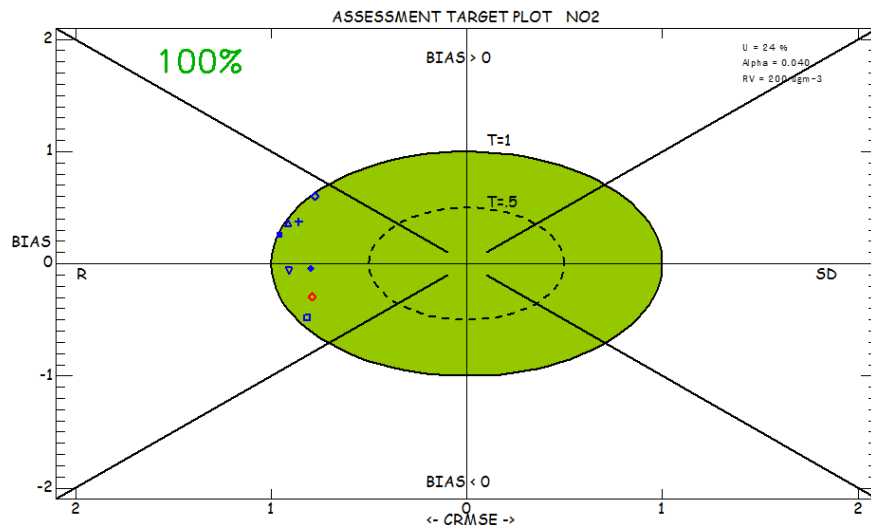
- Alnabru
- BygdoyAlle
- Grendland
- Hjornes
- Krievseien
- Manglerud
- Aalebergveien
- E18_Sandvika



■ Performance Criteria satisfied
■ Performance Criteria satisfied; Error dominated by corresponding Indicator
● TIME: >90% of stations fulfills the Performance Criteria
● SPACE: Dot fulfills the Performance Criteria
● TIME: <90% of stations fulfills the Performance Criteria
● SPACE: Dot does not fulfill the Performance Criteria

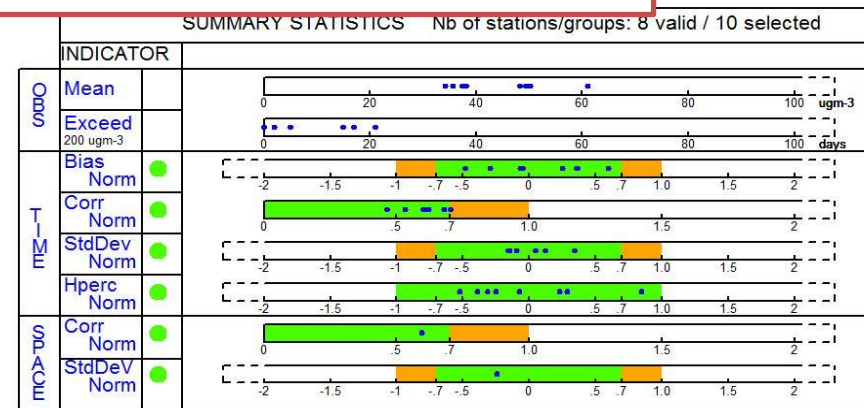
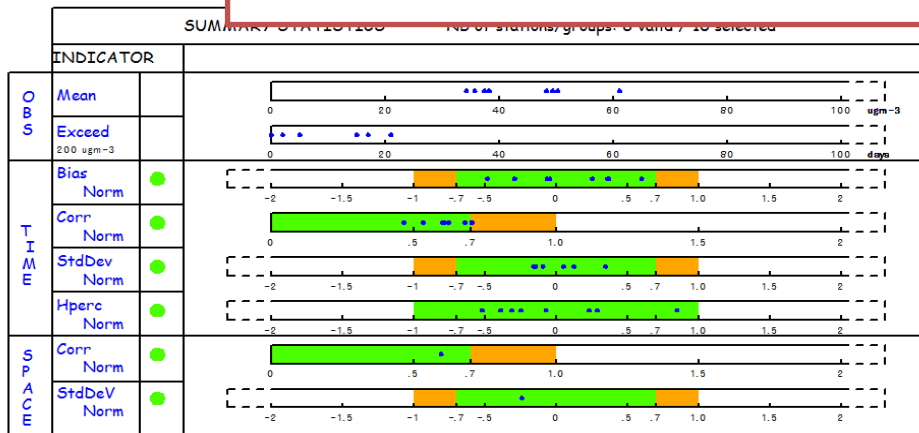
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● SPACE: Dot does not fulfill the Performance Criteria

Benchmarking (NO₂ hourly values $\mu\text{g}/\text{m}^3$)



Same results in v5.2 and v5.4!

