

# FORECAST IN KOSOVO

## Fairmode meeting CT3

### 6-8.10.2021

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# AQ Forecast in Kosovo

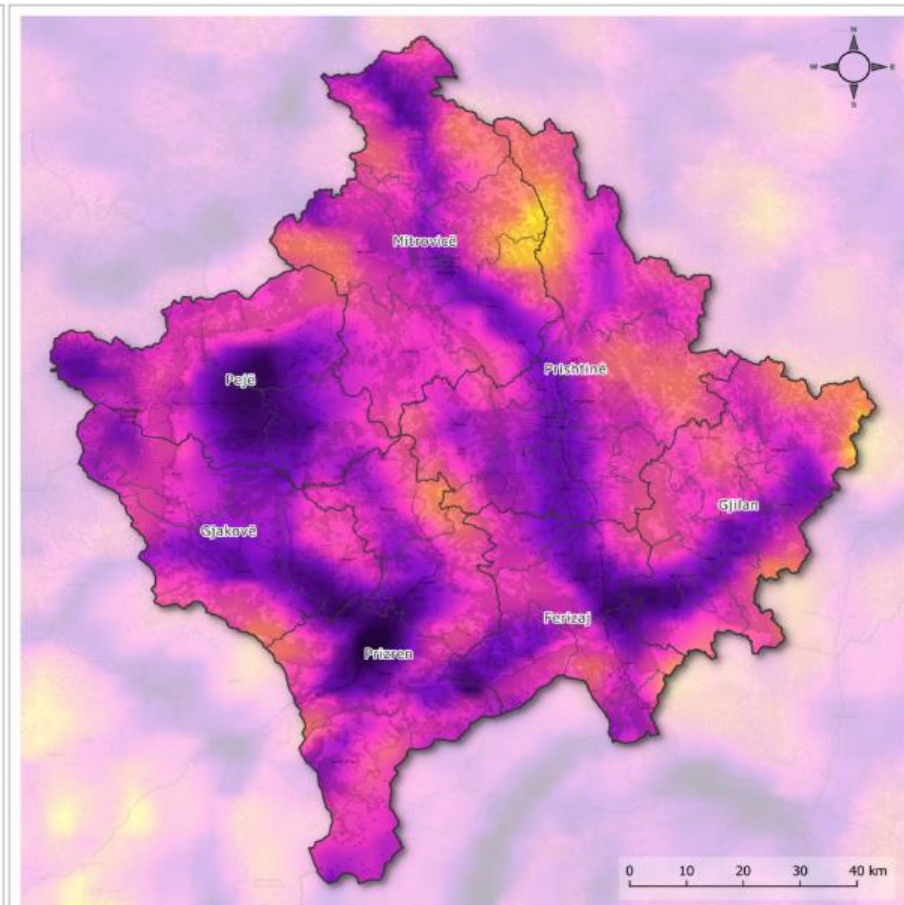
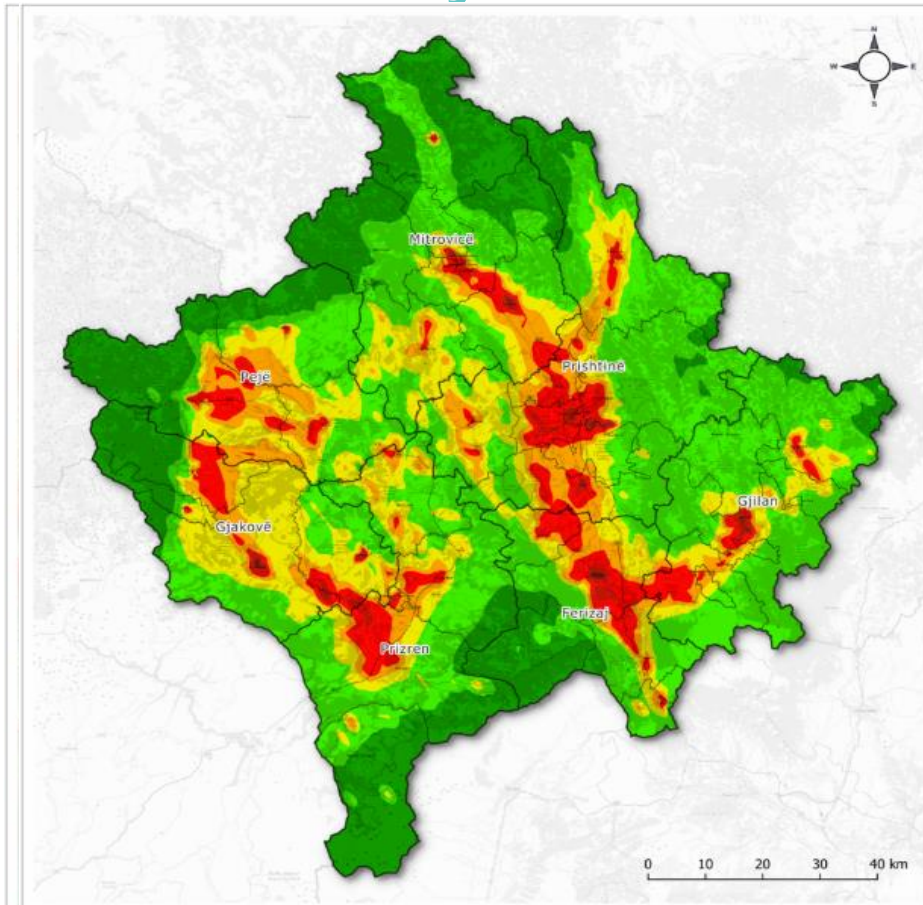
Kosovo forecast objective:

