

# Pilot Exercise for (ITALY/ARPAE)

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ARPAE, Regional Air Quality Center

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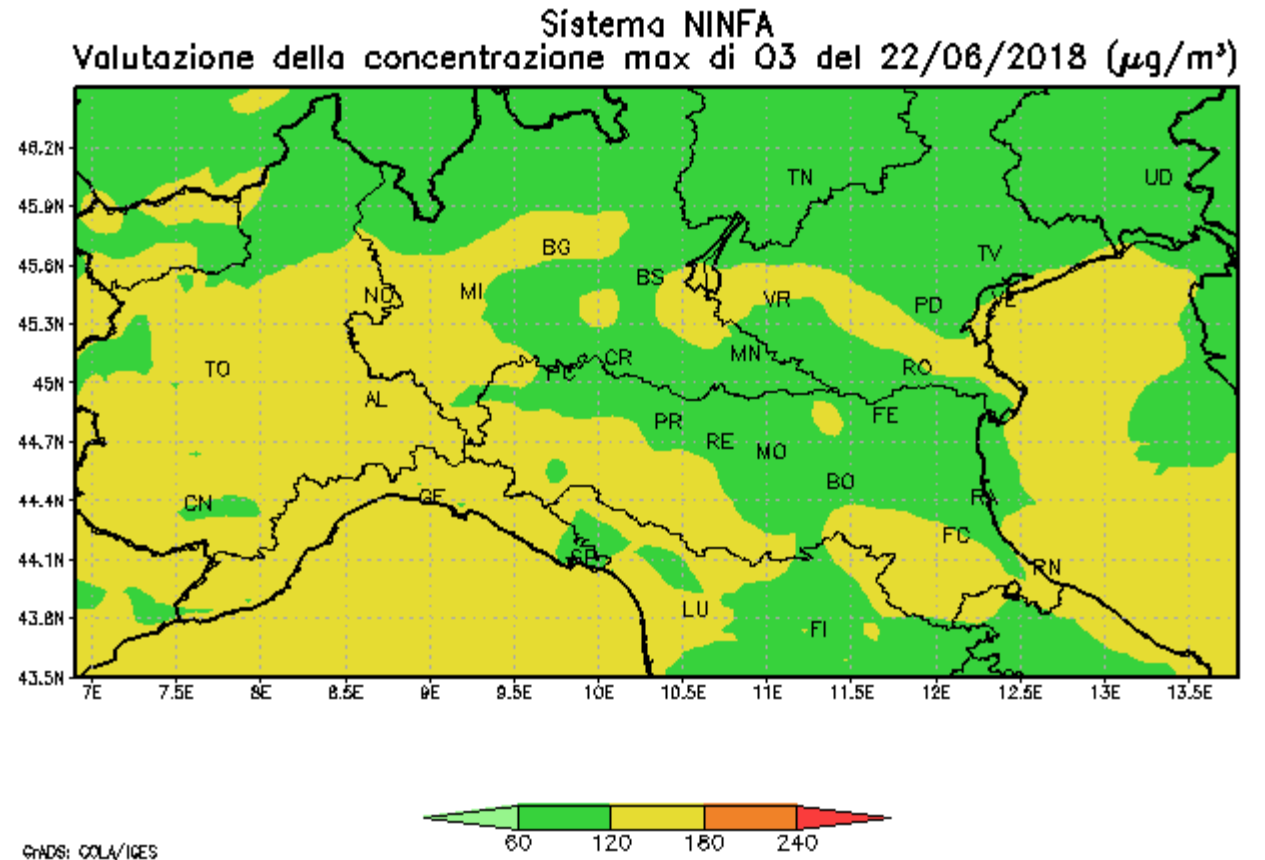
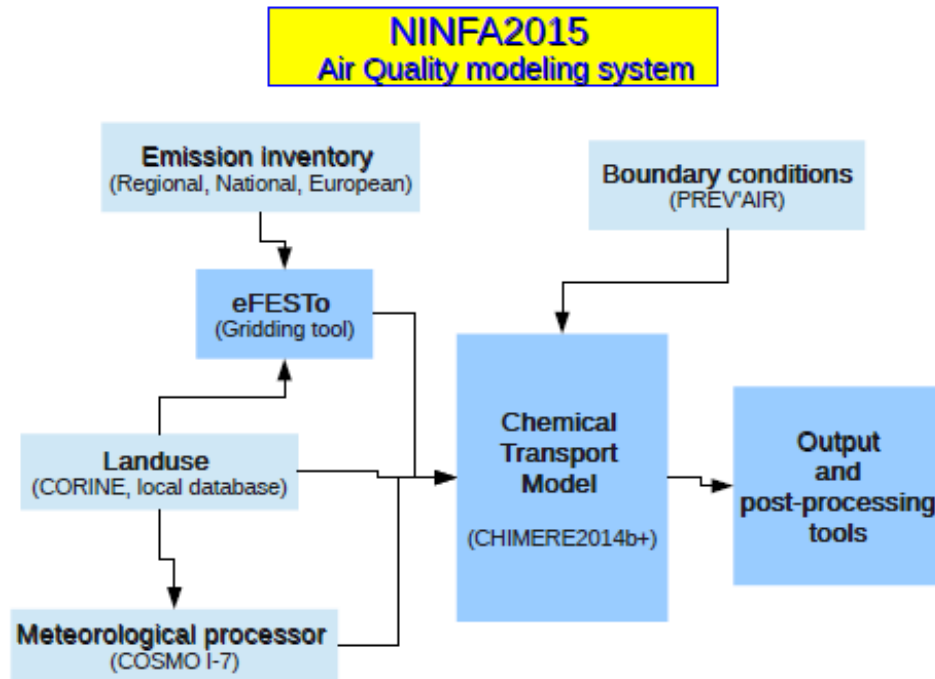