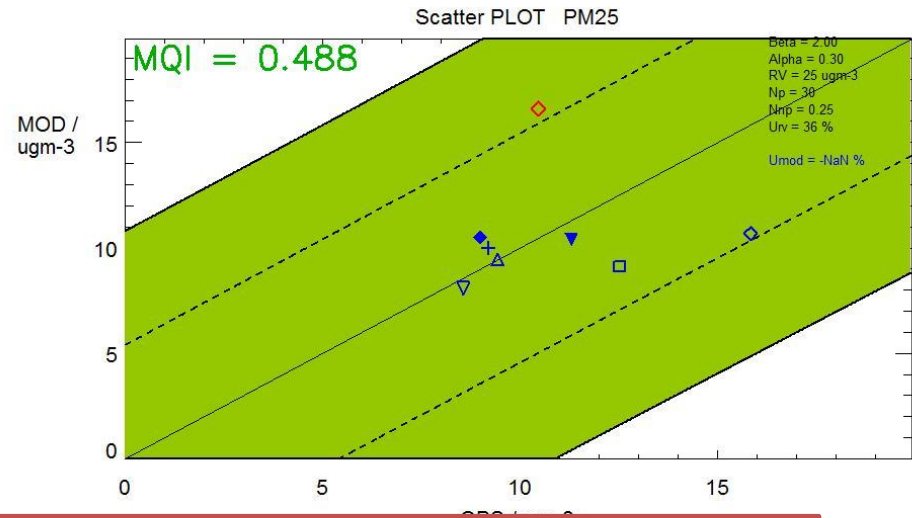
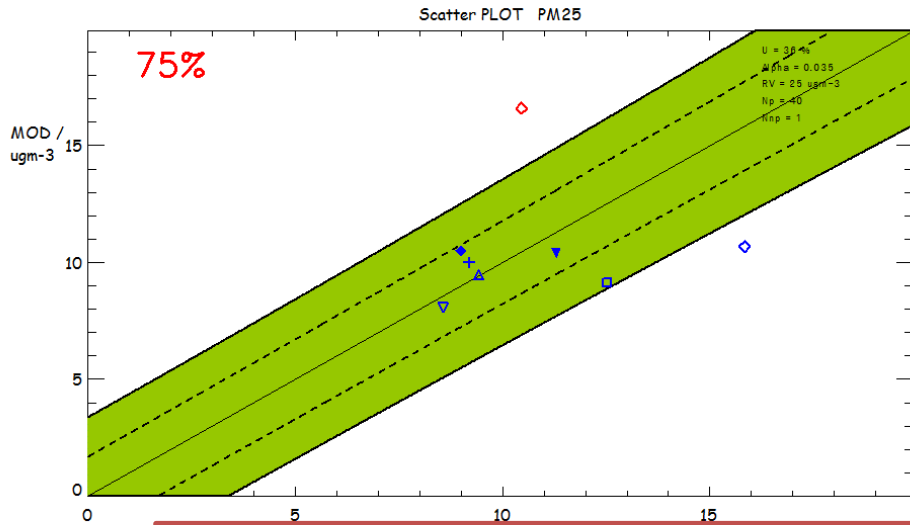
Strt/end Ind: 1-8760
 Model (s): EPISODE
 Parameter: NO2
 Scen: 2013
 Extra Values: No
 Season: Year
 Day hours: All 24h
 Time Average: Preserved
 Daily stats: preserved



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Benchmarking (PM_{2.5} yearly conc. $\mu\text{g}/\text{m}^3$)



From not fulfilling the MQO in v5.2 to fulfilling in v5.4!