- The main purpose of the forecasting system was to provide Kosovo citizens with adequate hourly air quality information and **health advice**. European AQI has been used.
- The quality objective of the forecast system was focused on the questions:

**Does the model forecast AQI level properly especially for poor and higher AQI level?**

**Are citizens warned against high pollution episodes?**

# Air Quality in Kosovo



# Air Quality in Kosovo

Supply of project management-, air quality information management, behavior change and communication services.

Contracting Authority: MFK - Millennium Foundation of Kosovo

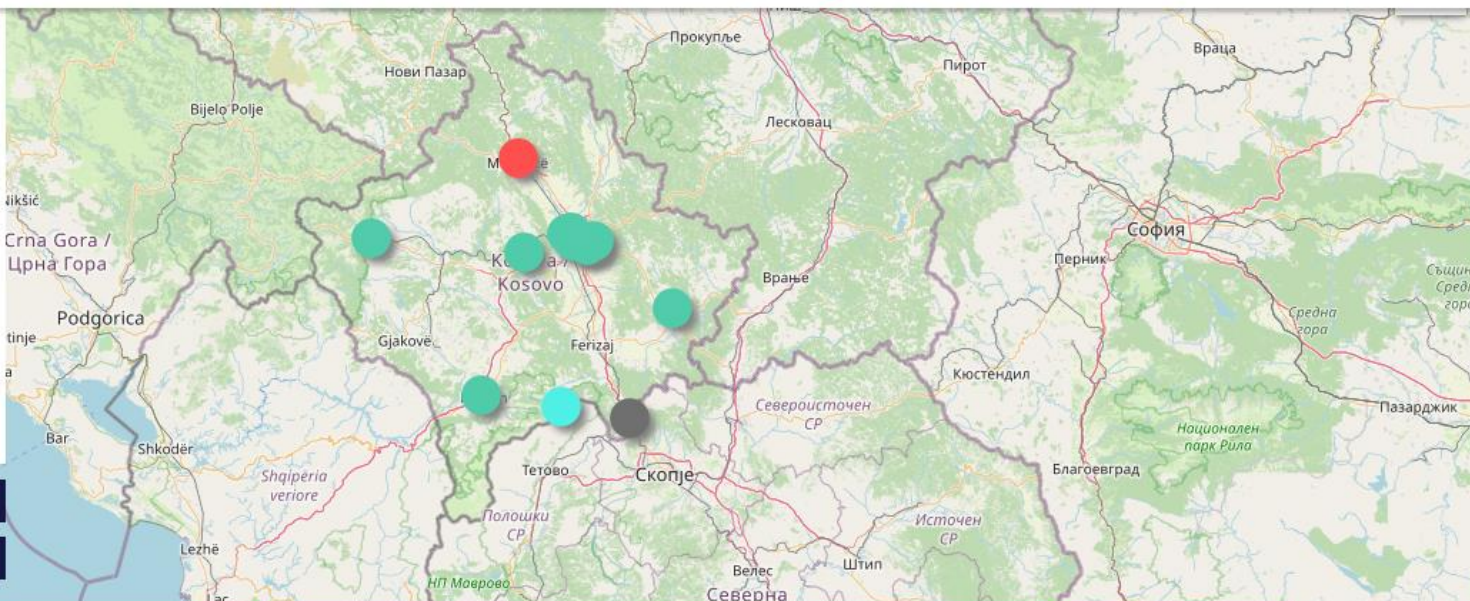
Sponsor USA: MCC – Millennium Challenge Corporation USA



Monitoring data ▾ Forecast data ▾ General information ▾ Contact English ▾



Brezovica	PM2.5	9.0 $\mu\text{g}/\text{m}^3$
Dardhishtë	PM2.5	18.4 $\mu\text{g}/\text{m}^3$
Drenas	PM2.5	16.7 $\mu\text{g}/\text{m}^3$
Gjilan	PM2.5	15.8 $\mu\text{g}/\text{m}^3$
Hani i Elezit	No data	
Mitrovica	PM2.5	28.3 $\mu\text{g}/\text{m}^3$
Mobile	PM2.5	19.8 $\mu\text{g}/\text{m}^3$
Obiliq	PM2.5	18.1 $\mu\text{g}/\text{m}^3$



Forecast for Kosovo

Forecast for Prishtina

Good

Fair

Moderate

Poor

Very poor

Extremely poor

+ Legend explained



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# Air Quality in Kosovo



[Monitoring data](#) [Forecast data](#) [General information](#) [Contact](#) [English](#)



Provisional data.