# Main conclusions on assessment

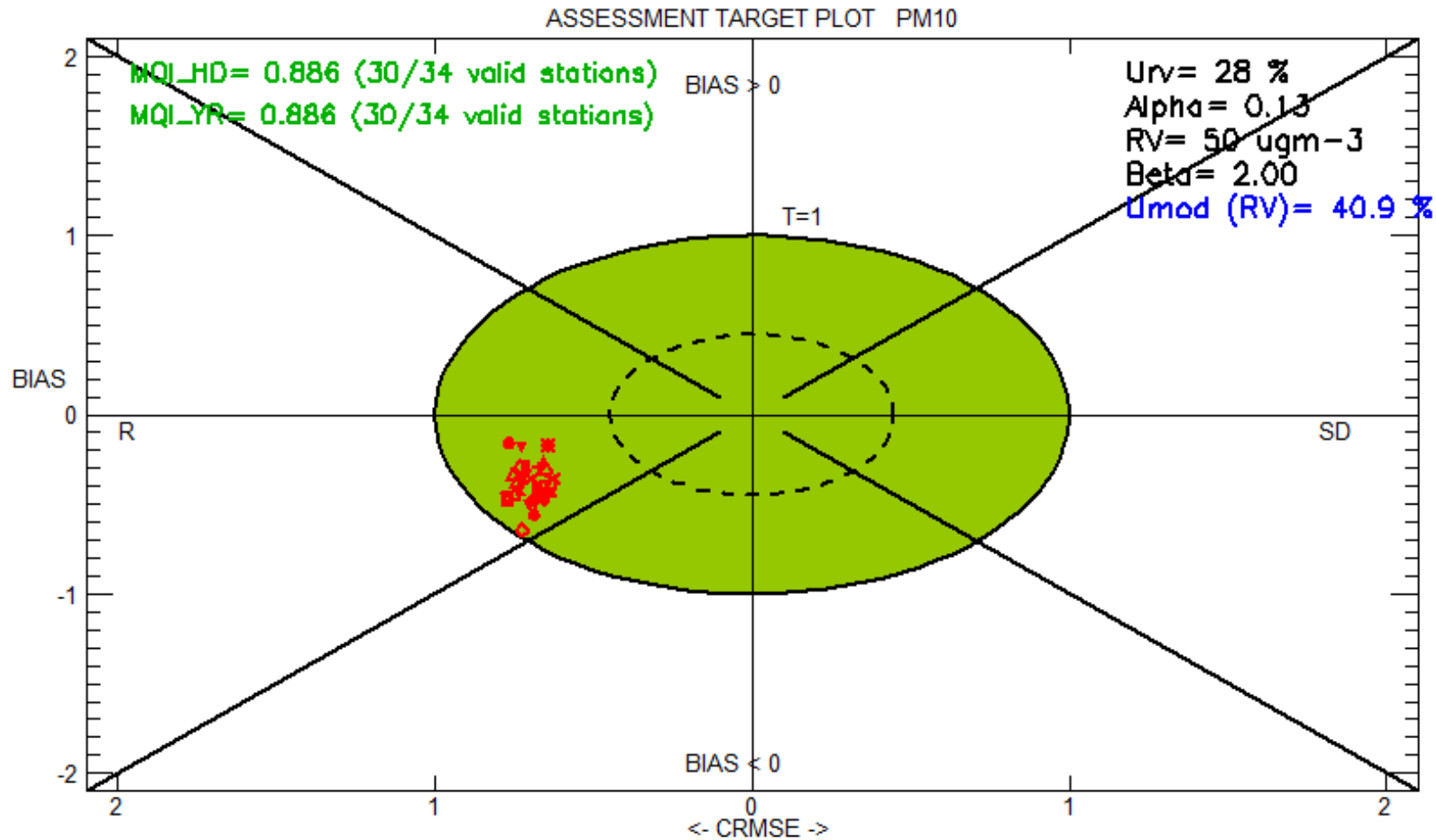
- What did you learn about your modelled concentrations through the Pilot study?
- What do you think of the concentration benchmarking tools available in FAIRMODE? Are they useful? How?
- What do you propose to improve air quality modelling, more in general, at local scale?

# “Delta tool” - (ARPAE/ITALY)

ARPAE since 2003 runs daily CTM model (NINFA model)  
[www.arpae.it/aria](http://www.arpae.it/aria)



