Feedback on DELTA – NIMH experience

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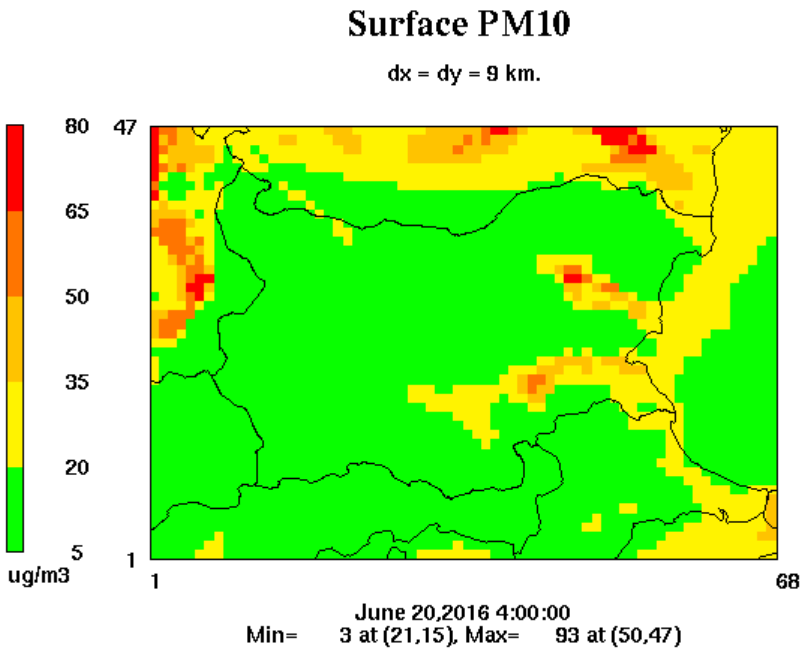
The AQ model - WRF- CMAQ v.4.6

- **not used for AQ assessment** under the AQD

- chemical weather forecast: 72h hourly maps of

SO2, O3, NO2, PM10

- 5 nested domains: from 81km to 1 km



http://info.meteo.bg/cw2.2/

DELTA used for:

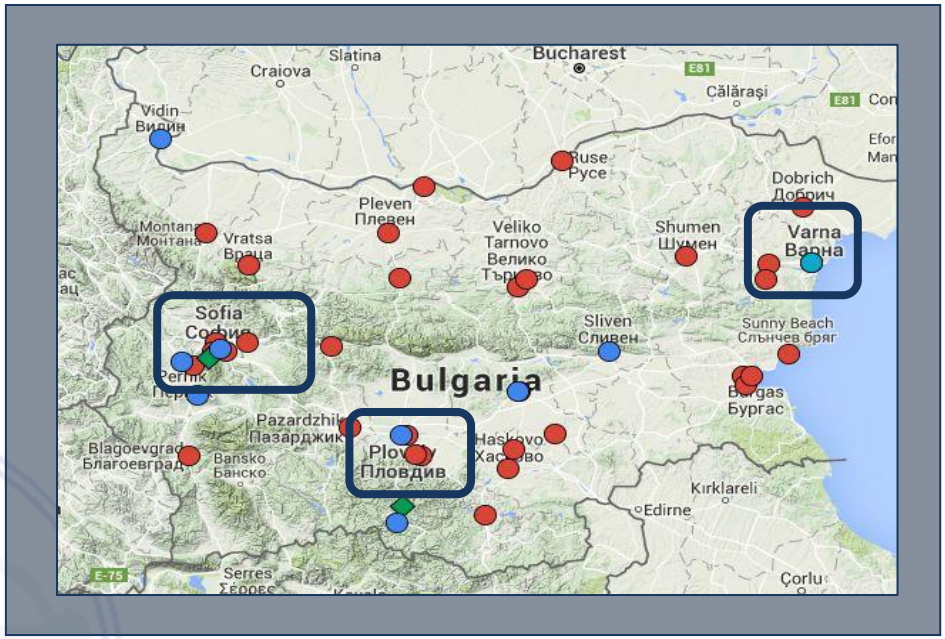
- **model performance (AQ assessm)**

  Bulgaria (9km) & Sofia (1km)

- **Forecast capabilities**

Air Quality Monitoring

Responsibility of Exec. Env. Agency Sofia



In 2015 : 50 stations

- 34 urban
- 9 traffic
- 2 rural (mountains)
- 5 in ecosystems

Stations per pollutant 2015:

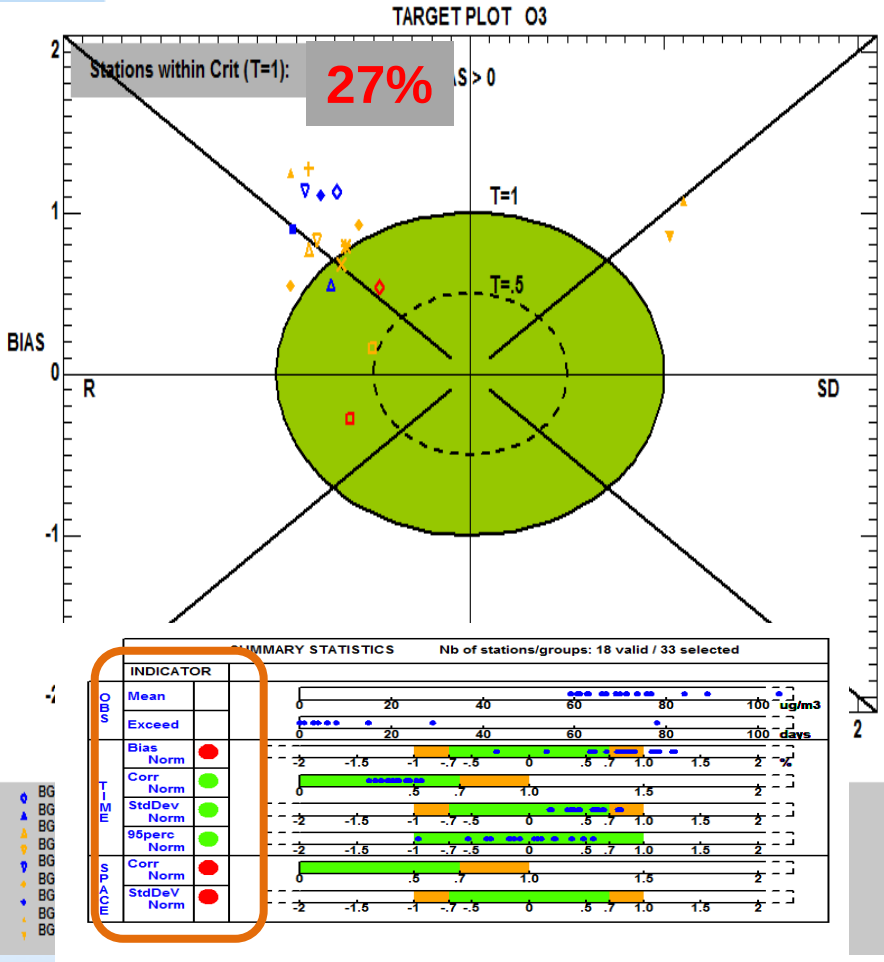
SO2 – 41; NO2 - 39; O3 – 27

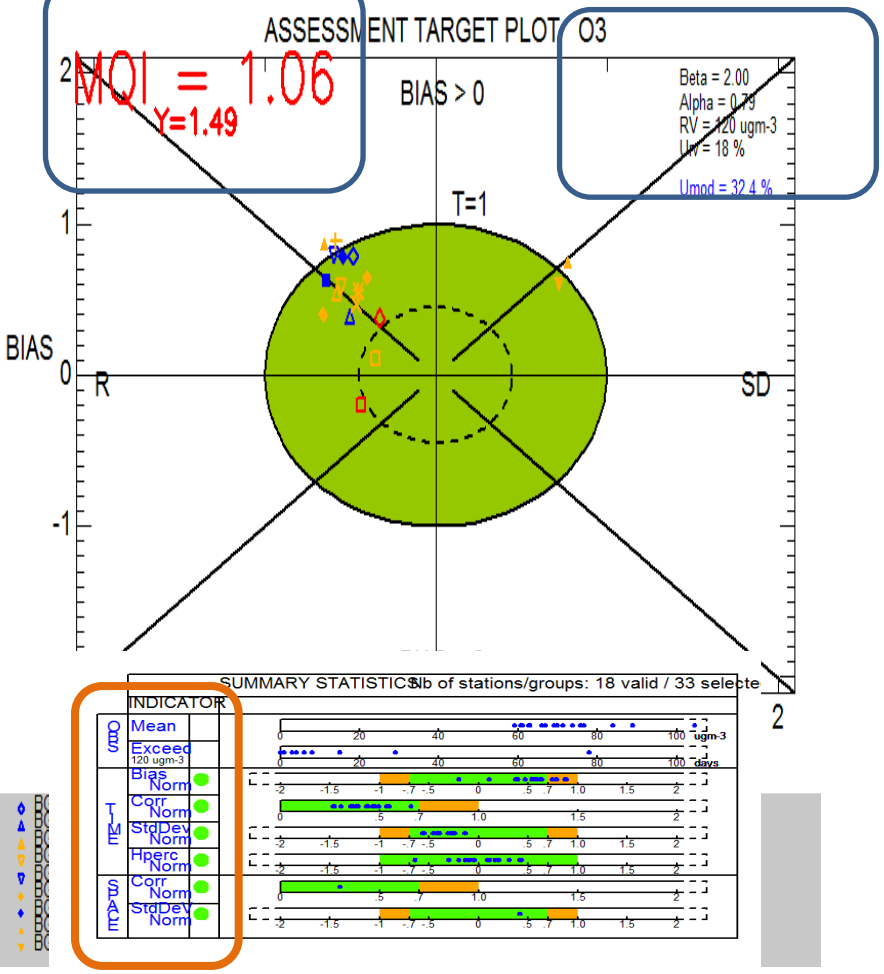
PM10 – 48; PM2.5 - 10

in Sofia (1.6 mil. Inhabitants) - 5 AQ stations, 1 for PM2.5

O3- 8hDMAx 2013 (18 valid stat.)

- v.3.6(2014) and v.5.4 (2016)