It is possible that there are missing data points for some parameters at interspersed periods of time. This situation may be caused by a hardware or software failure.

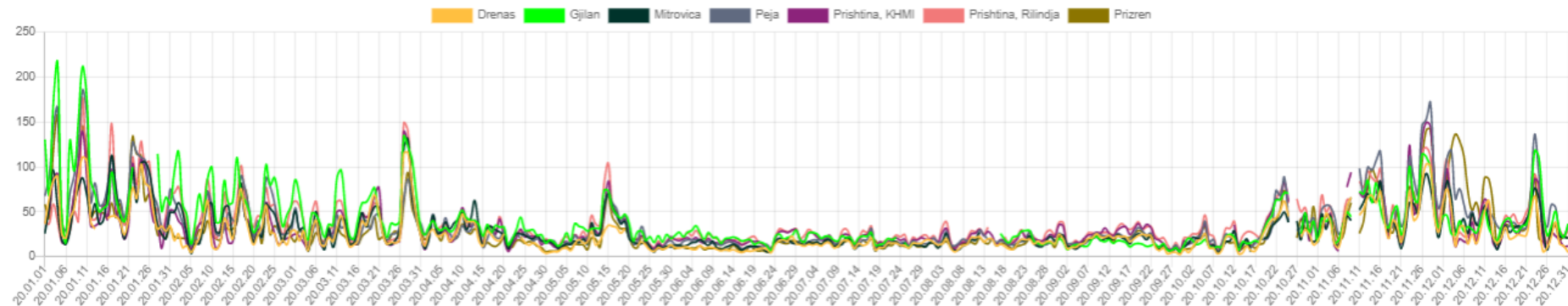
Parameters: 6 selected items  Stations: 7 selected items  Time resolution: hourly  **daily**  monthly  annual  Time range: 7d  14d  30d  **select date**  Values: **average**  maximum

Start date:

End date:

**Charts** Table

PM10  $\mu\text{g}/\text{m}^3$  :

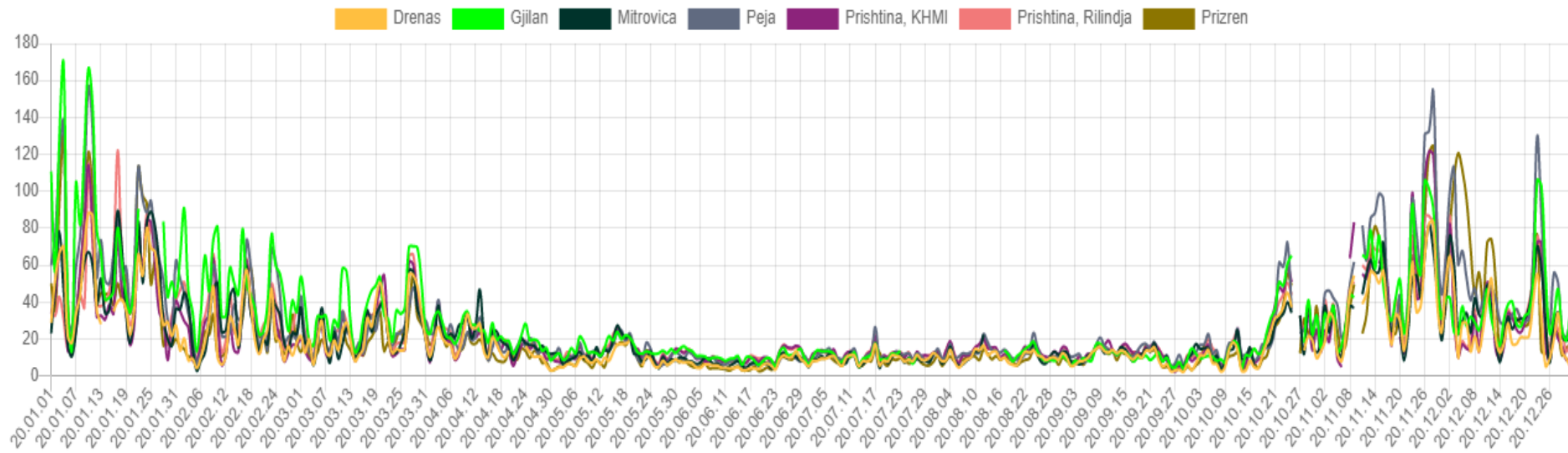


PM2.5  $\mu\text{g}/\text{m}^3$  :