# Operational run emission inventory 2010



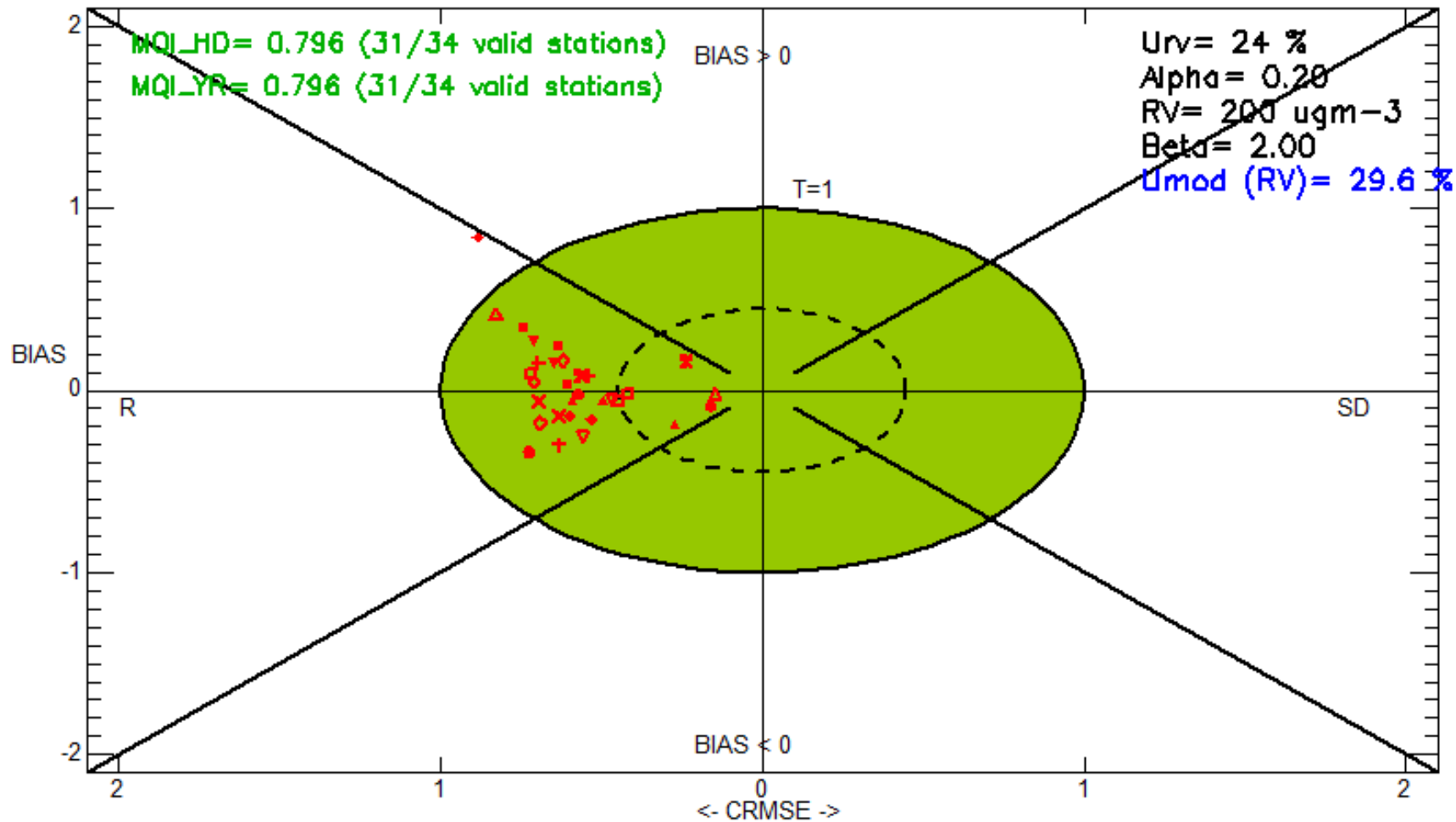
All stations fulfil the criteria, the bias is always negative, indicating a general underestimation of the PM10 by the model, attributable to the well-known difficulties of air quality model performing over the Po valley. Inside the random error, the source of error is due to the correlation between the modelled and observed data. All dots are also outside the dashed circle which represents the area where the model is within the range of observation uncertainty, this suggests that further improvements to the model can be achieved.

|                |                  |                 |               |
|----------------|------------------|-----------------|---------------|
| ◊ MARECCHIA    | ■ SROCCO         | † FRANCHINI-ANG | ■ VILLAFULVIA |
| ◊ VERUCCHIO    | ■ REMESINA       | † SAVIGNANO     | ■ CAORLE      |
| ◊ SANLEO       | ◊ PARCOFERRARI   | † SAVIGNANODIRI | ■ DELTACERVIA |
| ◊ CITTADELLA   | ◊ GAVELLO        | † GIARDINIMARGH |               |
| ◊ BADIA        | ◊ PARCOEDILCARA  | † SANPIETROCAPO |               |
| ◊ SARAGAT      | ◊ LUGAGNANO      | † VIACHIARINI   |               |
| ◊ CASTELLARANO | ◊ PARCOMONTECLIC | † CASTELLUCCIO  |               |
| ◊ SLAZZARO     | ◊ CORTEBRUGNATE  | † GHERARDI      |               |
| ◊ FEBBIO       | ◊ PARCORESISTEN  | † CENTO         |               |

Strt/end Ind: 1-8784  
Model (s): NINFAOPE  
Parameter: PM10  
Scen: 2016  
Extra Values: No  
Season: Year  
Day hours: All 24h  
Time Average: Preserved  
Daily stats: Mean