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

MQI & MQO - definition - 1/4

- **v.3.6(2014) and v.5.4 (2016)**

$$MQO_1 = \frac{|M-O|}{2U_O} \leq 1$$

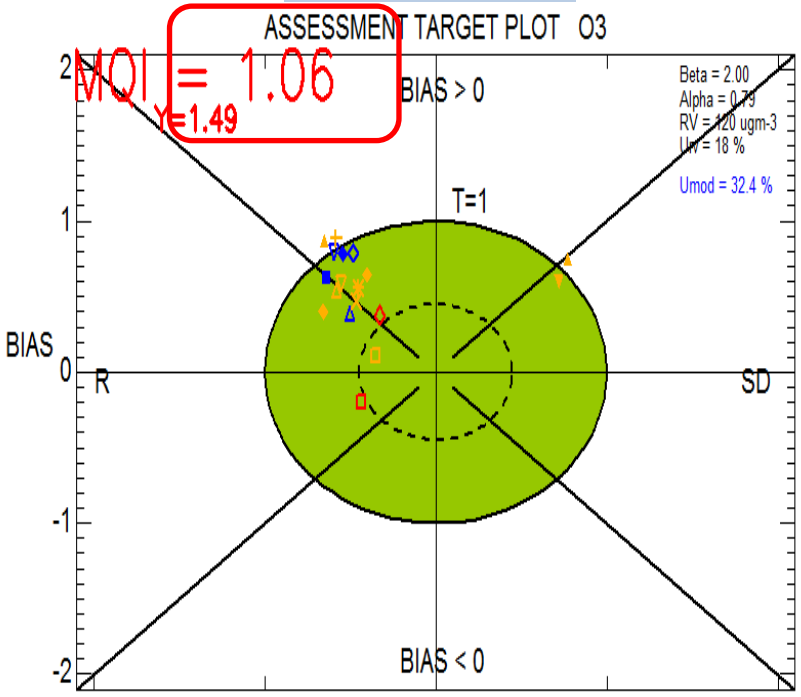
$$MQO_4 = \frac{|M-O|}{\beta U_O} \leq 1, with\ \beta = 2$$

" MQO_4 can be calculated for the 90th or 95th percentile station and used as performance indicator",

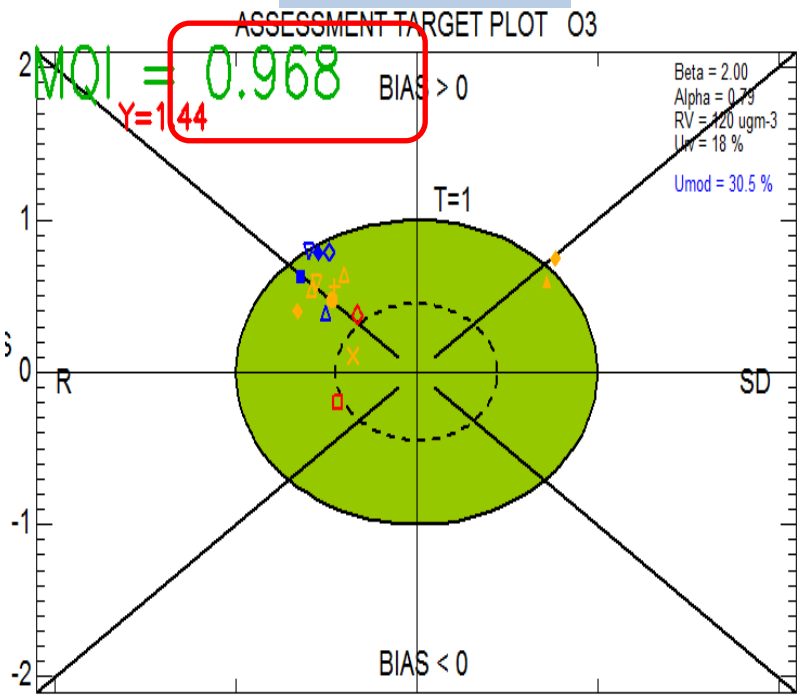
90% of stations is implicitly accounted; application for small number of stations

MQI & MQO – No. of stations - 2/4

18 stations



16 stations



BAD **???** **GOOD**

? Exclusion of stations to obtain the MQO ?

? Margin of tolerance for MQI ?

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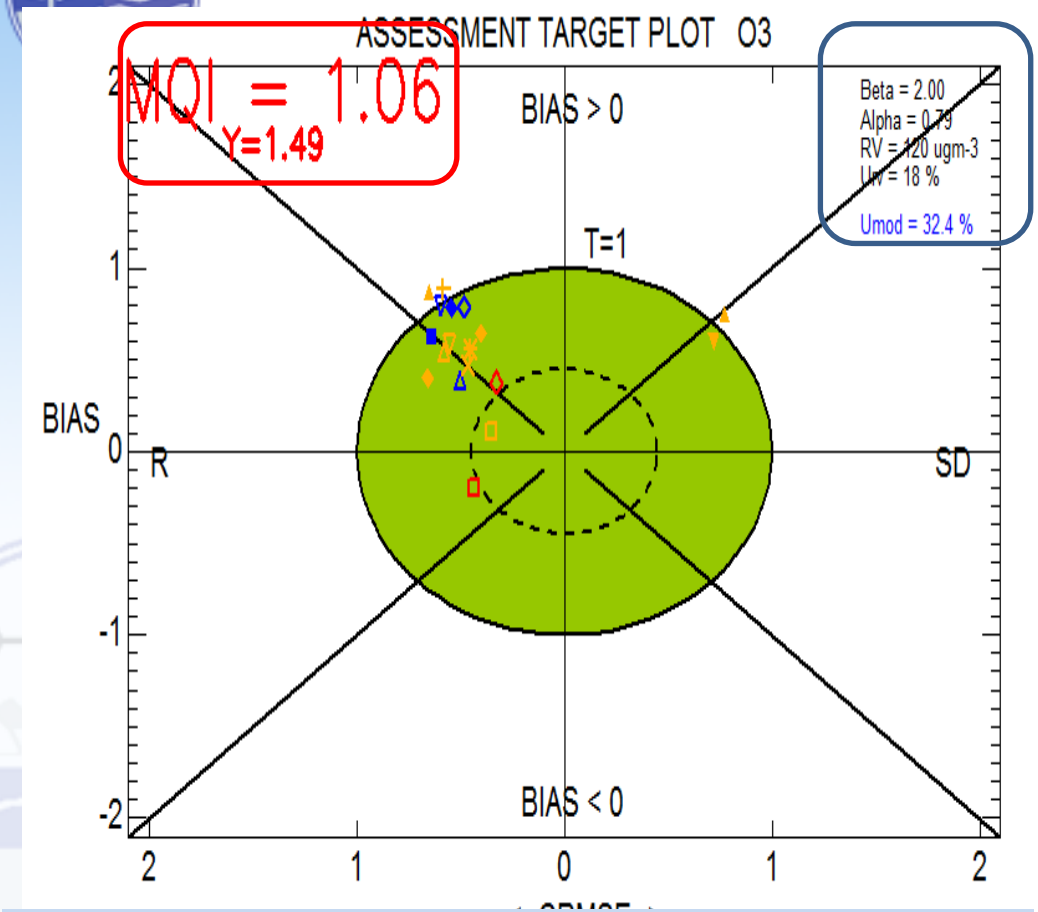
MQI & MQO - text on the diagram- 3/4



MQO : MQI <= 1

visual criteria "most of the points in the green area" valid?