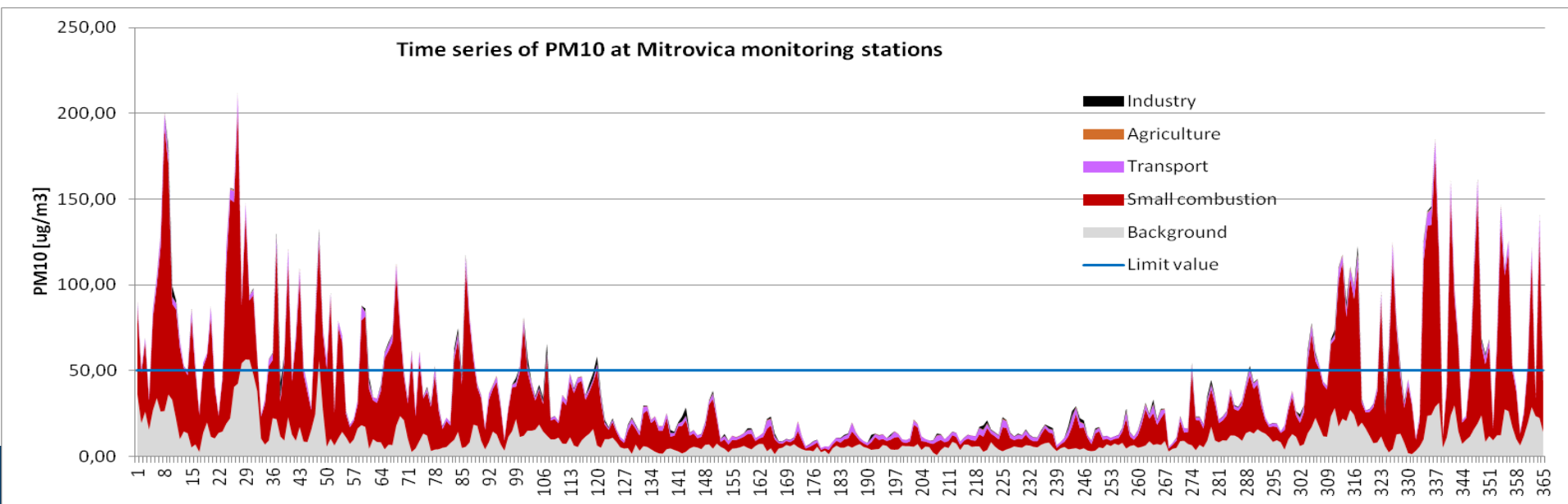
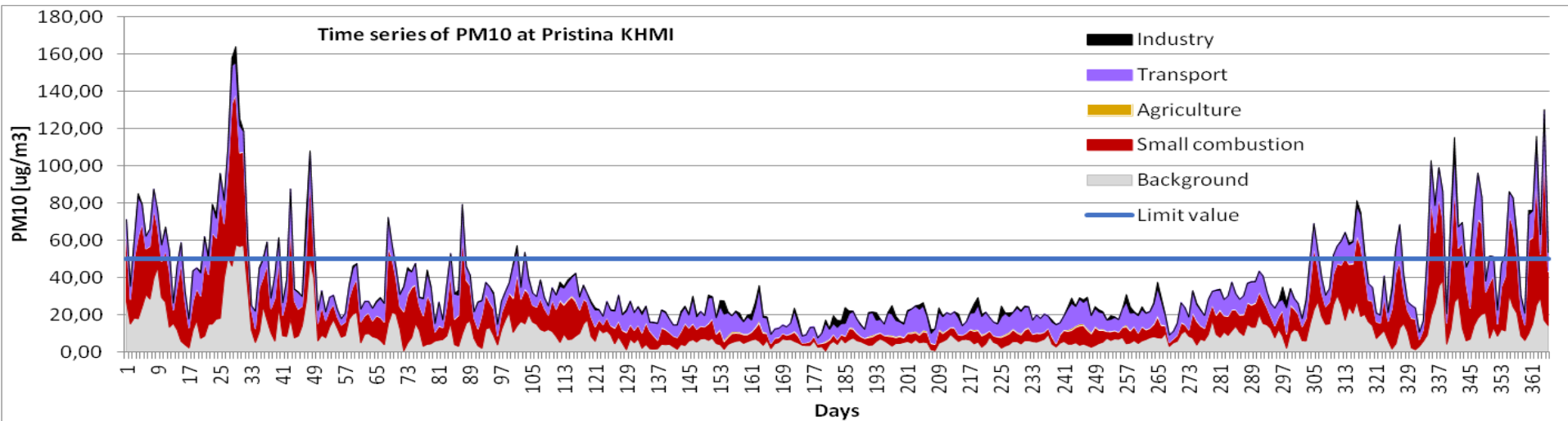
# Air Quality in Kosovo