# Operational run emission inventory 2010

ASSESSMENT TARGET PLOT NO2



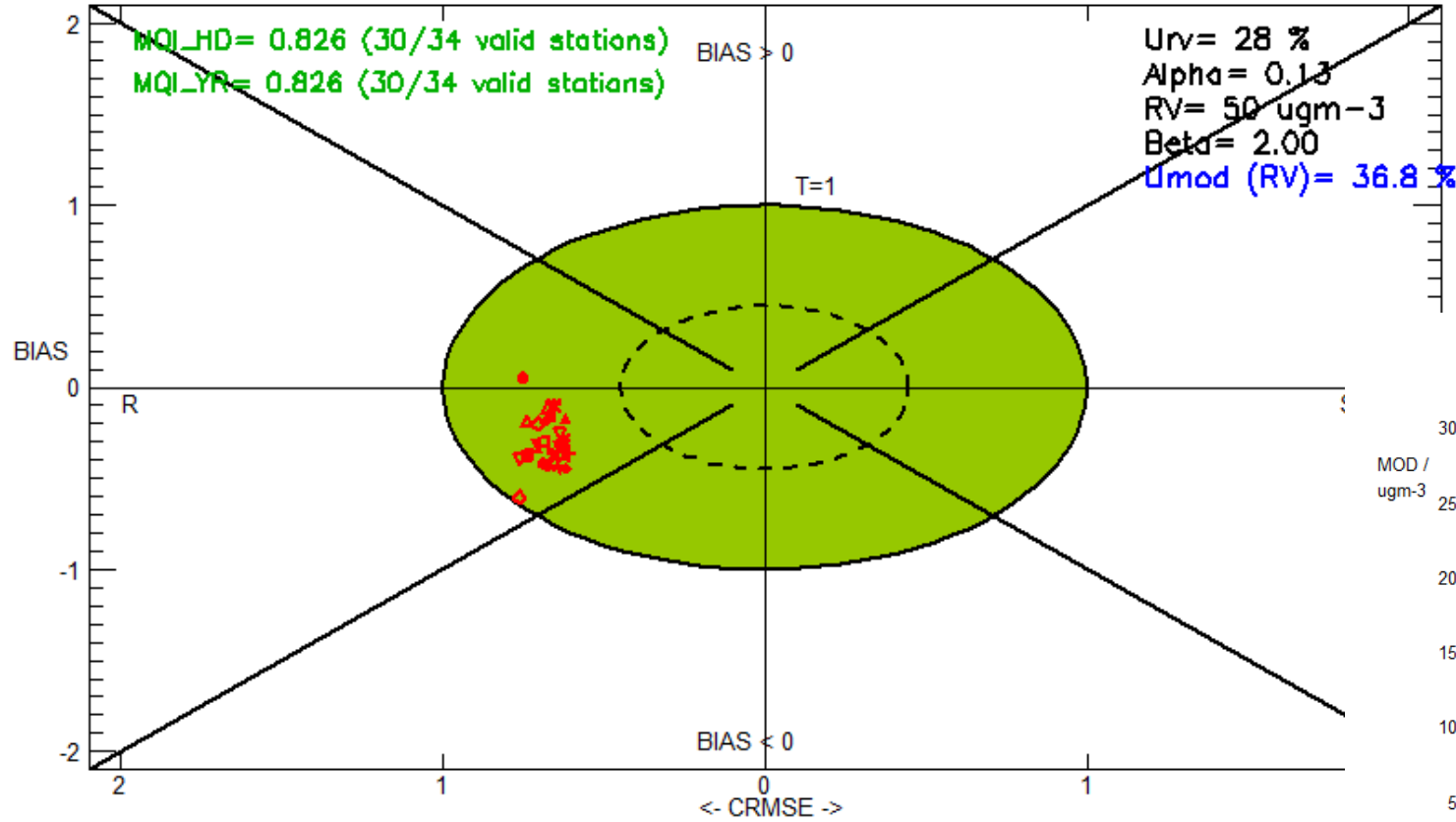
Only one station is outside the green circle. The 54% of sites show negative bias. The 16% of the points lie inside the dashed circle, thus there is no margin for a model improvement at these sites. The correlations is the source of error inside CRMSE zone.

- |   |              |   |               |   |               |   |             |
|---|--------------|---|---------------|---|---------------|---|-------------|
| ○ | MARECCHIA    | × | REMESINA      | ● | SAVIGNANO     | ◊ | OSTELLATO   |
| □ | VERUCCHIO    | ○ | PARCOFERRARI  | ◊ | SAVIGNANODIRI | ◊ | CAORLE      |
| + | CITTADELLA   | ◊ | GAVELLO       | ◊ | GIARDINIMARGH | ◊ | BALLIRANA   |
| + | BADIA        | ◊ | PARCOEDILCARA | ◊ | SANPIETROCAPO | ◊ | DELTACERVIA |
| + | SARAGAT      | ◊ | LUGAGNANO     | ◊ | VIACHIARINI   |   |             |
| + | CASTELLARANO | ◊ | BESENZONE     | ◊ | CASTELLUCCIO  |   |             |
| + | SLAZZARO     | ◊ | PARCOMONTECUC | ◊ | GHERARDI      |   |             |
| + | FEBBIO       | ◊ | CORTEBRUGNATE | ◊ | CENTO         |   |             |
| + | SROCCO       | + | FRANCHINI-ANG | ◊ | VILLAFULVIA   |   |             |

Strt/end Ind: 1-8784  
 Model (s): NINFAOPE  
 Parameter: NO2  
 Scen: 2016  
 Extra Values: No  
 Season: Year  
 Day hours: All 24h  
 Time Average: Preserved  
 Daily stats: preserved