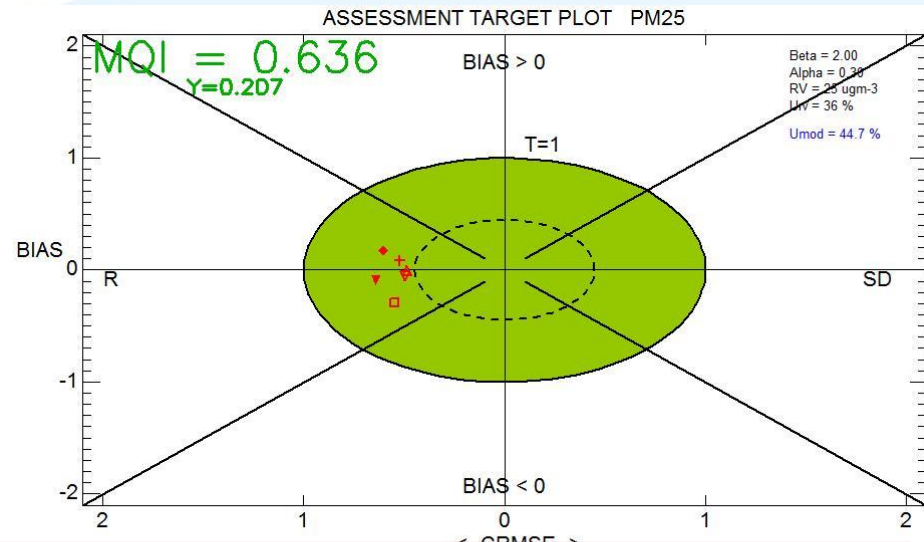
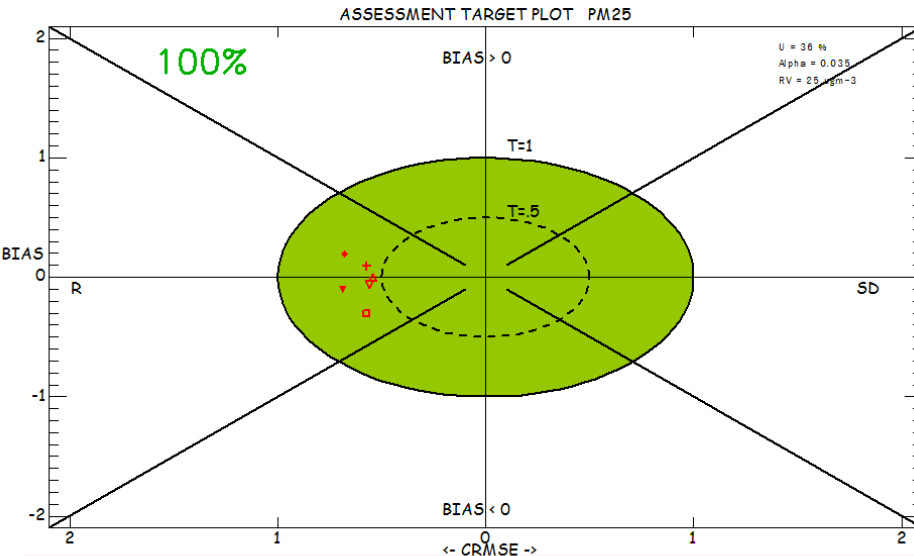
INDICATOR		
OBS	Mean	
	Bias Norm	
SPACE	Corr Norm	
	StdDeV Norm	

Summary Yearly STATISTICS

Nb of stations/groups: 6 valid / 11 selected

INDICATOR		
OBS	Mean	
	Bias Norm	
SPACE	Corr Norm	
	StdDeV Norm	

Benchmarking (PM_{2.5} daily conc. $\mu\text{g}/\text{m}^3$)



