Rijksinstituut voor Volksgezondheid
en Milieu
*Ministerie van Volksgezondheid,
Welzijn en Sport*

National Institute for Public Health and
the Environment
Ministry of Health, Welfare and Sport

Dutch feedback on MQO (for NO2 and PM10)

Contents

- The Model Quality Objective (MQO).
- The measurement uncertainty (U_{meas}).
- Alternative formulations for U_{meas}.
- Evaluation and presentation.
- The 90% criterium.
- Conclusions.

MQO

In the Netherlands there is a strong focus on yearly average concentrations.

Model Quality Objective: $MQO = \frac{|M - O|}{2RMS_U}$

$< \quad 1 \rightarrow$ **OK**

$>= 1 \rightarrow$ **!OK**

Zone	Bias	Standard deviation	Correlation	MQO	Ref
1	$\frac{NMB^2}{(2RMS_U)^2} < 1$	$\frac{(\sigma_M - \sigma_O)^2}{(2RMS_U)^2} < 1$	$\frac{2\sigma_M\sigma_O(1-R)}{(2RMS_U)^2} < 1$	MQO<1	(8)
2	$0.5 < \frac{NMB^2}{(2RMS_U)^2} < 1$	$0.5 < \frac{(\sigma_M - \sigma_O)^2}{(2RMS_U)^2} < 1$	$0.5 < \frac{2\sigma_M\sigma_O(1-R)}{(2RMS_U)^2} < 1$		(9)
3	$\frac{NMB^2}{RMS_U^{\ 2}} < 0.5$	$\frac{(\sigma_M - \sigma_O)^2}{RMS_U^{\ 2}} < 1$	$\frac{2\sigma_M\sigma_O(1-R)}{RMS_U^{\ 2}} < 1$	MQO<0.5	(10)

Formulation of $U_{measured}$

Expression for measurement uncertainty:

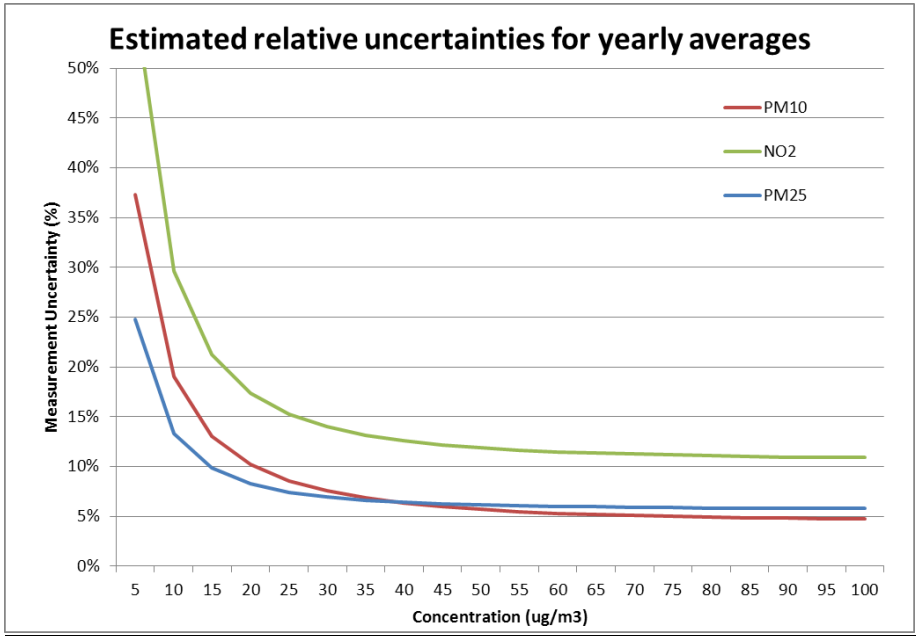
$$RMS_U = U(\overline{O}) = ku_r^{RV}\sqrt{\frac{(1-\alpha)}{N_p}\overline{O}^2 + \frac{\alpha * RV^2}{N_{np}}}$$