Y (temporary info, but for O3 ?

Informative for experienced user

How to Interpret **Um** ?

Ur =18%, Um=32%→

γ **= 1.78**

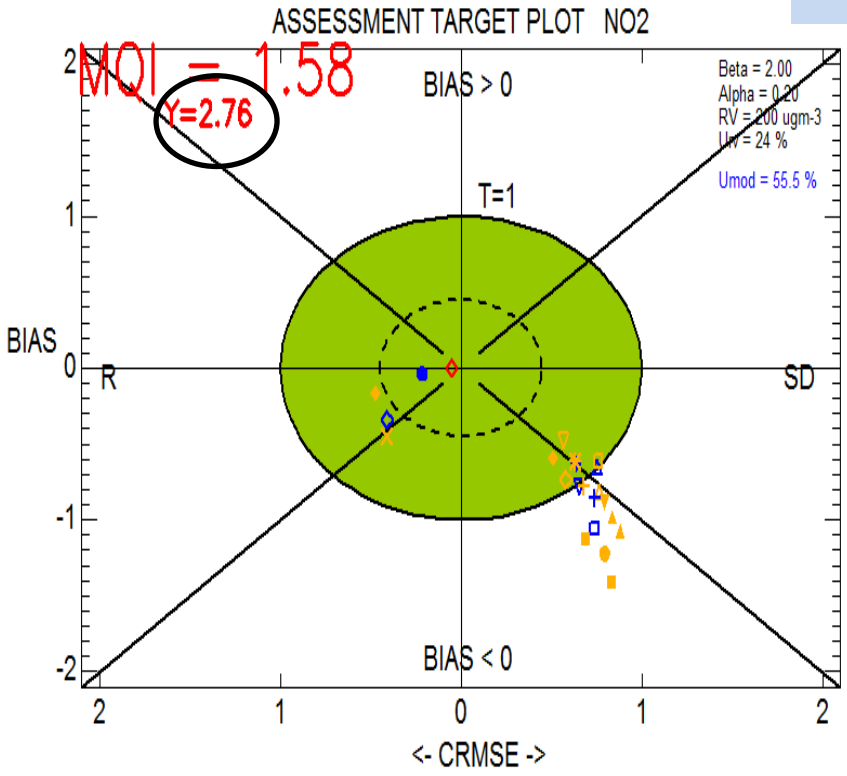
Should Um <=1.75 Uo when MQI <=1

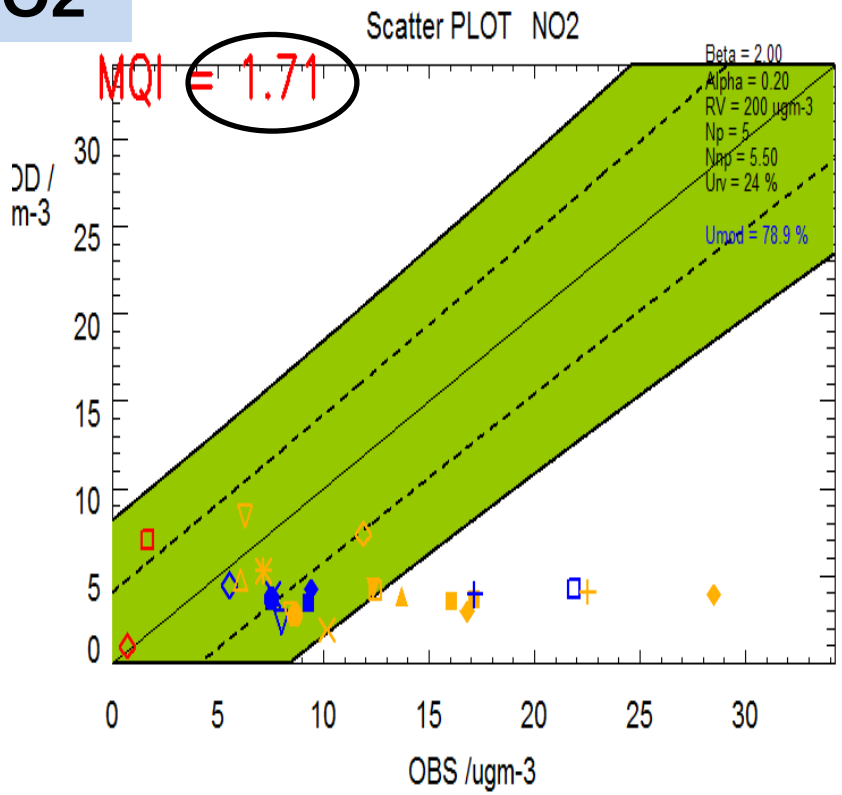
"A value of γ can then be calculated as an output $\gamma = \sqrt{\left(\frac{M-O}{U_O}\right)^2 - 1}$ to provide info on the model uncertainty $U_M = \gamma U_O$"