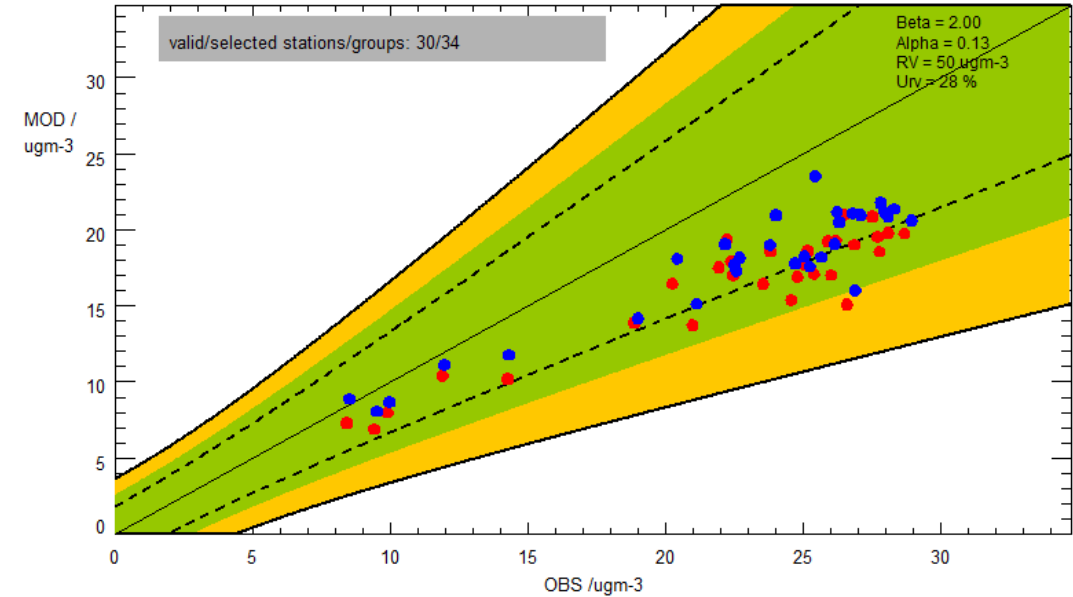
# Rerun using emission inventory 2013

ASSESSMENT TARGET PLOT PM10



All stations fulfil the criteria, the bias is negative, only a station as a positive bias indicating a general underestimation. All dots are also outside the dashed circle which represents the area where the model is within the range of observation uncertainty, this suggests that further improvements to the model can be achieved. Nevertheless the new run (blue dots) improve the model performance

Scatter PLOT PM10

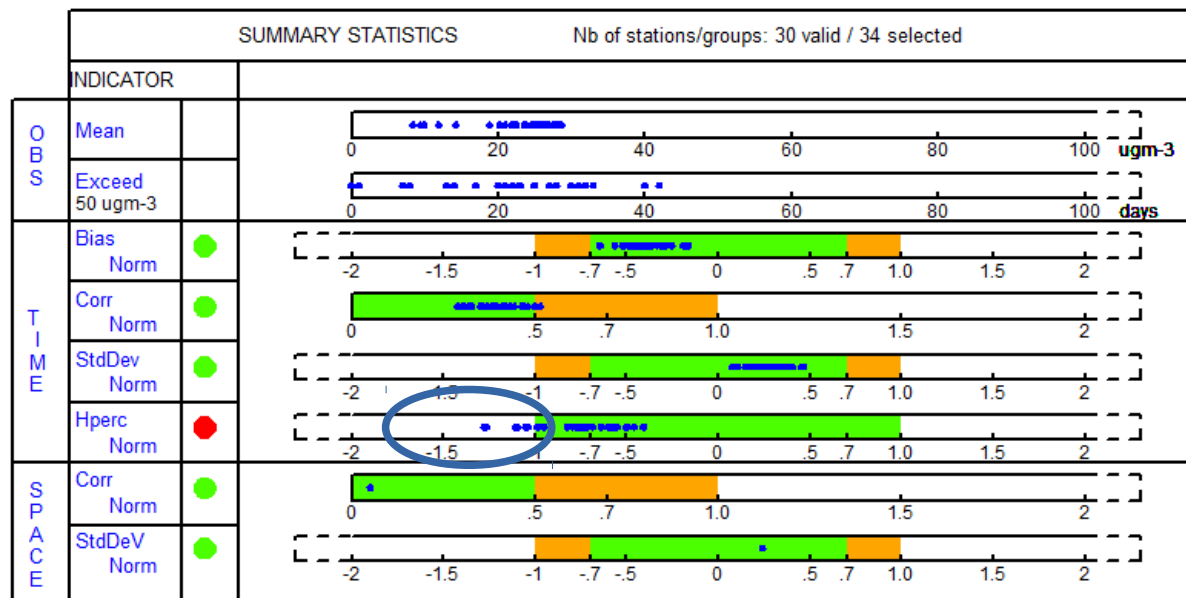


|  |  |   |  |  |
|--|--|---|--|--|
| <ul style="list-style-type: none"> <li>○ MARECCHIA</li> <li>○ VERUCCHIO</li> <li>○ SANLEO</li> <li>○ CITTADELLA</li> <li>○ BADIA</li> <li>○ SARAGAT</li> <li>○ CASTELLARANO</li> <li>○ SLAZZARO</li> <li>○ FEBBIO</li> </ul> | <ul style="list-style-type: none"> <li>○ SROCCO</li> <li>○ REMESINA</li> <li>○ PARCOFERRARI</li> <li>○ GAVELLO</li> <li>○ PARCOEDILCARA</li> <li>○ LUGAGNANO</li> <li>○ PARCOMONTECUC</li> <li>○ CORTEBRUGNATE</li> <li>○ PARCORESISTEN</li> </ul> | <ul style="list-style-type: none"> <li>○ FRANCHINI-ANG</li> <li>○ SAVIGNANO</li> <li>○ SAVIGNANODIRI</li> <li>○ GIARDINIMARGH</li> <li>○ SANPIETROCAPO</li> <li>○ VIACHIARINI</li> <li>○ CASTELLUCCIO</li> <li>○ GHERARDI</li> <li>○ CENTO</li> </ul> | <ul style="list-style-type: none"> <li>○ VILLAFULVIA</li> <li>○ CAORLE</li> <li>○ DELTACERVIA</li> </ul> | <p>Strt/end Ind: 1-8784<br/>           Model (s): ninfa2016N<br/>           Parameter: PM10<br/>           Scen: 2016<br/>           Extra Values: No<br/>           Season: Year<br/>           Day hours: All 24h<br/>           Time Average: Preser<br/>           Daily stats: Mean</p> |
|--|--|---|--|--|