PM2.5  $\mu\text{g}/\text{m}^3$  :



[Air Quality Portal \(rks-gov.net\) https://airqualitykosova.rks-gov.net/en/](https://airqualitykosova.rks-gov.net/en/)

# Air Quality in Kosovo



# Forecast system in Kosovo

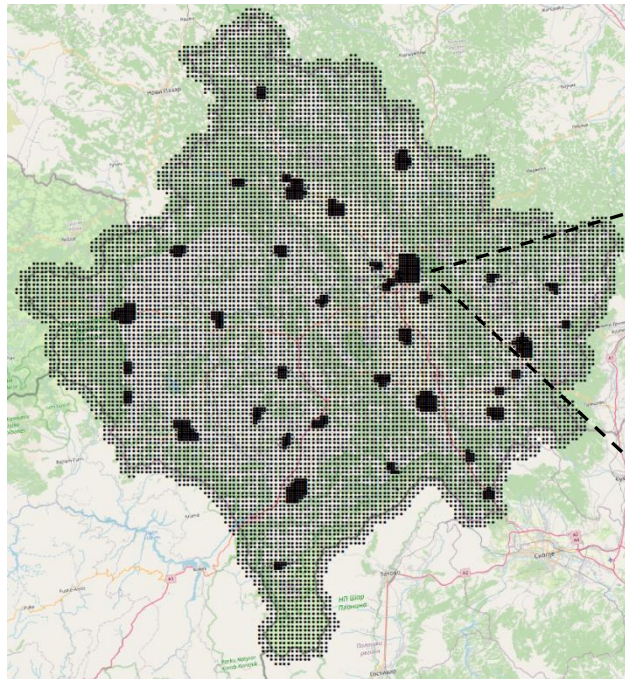
3 days forecast using:

- Calpuff
- WRF
- CAMS Ensemble

Update - every day

Kosovo

1 km x 1 km , 0,5 km x 0,5 km in cities

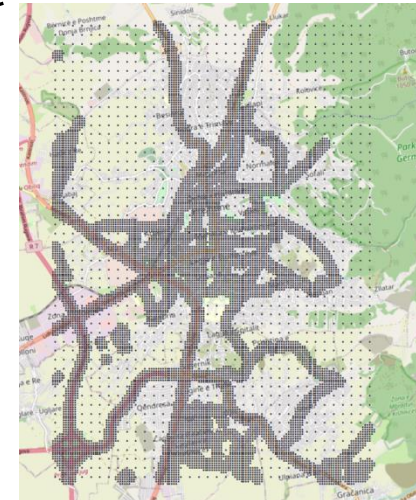


Emissions:

- Small combustion
- Transport
- Energy and Industry
- Agriculture
- Waste
- Mines and quarries