Hourly/daily values:

	k	! ¦ "	LV (ug/m3)	#	Np	Nnp
NO2	2.00	0.120	200	0.040	1	1
O3	1.40	0.090	120	0.620	1	1
PM10	2.00	0.140	50	0.018	1	1
PM25	2.00	0.180	25	0.018	1	1

Yearly average values:

	Average	Np	Nnp
NO2	Yearly	5	12
PM10	Yearly	40	1
PM25	Yearly	40	1



Formulation of $U_{measured}$

Define equivalent relation for U_{meas} based on the yearly average limit value and it's uncertainty:

$$U(\overline{O}) = ku_r^{RV}\sqrt{\frac{(1-\alpha)}{N_p}\overline{O}^2 + \frac{\alpha * RV^2}{N_{np}}}$$

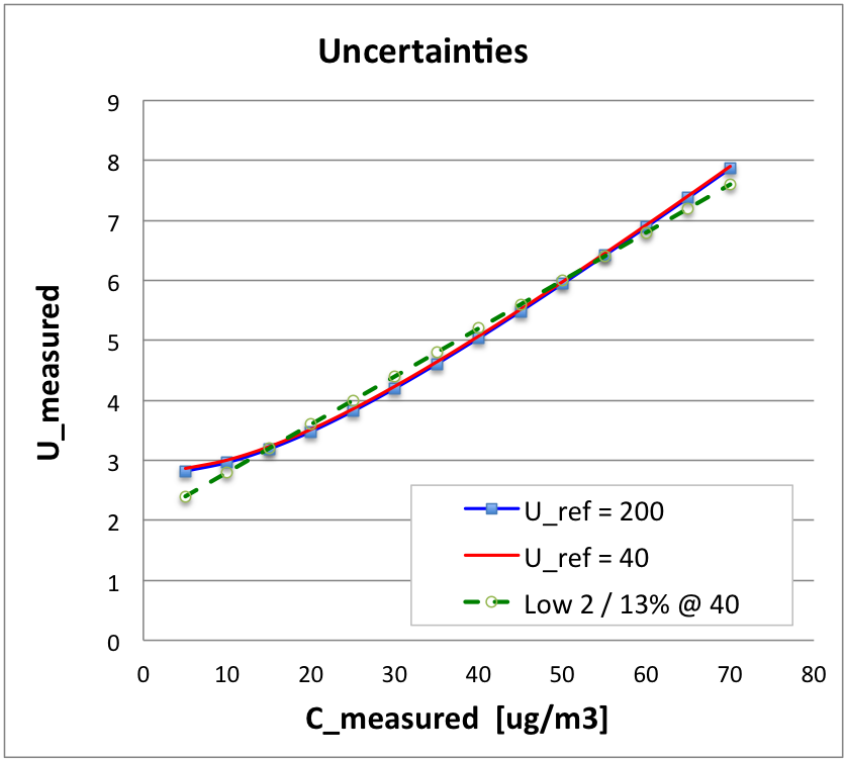
k	2.00
Urv	0.12
Np	5.00
Nnp	12.00
a	0.04
RV	200