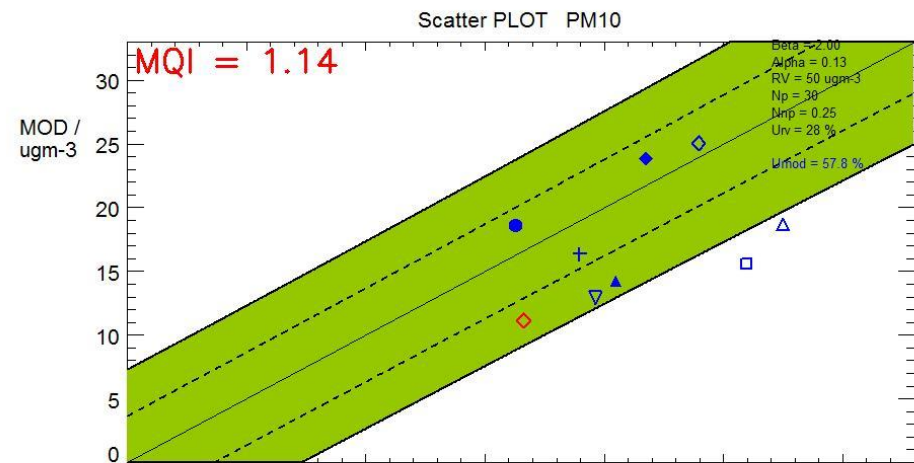
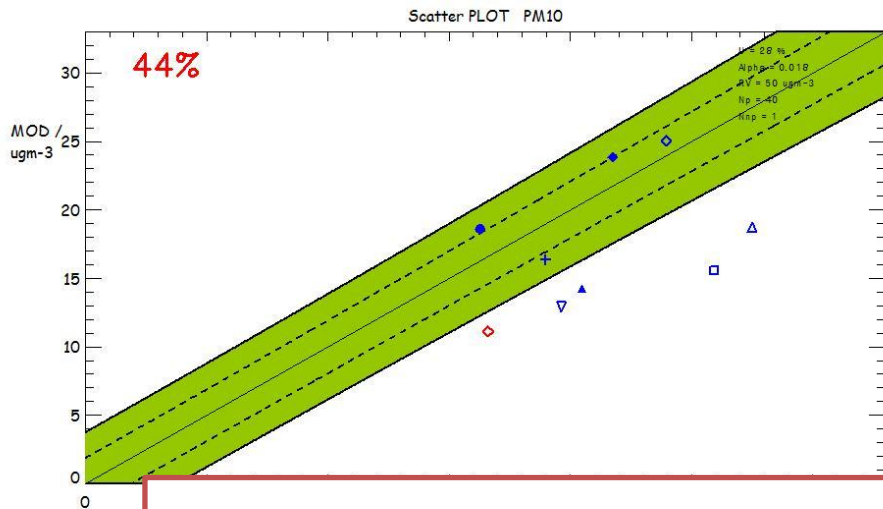
Almost the same results in v5.2 and v5.4!

		SUMMARY STATISTICS		Nb of stations/groups: 6 valid / 10 selected	
INDICATOR					
OBS	Mean	[Plot: Mean values between 0 and 100 $\mu\text{g}/\text{m}^3$]			
	Exceed 25 $\mu\text{g}/\text{m}^3$	[Plot: Exceedance values between 0 and 100 days]			
TIME	Bias Norm	[Plot: Bias Norm values between -2 and 2]			
	Corr Norm	[Plot: Corr Norm values between 0 and 2]			
	StdDev Norm	[Plot: StdDev Norm values between -2 and 2]			
	Hperc Norm	[Plot: Hperc Norm values between -2 and 2]			
	Corr Norm	[Plot: Corr Norm values between -2 and 2]			
SPACE	StdDev Norm	[Plot: StdDev Norm values between -2 and 2]			