Pristina

200 m x 200 m , 50 m x 50 m along streets



PM10

PM2.5

NO2

O3



# Forecast system in Kosovo

Search for locations

Add Data

DATA SETS [ 1 ] Remove All

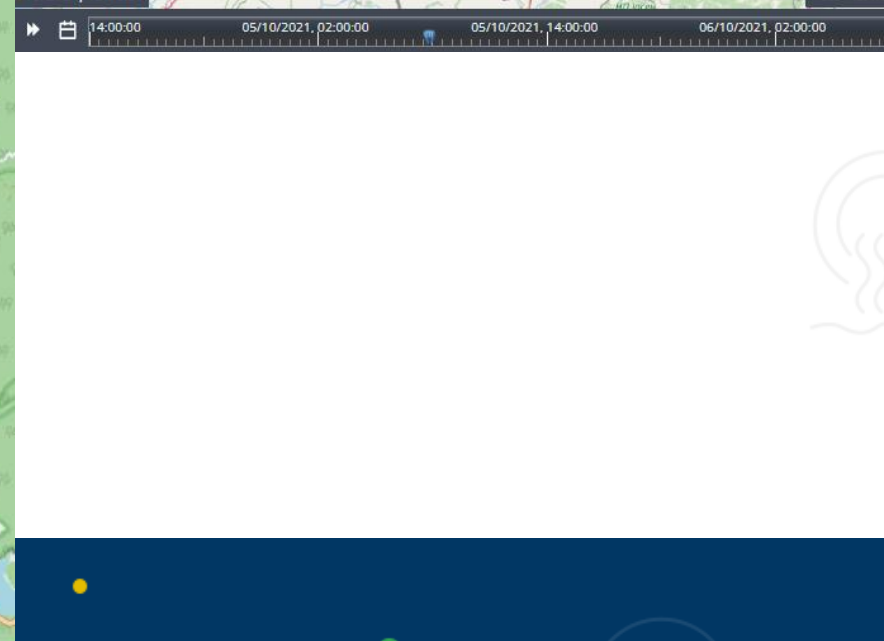
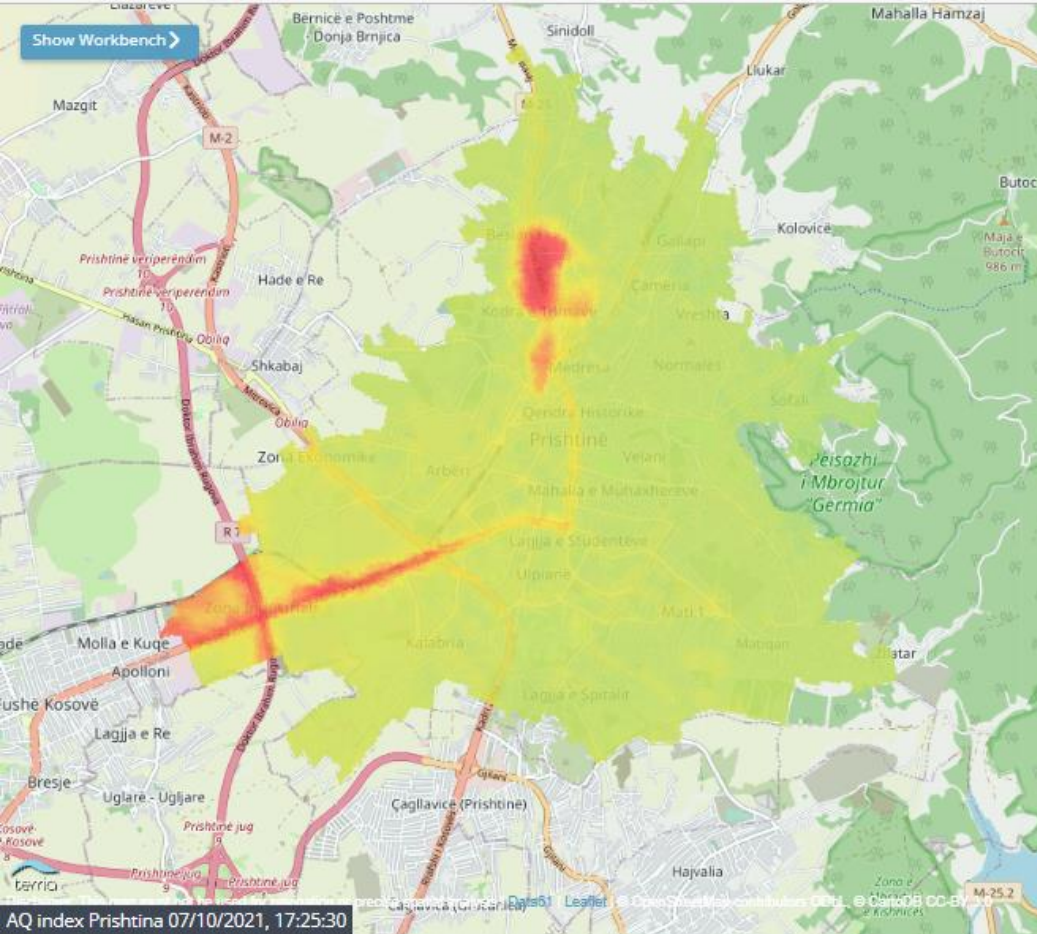
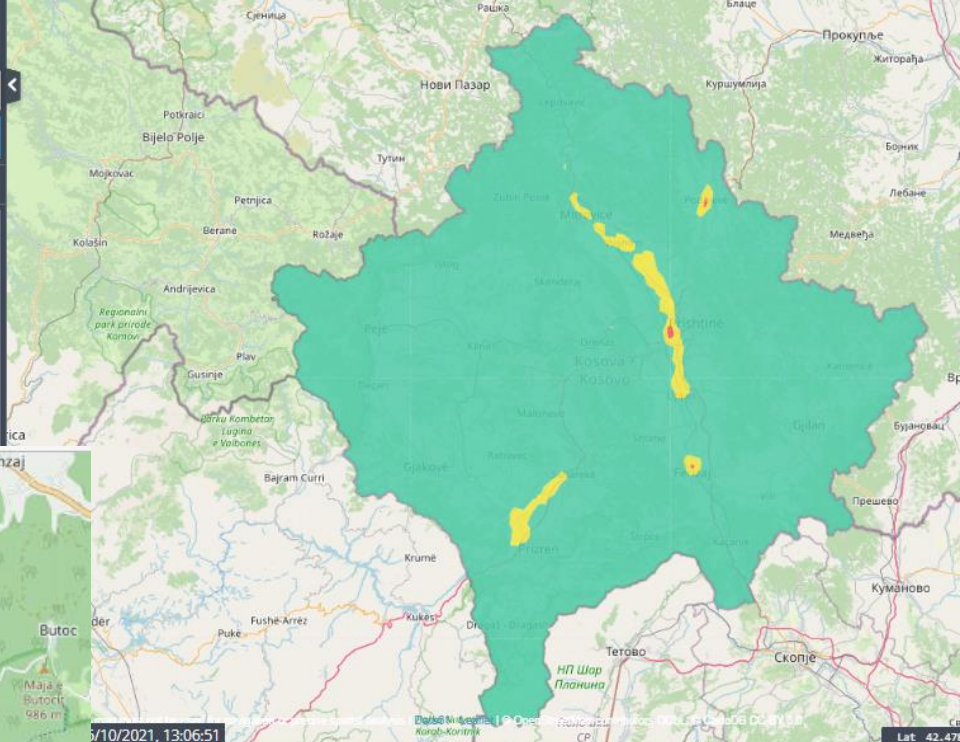
AQ Index