???? γ <= 1.75 with β=2

MQI & MQO- Long vs. short term - 4/4

NO2





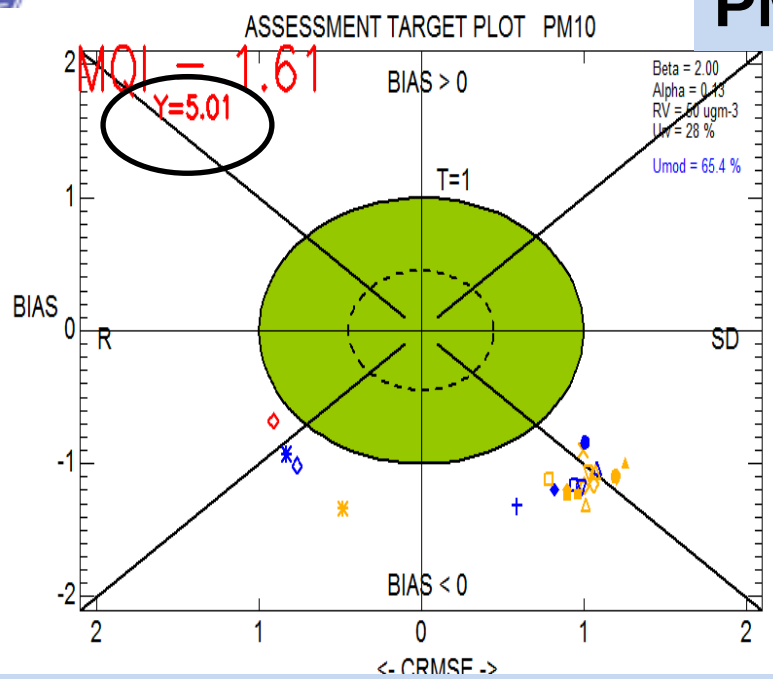
Y = 2.76 vs. **MQI = 1.71**

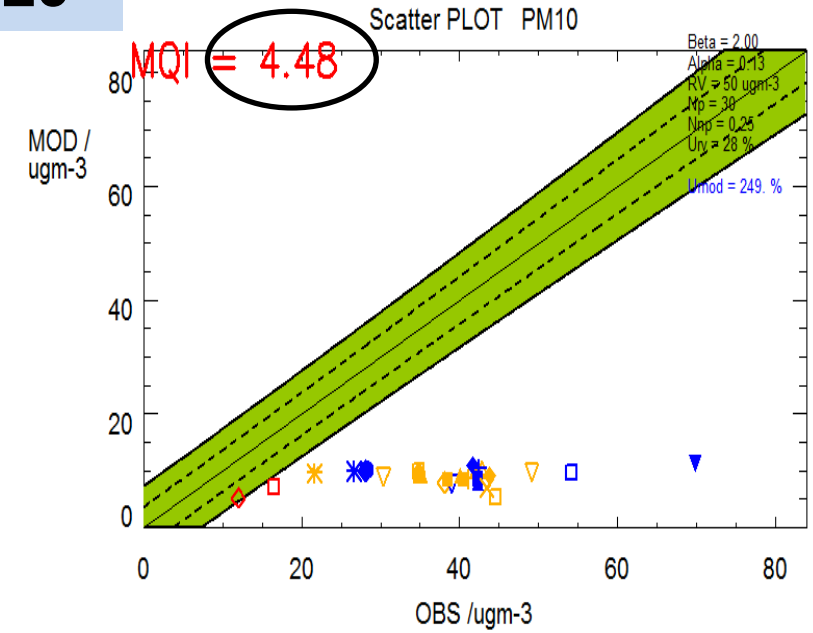
hourly input MQI = 1.58

yearly input MQI = 1.71