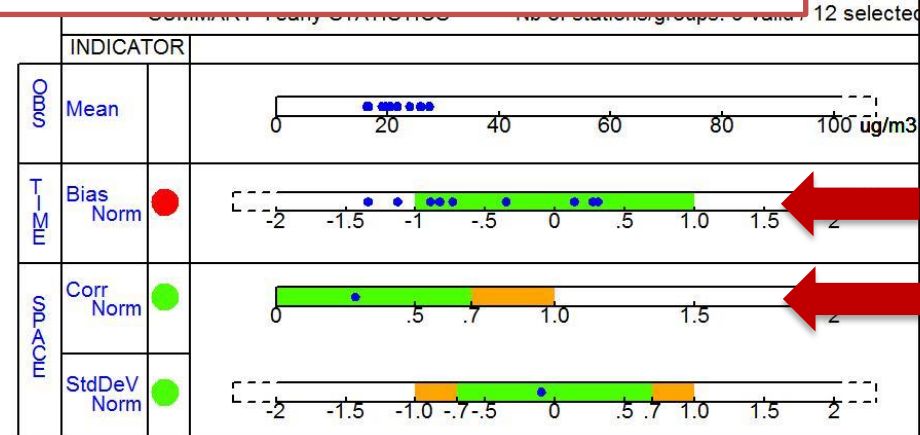
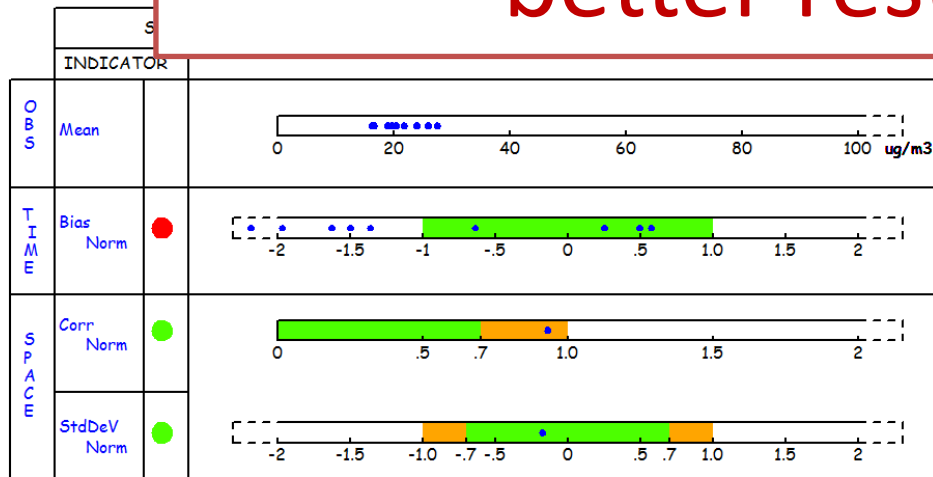
small change

		SUMMARY STATISTICS		Nb of stations/groups: 6 valid / 10 selected	
INDICATOR					
OBS	Mean	[Plot: Mean values between 0 and 100 $\mu\text{g}/\text{m}^3$]			
	Exceed 25 $\mu\text{g}/\text{m}^3$	[Plot: Exceedance values between 0 and 100 days]			
TIME	Bias Norm	[Plot: Bias Norm values between -2 and 2]			
	Corr Norm	[Plot: Corr Norm values between 0 and 2]			
	StdDev Norm	[Plot: StdDev Norm values between -2 and 2]			
	Hperc Norm	[Plot: Hperc Norm values between -2 and 2]			
	Corr Norm	[Plot: Corr Norm values between -2 and 2]			
SPACE	StdDev Norm	[Plot: StdDev Norm values between -2 and 2]			

Benchmarking (PM₁₀ yearly conc. $\mu\text{g}/\text{m}^3$)