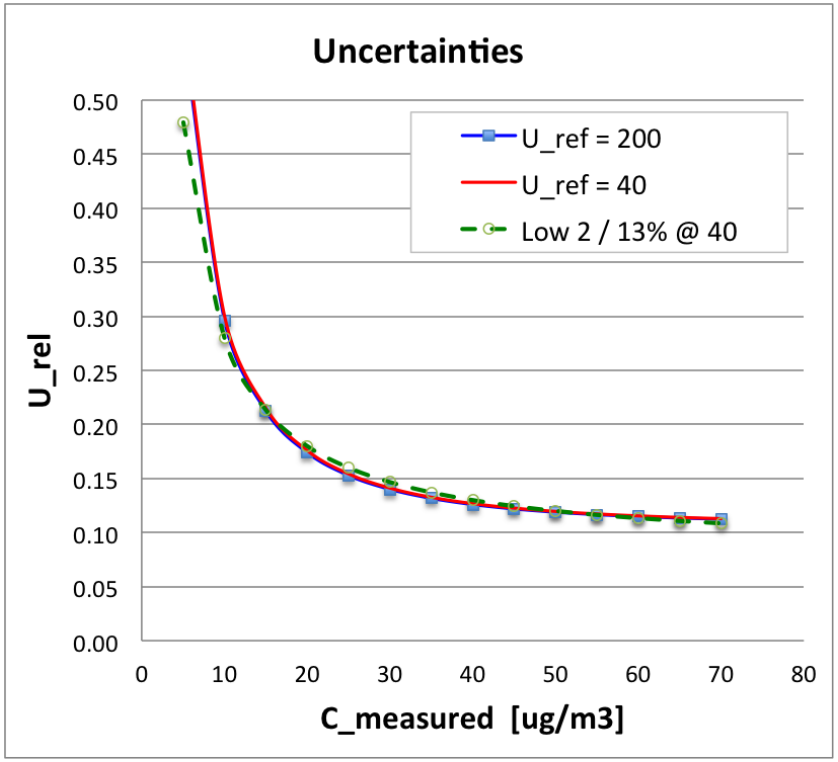
Alternatively, fix/define the U_{meas} at some value for low concentrations and at the limit value, interpolate the range in between:

U_{meas} = { 2 ug/m3 at low concentration

13% at the yearly average LV

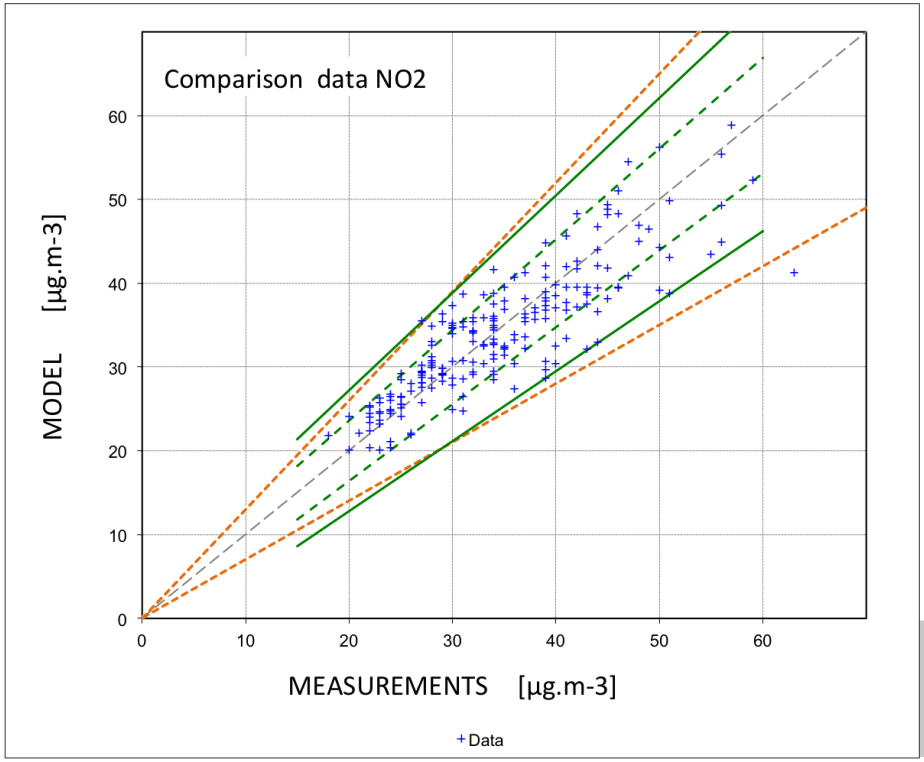
Formulation of $U_{measured}$

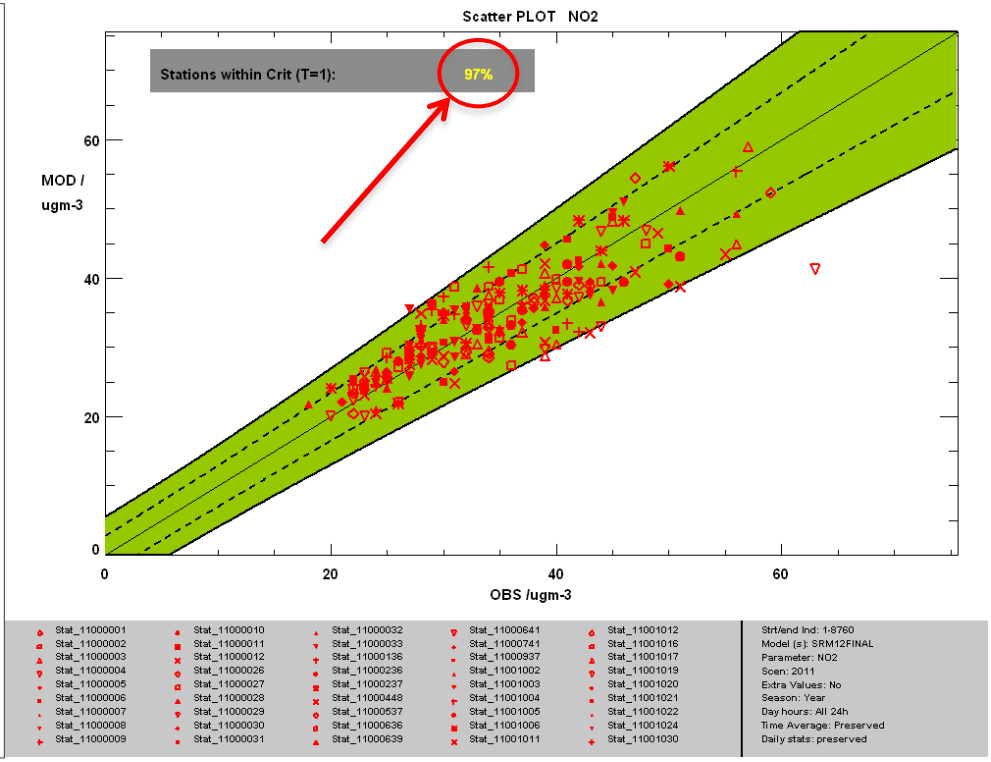




Evaluation and presentation

For the NL the scatter diagram is the most important result of the Deltatool.