MQI & MQO- Long vs. short term - 4/4

PM10





Y = 5.01 vs. **MQI = 4.48**

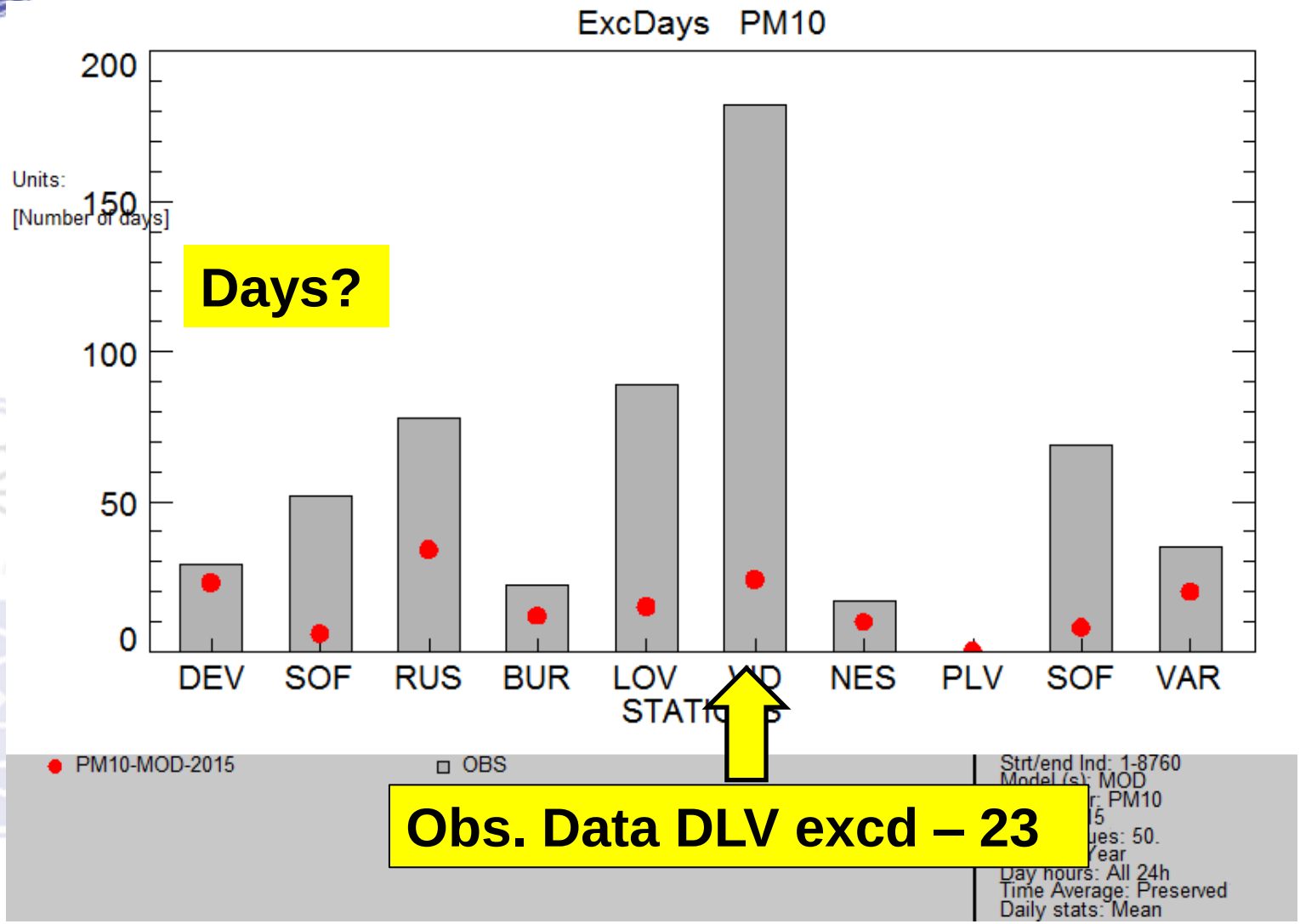
hourly input

MQI = 1.61

yearly input

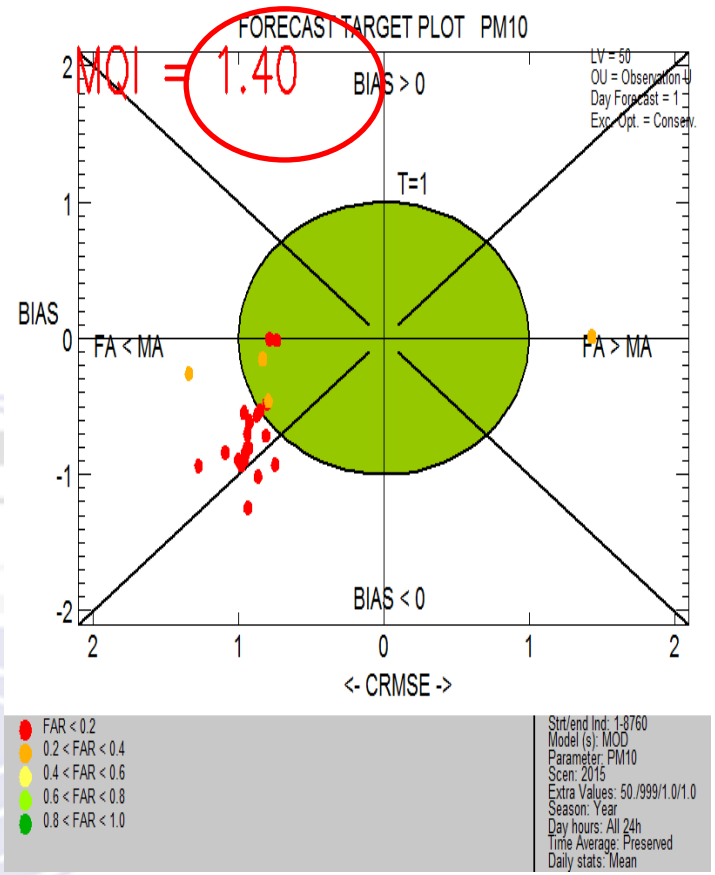
MQI = 4.48

Forecast & Excd. PM10 (2015)