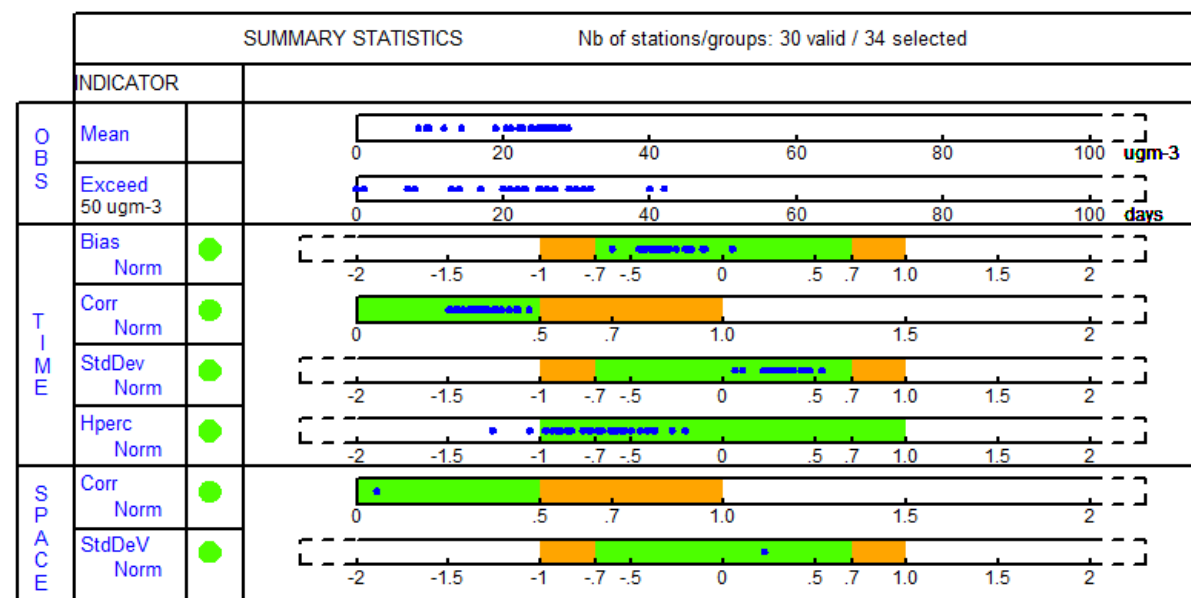
|  |  |
|--|--|
| <ul style="list-style-type: none"> <li>● NINFAOPE</li> <li>● ninfa2016N</li> </ul> | <p>Strt/end Ind: 1-8784<br/>           Parameter: PM10<br/>           Scen: 2016<br/>           Extra Values: No<br/>           Season: Year<br/>           Day hours: All 24h<br/>           Time Average: Preserved<br/>           Daily stats: Mean</p> |
|--|--|

# PM10

## Operational run emission inventory 2010



## Rerun using emission inventory 2013

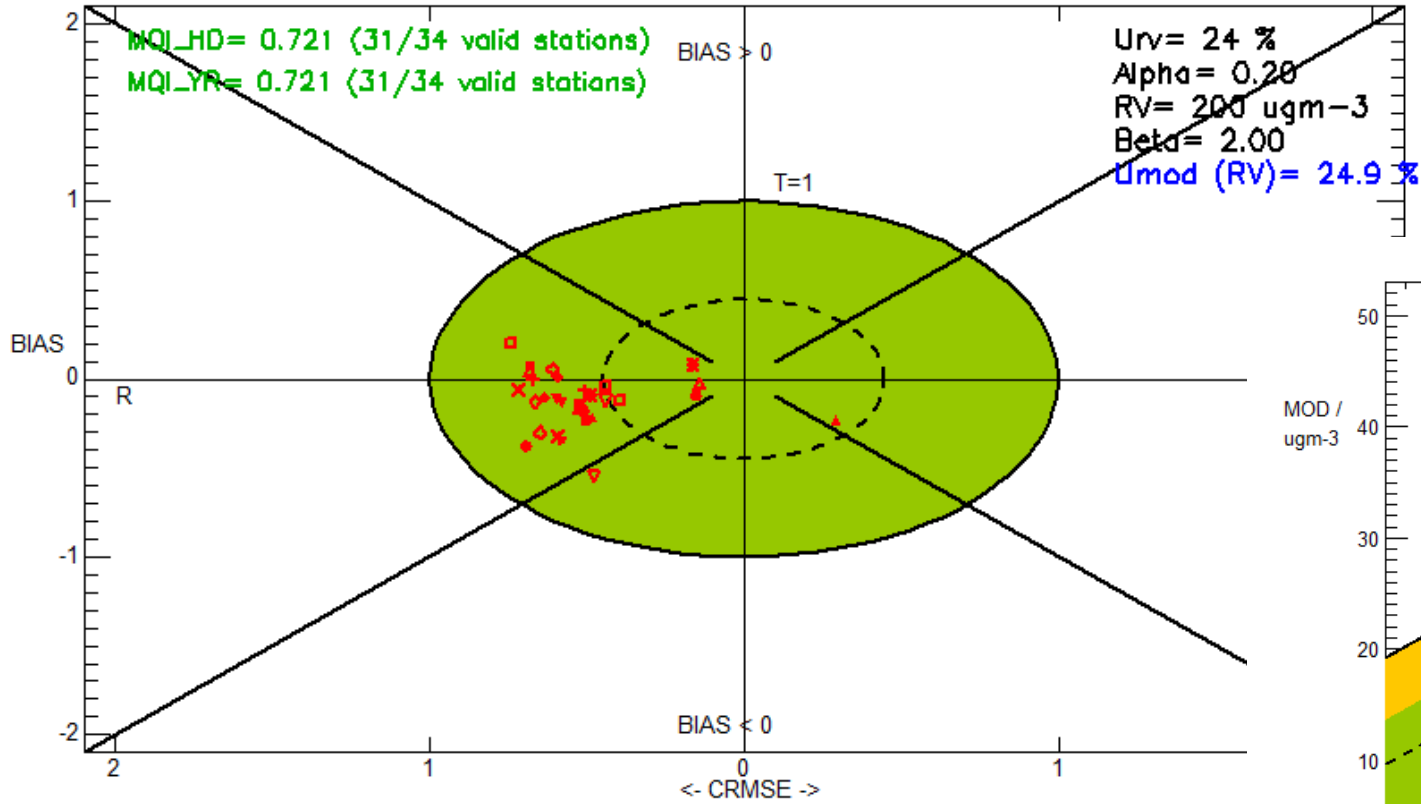


■ Performance Criteria satisfied  
■ Performance Criteria satisfied; Error dominated by corresponding Indicator  
● TIME: >90% of stations fulfills the Performance Criteria  
● SPACE: Dot fulfills the Performance Criteria  
● TIME: <90% of stations fulfills the Performance Criteria  
● SPACE: Dot does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