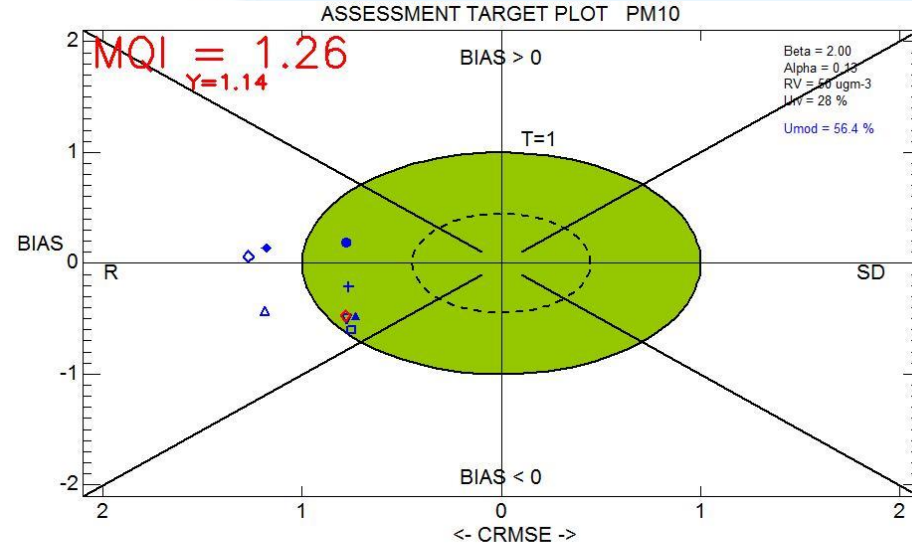
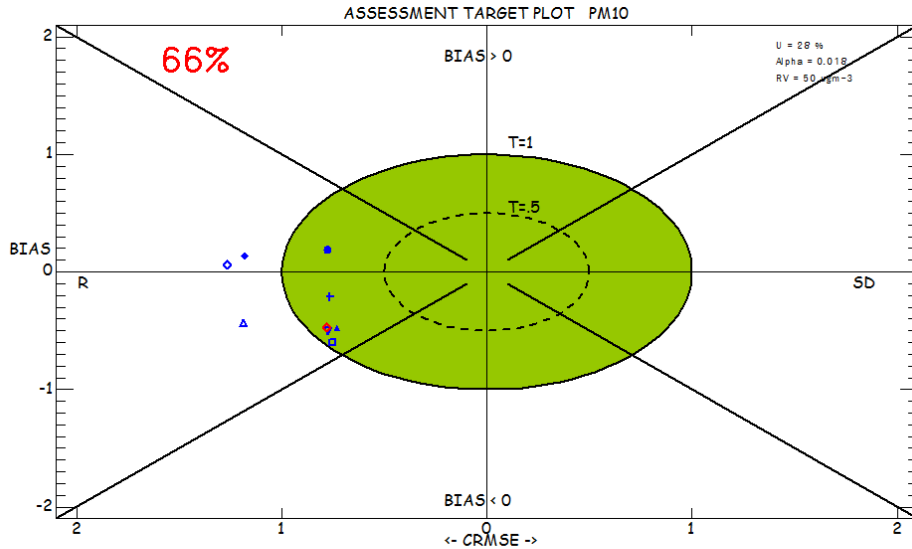
Still no fulfilment of MQO but much better results in v5.4!



- ◆ Alnabru
- ◆ BygdoyAlle
- ▲ Hjørnes
- ▼ Kjørveien
- ◆ Manglerud
- ◆ Skøyen
- ◆ Sofienbergpark
- ◆ Aakerbergveien
- ◆ E16_Sandsvika

30
760
ODE
0
0
4h reserved
erved

Benchmarking (PM₁₀ daily conc. $\mu\text{g}/\text{m}^3$)



Almost the same results in v5.2 and v5.4!

SUMMARY STATISTICS		Nb of stations/groups: 9 valid / 12 selected	
INDICATOR			
OBS	Mean	[Bar chart: 0-100 $\mu\text{g}/\text{m}^3$]	
	Exceed 50 $\mu\text{g}/\text{m}^3$	[Bar chart: 0-100 days]	
TIME	Bias Norm	[Bar chart: -2 to 2]	
	Corr Norm	[Bar chart: -2 to 2]	
	StdDev Norm	[Bar chart: -2 to 2]	
	Hperc Norm	[Bar chart: -2 to 2]	
	Corr Norm	[Bar chart: -2 to 2]	
SPACE	StdDev Norm	[Bar chart: -2 to 2]	

Minor change

SUMMARY STATISTICS		Nb of stations/groups: 9 valid / 12 selected	
INDICATOR			
OBS	Mean	[Bar chart: 0-100 $\mu\text{g}/\text{m}^3$]	
	Exceed 50 $\mu\text{g}/\text{m}^3$	[Bar chart: 0-100 days]	
TIME	Bias Norm	[Bar chart: -2 to 2]	
	Corr Norm	[Bar chart: -2 to 2]	
	StdDev Norm	[Bar chart: -2 to 2]	
	Hperc Norm	[Bar chart: -2 to 2]	
	Corr Norm	[Bar chart: -2 to 2]	
SPACE	StdDev Norm	[Bar chart: -2 to 2]	

Conclusions

Main changes and their impacts on Norwegian results:

- Change in the implementation of the 90th percentile constraint
 - Very useful to integrate this criteria of the AQD into the MQO. Especially in areas with nr of stations $\neq N \times 10$
- Update of the attenuation parameters for yearly PM₁₀ and PM₂₅
 - Less stringent than previously for yearly MQO, especially for lower PM concentrations, where the beta-ray U_0 is higher than the earlier used gravimetric U_0
 - Still problems with fulfilling the yearly NO₂ MQO
- Model uncertainty in the report's output
 - Useful indication to interpret the results.