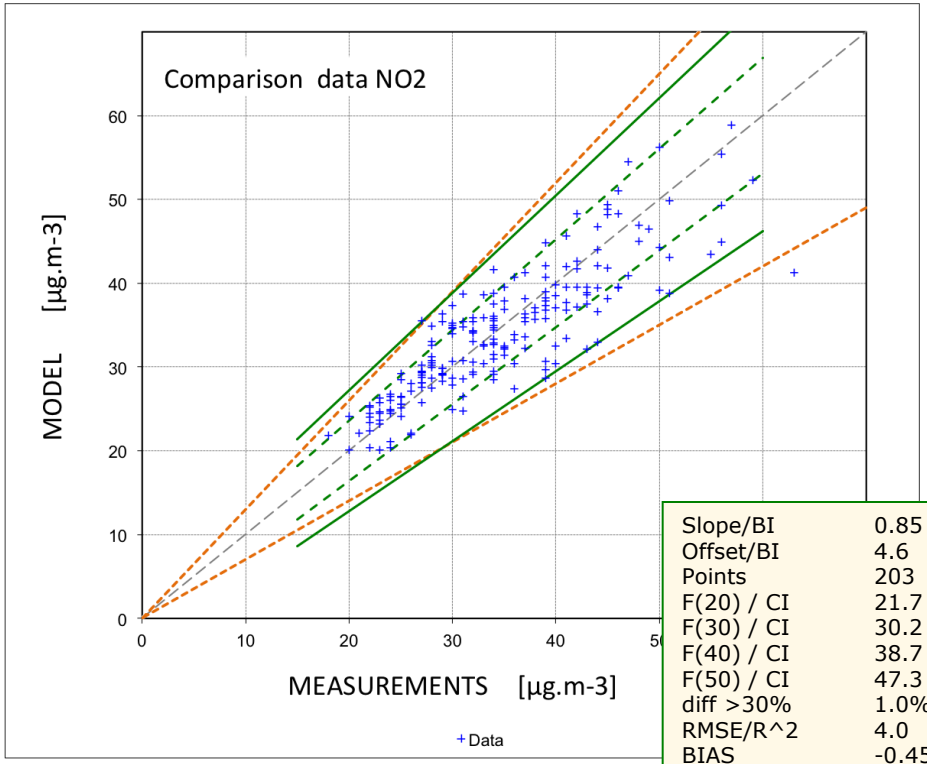


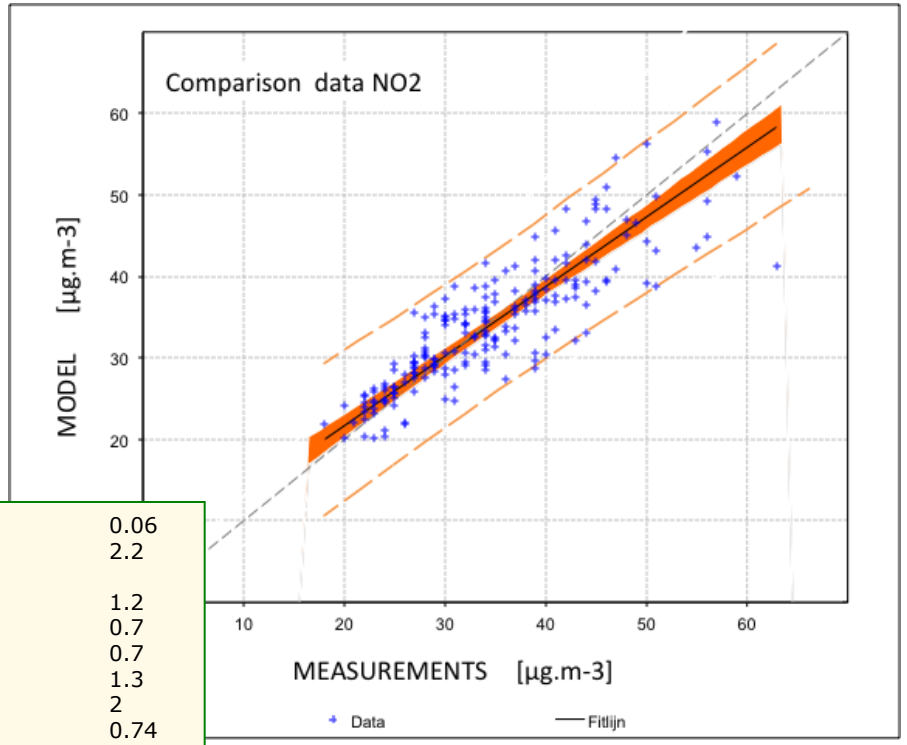
The 90% principle

For all statistical indicators used in DELTA for benchmarking purposes the approach used to derive the maximum RDE in the AQD has been followed. This means that performance criteria must be fulfilled for at least 90% of the available stations.

- What is the statistical basis of the 90%?
- Is 90% ambitious and/or practical?
- What defines 'valid' data points? Which data points should (or not) be included in the evaluation?
- What to do with measurements outside of the 'application range' of the model being compared to?
- How to explain the general public and politicians that the whole green area is 'good enough'?

MQO versus 'traditional' analyses





Slope/BI	0.85	0.06
Offset/BI	4.6	2.2
Points	203	
F(20) / CI	21.7	1.2
F(30) / CI	30.2	0.7
F(40) / CI	38.7	0.7
F(50) / CI	47.3	1.3
diff >30%	1.0%	2
RMSE/R^2	4.0	0.74
BIAS	-0.45	
MNB/ANB	0.00	-0.01
MQO	0.97	0.73
>40.5	49	36

Conclusions

- The present MQO's *seem* workable and attainable for NO2 in the Netherlands.
- For PM10, there seems a problem with the present MQO.
- The 90% criteria raises questions and should have an evident sound (statistical) basis and interpretation.
- Background information should be available for the relation between the MQO and more traditional analyses.
- It would be nice if the Deltatool could automatically provide some traditional statistical parameters.

THANK YOU