■ Performance Criteria satisfied  
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● 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

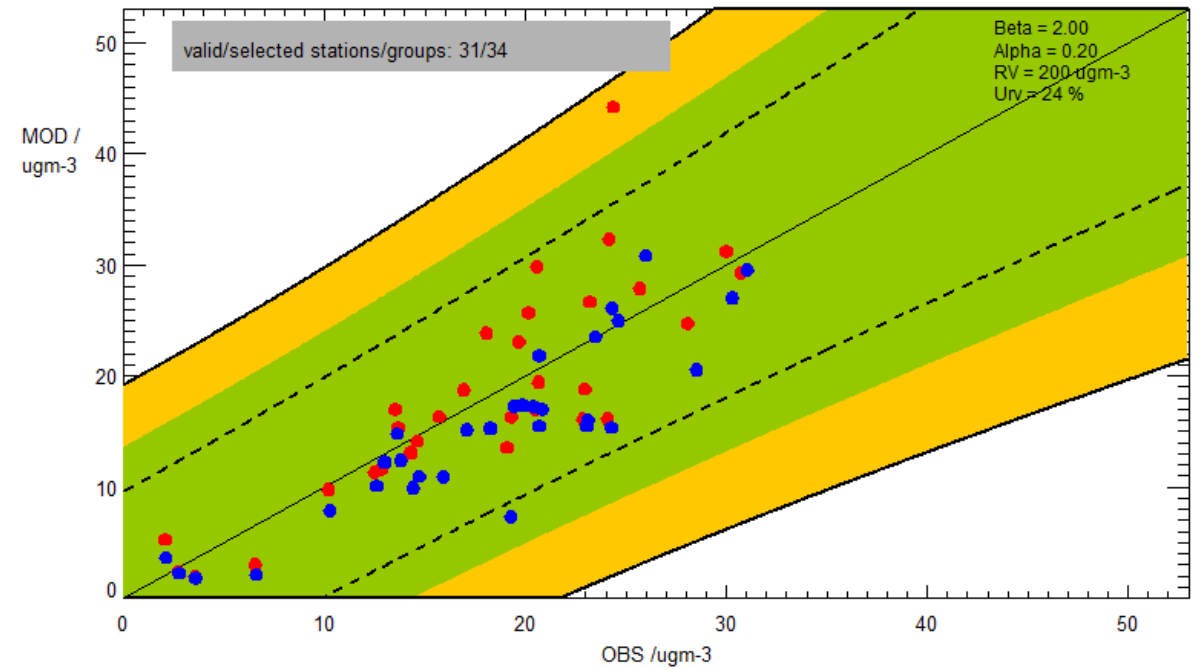
# Rerun using emission inventory 2013

ASSESSMENT TARGET PLOT NO2



All stations are inside the green circle. The 77% of sites show negative bias, indicating an underestimation. The 25% of the points lie inside the dashed circle. The correlations is the main source of error.

Scatter PLOT NO2



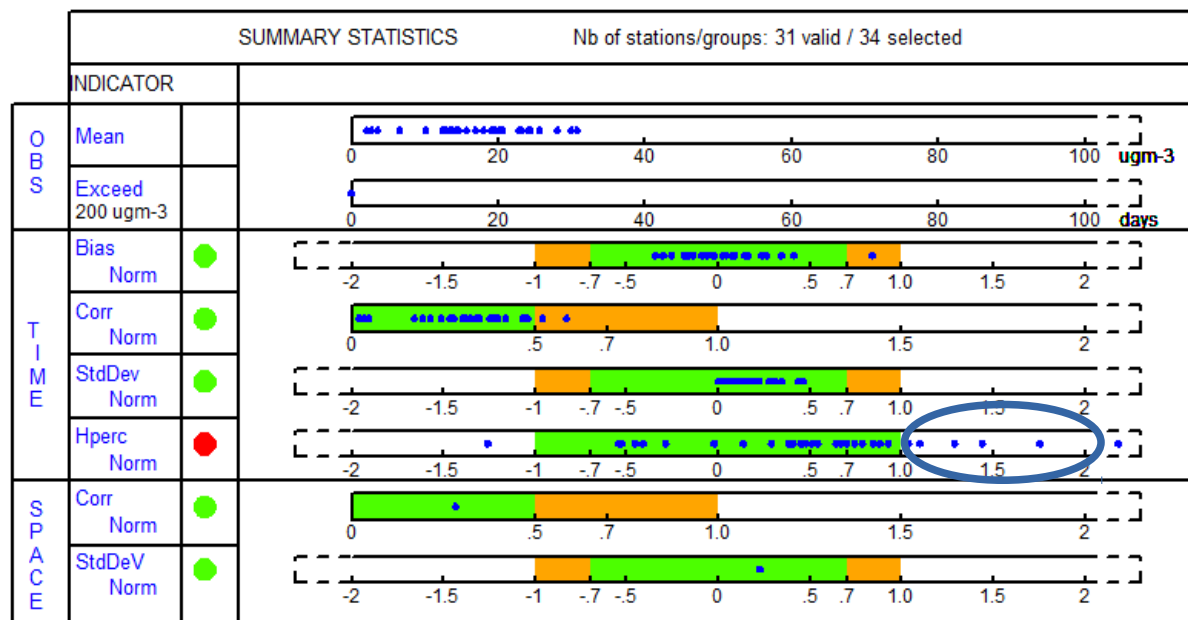
|   |              |   |               |   |                |   |             |
|---|--------------|---|---------------|---|----------------|---|-------------|
| ○ | MARECCHIA    | × | REMESINA      | ◇ | SAVIGNANO      | △ | OSTELLATO   |
| ○ | VERUCCHIO    | × | PARCOFERRARI  | ◇ | SAVIGNANODIRI  | △ | CAORLE      |
| ○ | CITTADELLA   | × | GAVELLO       | ◇ | GIARDINIMARGH. | △ | BALLIRANA   |
| ○ | BADIA        | × | PARCOEDILCARA | ◇ | SANPIETROCAPO  | △ | DELTACERVIA |
| ○ | SARAGAT      | × | LUGAGNANO     | ◇ | VIACHIARINI    |   |             |
| ○ | CASTELLARANO | × | BESENZONE     | ◇ | CASTELLUCCIO   |   |             |
| ○ | SLAZZARO     | × | PARCOMONTECUC | ◇ | GHERARDI       |   |             |
| ○ | FEBBIO       | × | CORTEBRUGNATE | ◇ | CENTO          |   |             |
| ○ | SROCCO       | × | FRANCHINI-ANG | ◇ | VILLAFULVIA    |   |             |