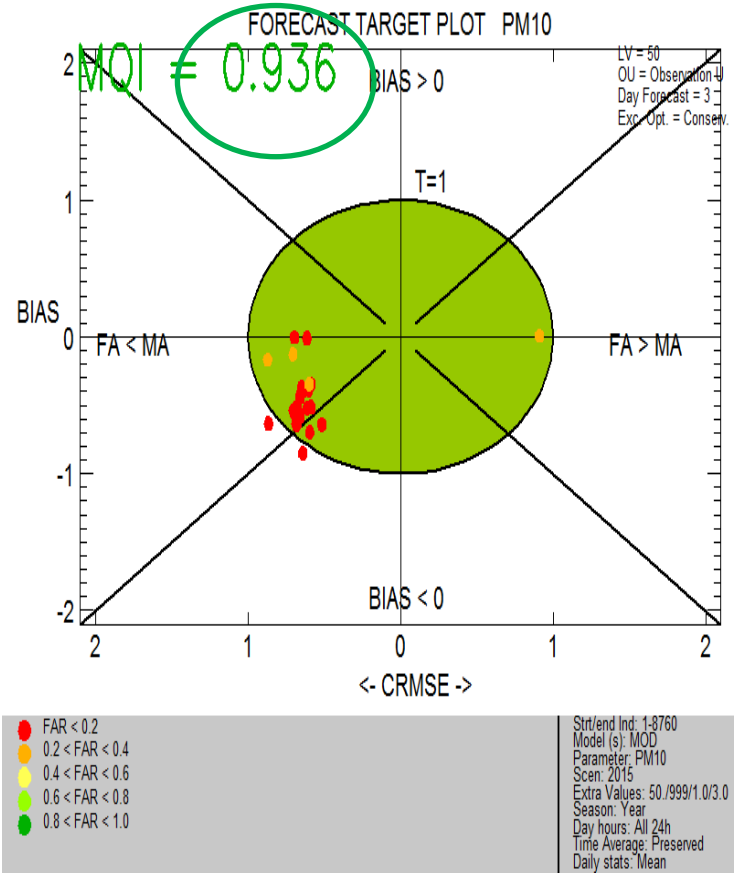


Forecast Target – forecast time length

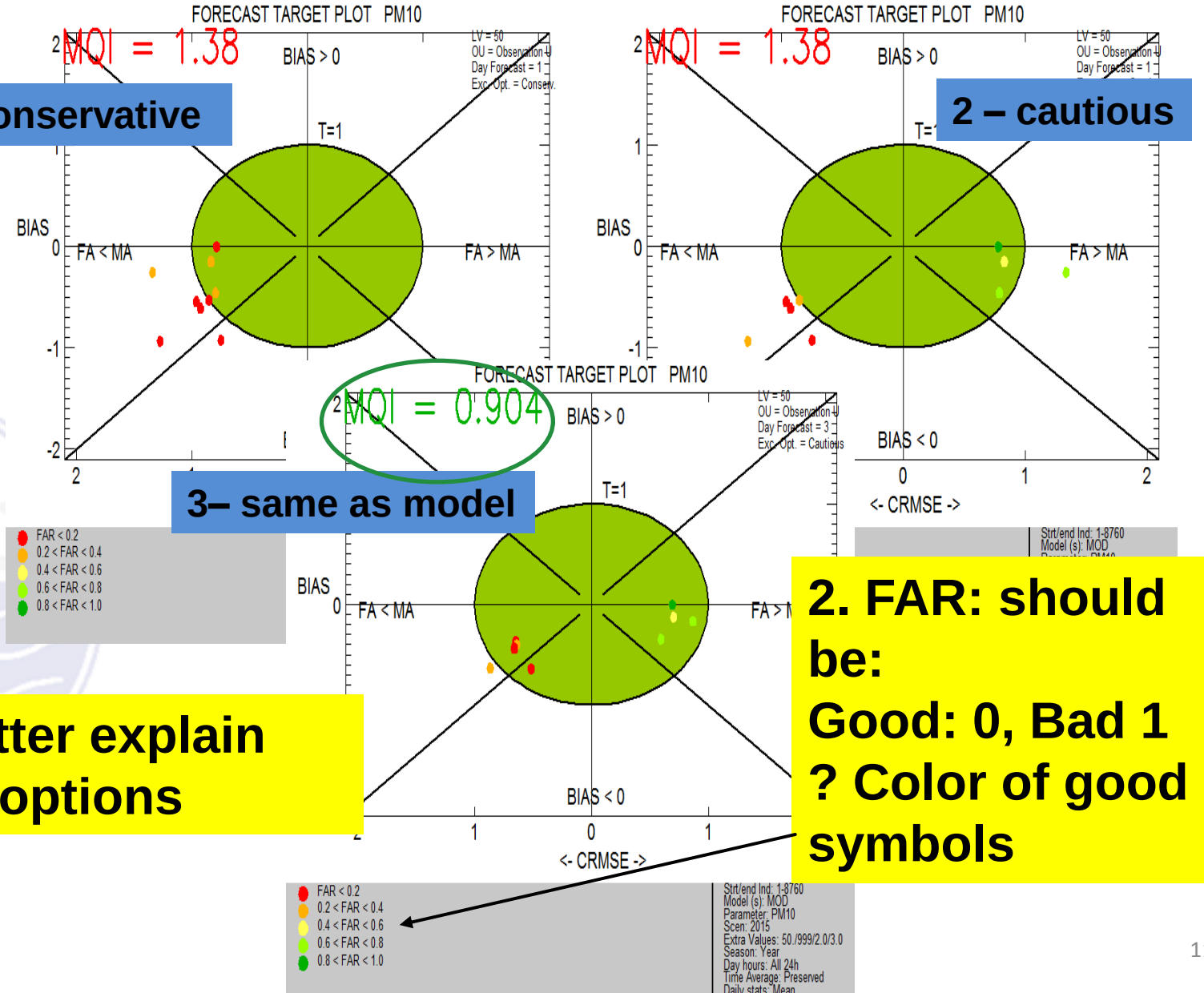
day1



day3



Forecast Target – flexibility options



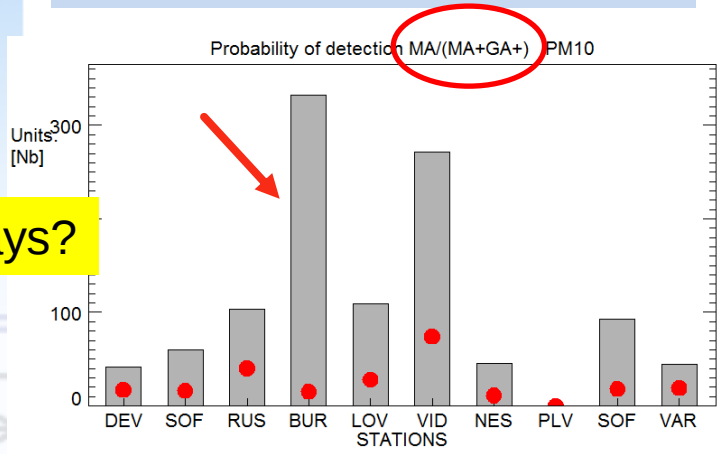
1. Better explain 1,2,3 options

2. FAR: should be:
Good: 0, Bad 1
? Color of good symbols

Probability of Detection – flexibility

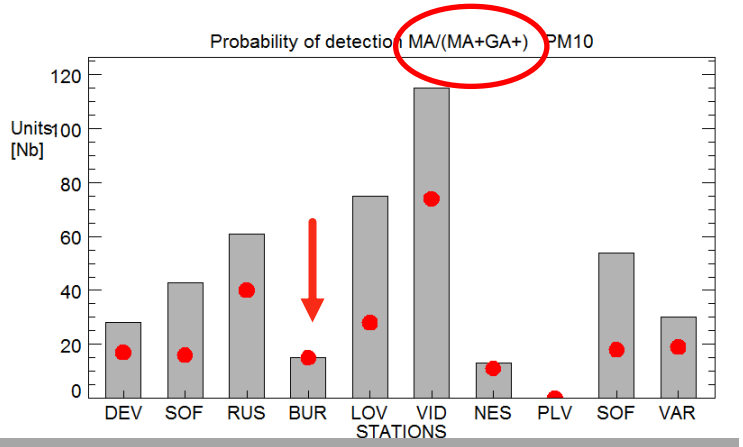
1. To Correct "Formula" expression

POD 1-conservat.



Days?

POD 3-same as mod



Differences in the grey bars (total obs. alarms) e.g. at station BUR: (MA +GA+)= 300 (option 1) and = 20 (option 3).

Better explain 1,2,3 flexibility options

Values of GA+ from POD and FAR plots

GA+ = Hits = counts correctly predicted alarms

FA - false alarms, MA – missed alarms