|   |            |                         |
|---|------------|-------------------------|
| ● | NINFAOPE   | Strt/end Ind: 1-8784    |
| ● | ninfa2016N | Model (s): ninfa        |
|   |            | Parameter: NO2          |
|   |            | Scen: 2016              |
|   |            | Extra Values: No        |
|   |            | Season: Year            |
|   |            | Day hours: All 24h      |
|   |            | Time Average: Preserved |
|   |            | Daily stats: preserved  |

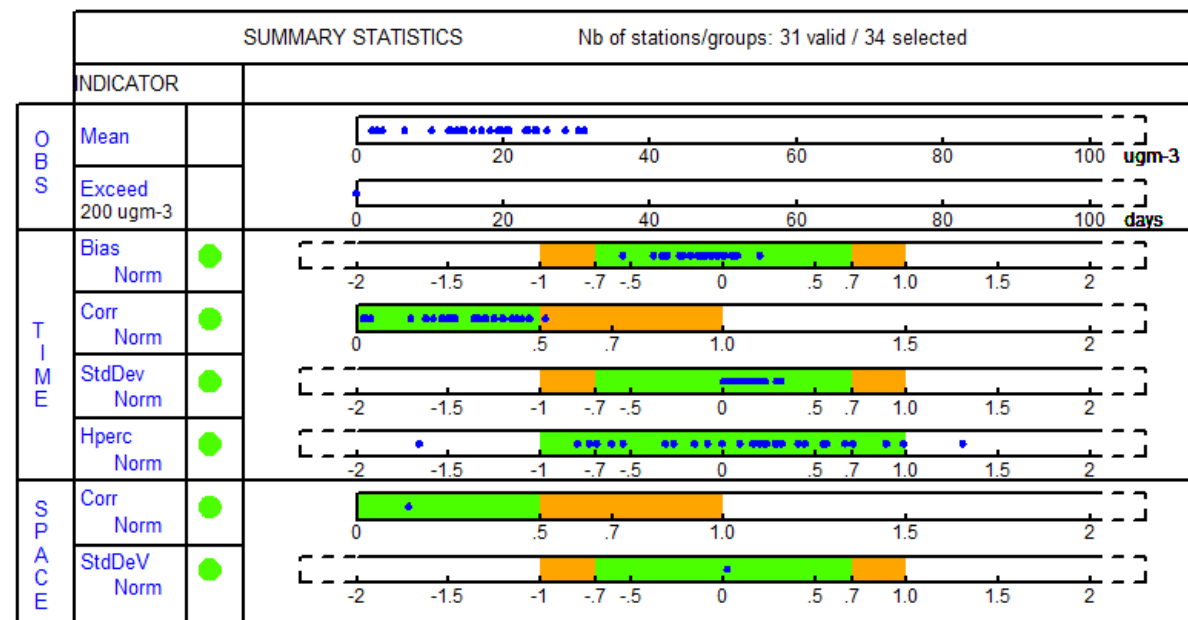


# NO2

## Operational run emission inventory 2010



## Rerun using emission inventory 2013



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

Delta tool gives an immediate evaluation of the performance of air quality model.

The main advantages for a regional environmental agency as ARPAE are a common benchmarking methodology and an analysis focused on the main pollutants under the Air Quality Directive.

Analyzing base case and rerun 2016 confirms the importance of the emission inventory

We are planning Emilia-Romagna simulations at 2 km and upgrade emission inventory 2015 to improve NO<sub>2</sub> performance

## “Composite mapping concentration” – (ITALY/ARPAE)

- We apologize but don't have uploaded concentration grid data refer to 2016 simulations yet. In the composite mapping tool there is a simulations refer to 2012. We hope to uploaded new maps in two weeks.
- A comparison at national level and/or between the other regions of the Po Valley would be very useful for a regional agency as we are

## Additional comments- (ARPAE/ITALY)

- The tool is well updated
- The methodology should also be disseminated to be used in other tools
- Scripts codes to run the tool and produce graphs in background mode