Example for 1 station (options 50#999#1)

from the barplot POD **GA+/(MA+GA+) = 17/42;**

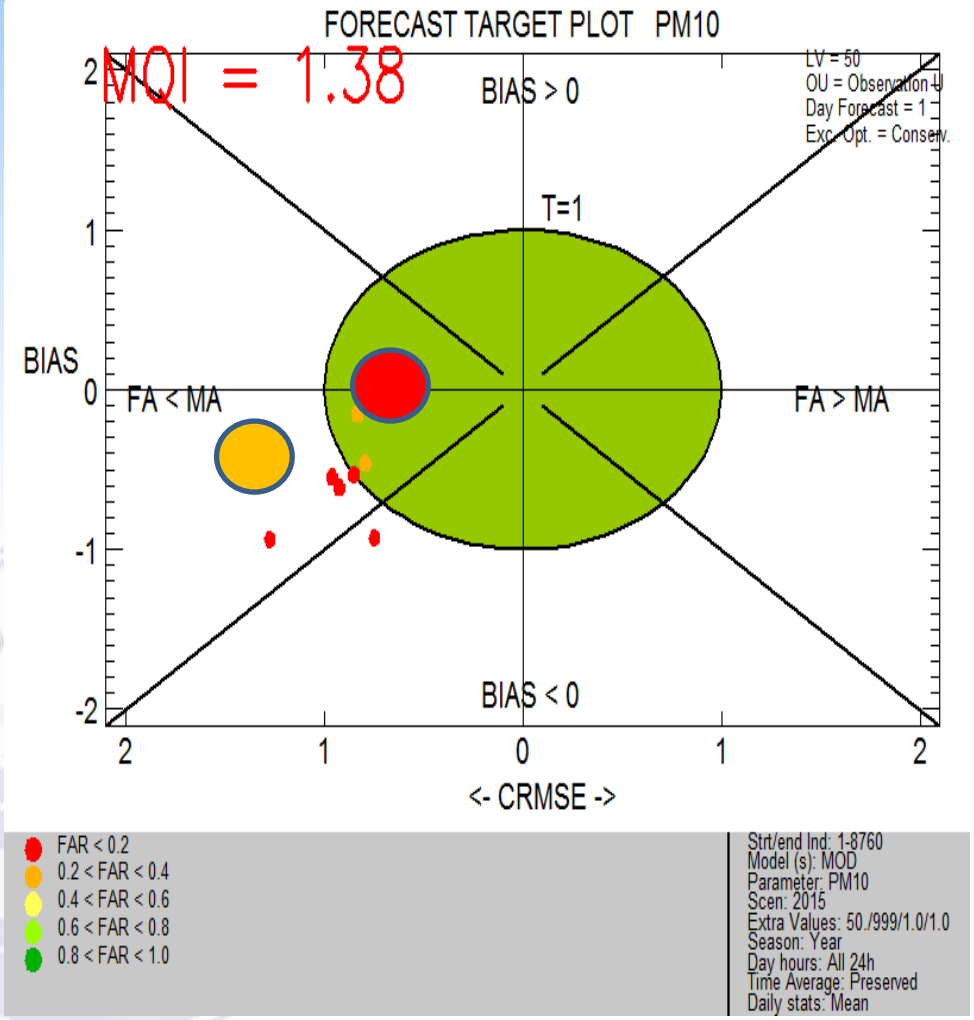
→ GA+ = 17, MA =25

from the barplot FAR **FA/(FA+GA+) = 17/27;**

→ FA= 17, GA+ =10

Why are the values for "hits" different ?

Forecast indicators & position on Target ?



POD	0.40	0.05
FAR	0.63	1
CEI1	0.64	0.045
CEI2	0.52	0.52
MPI	0.013	0.014

Conclusions

- ***MQO – seem more stringent for PM , than for O3 and NO2***
- ***MQO – to be uniform in the Guidance and User's Guide***
- ***Forecast - methodology based on "contingency table" , OU – accounted, MU - further***
- ***Forecast – flexibility options better explained***
- ***Forecast MPI – check synergy with Target position***

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BAS

THANK YOU !