Zoom To Extent About This Data Split Remove

Opacity: 85 %

05/10/2021, 13:00:00

- 0 - Good / E mirë / Dobër
- 1 - Fair / E pranueshme / Prafshshëm
- 2 - Moderate / Mesazare / Umetren
- 3 - Poor / E dobët / Lohtë
- 4 - Very poor / Shumë e dobët / Veoma lohtë
- 5 - Extremely poor / Ishëmbësueshëm e dobët / Izuzetno lohtë



# Forecast verification

Using „traditional” indicators based on hourly data:

- CC (R) - correlation coefficient (Pearson) ,
- RDE - Relative Directive Error,
- RMSE - Root Mean Square Error, BIAS,
- RE - relative error

PM10	IHMK Pristina	Pristina - Rilindja	Peja	Prizren	Gjilan	Drenas	Mitrovica
CC	0,90	0,91	0,86	0,84	0,74	0,74	0,87
bias	4,7	7,5	3,5	-0,9	4,4	-0,8	5,0
RMSE	8,3	10,3	10,4	5,8	8,6	6,4	8,2
monthly RE	22%	31%	17%	-5%	22%	-5%	23%
RDE LV	11%	27%	32%	2%	12%	1%	16%
PM2.5	IHMK Pristina	Pristina - Rilindja	Peja	Prizren	Gjilan	Drenas	Mitrovica
CC	0,90	0,90	0,84	0,83	0,77	0,87	0,85
bias	2,2	3,0	1,5	-0,4	1,9	-0,1	2,9
RMSE	3,5	4,0	3,2	2,8	3,6	2,4	4,5
monthly RE	20%	25%	15%	-5%	18%	-1%	24%
RDE	27%	31%	20%	25%	37%	23%	36%

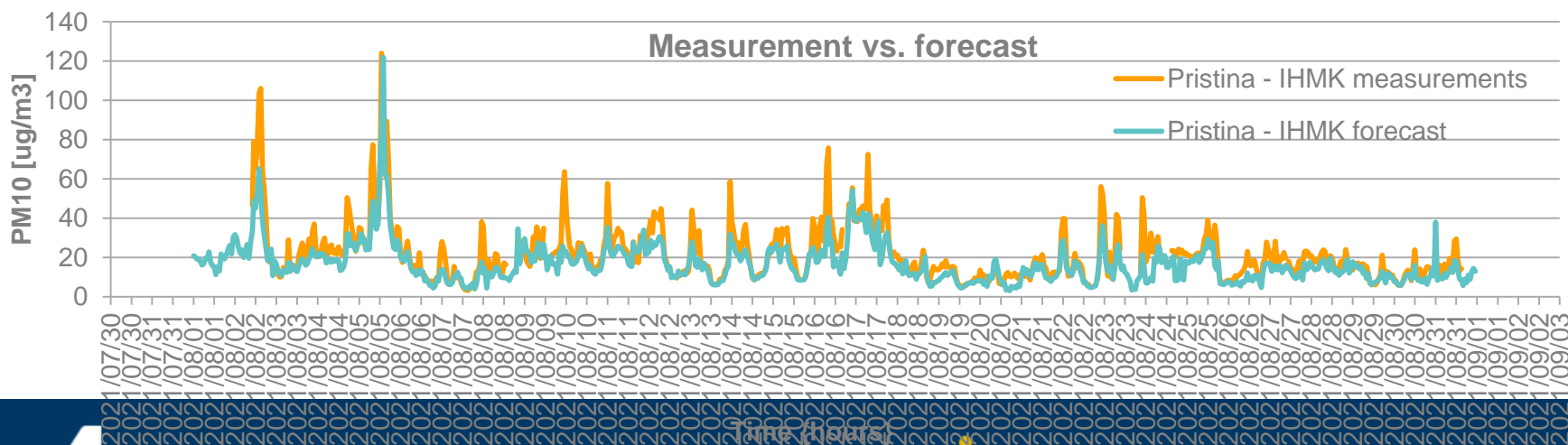
# Forecast verification

Additionally:

- compatibility of AQI [%]
- [%] of cases with 2 level difference of AQI
- correct identification of the main pollutant [%]
- overestimation of AQI [%]
- underestimation of AQI [%]
- GSS: Gilber Skill Score:

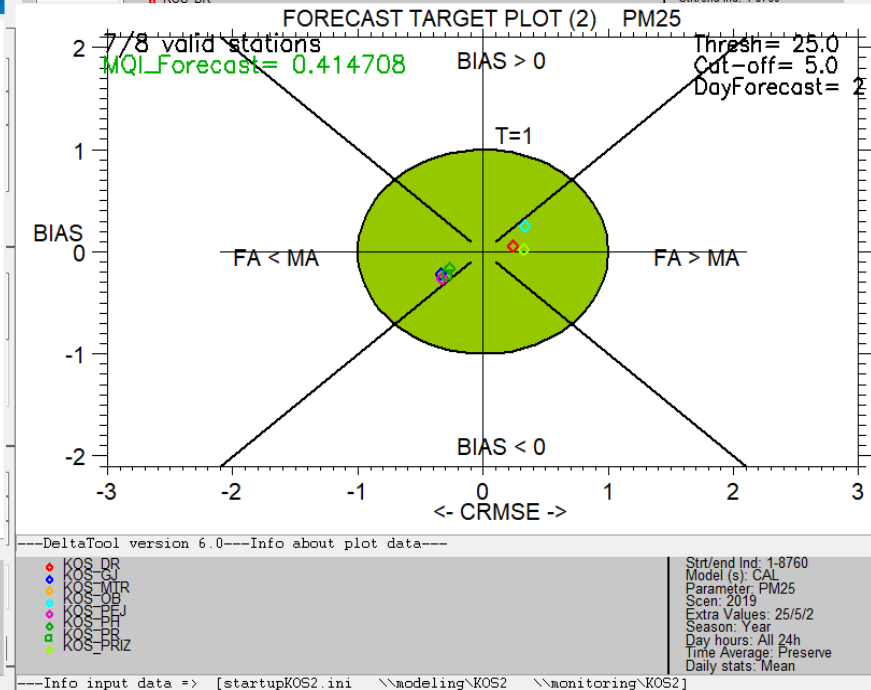
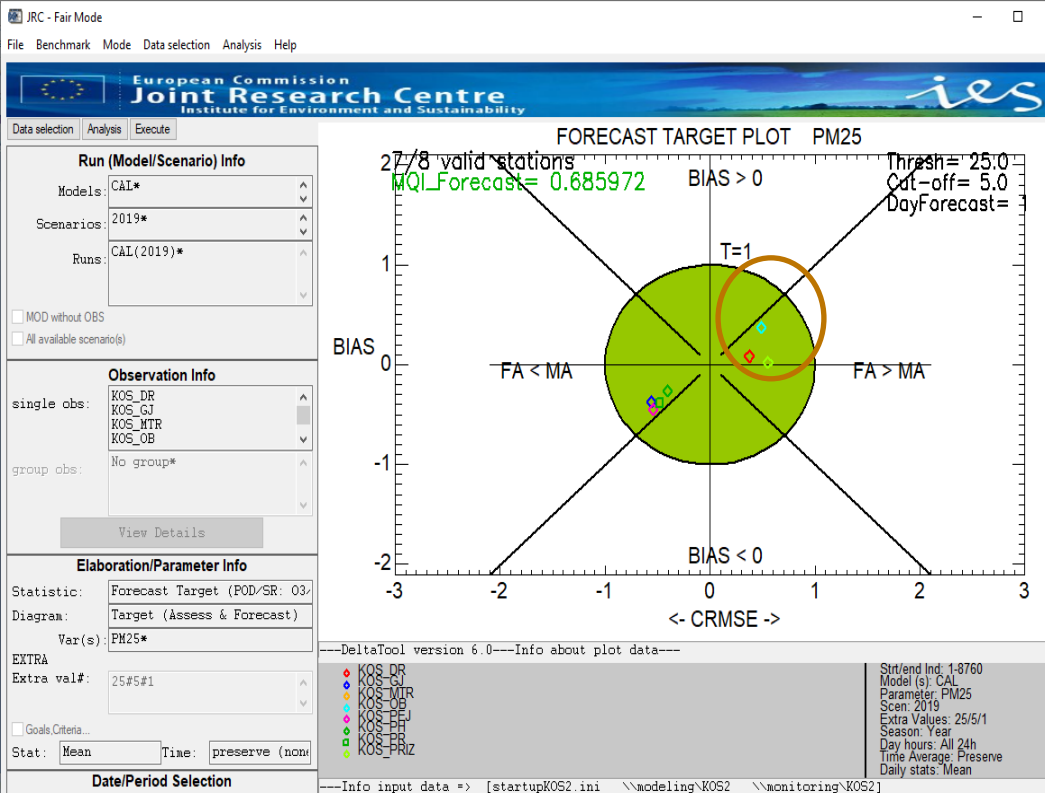
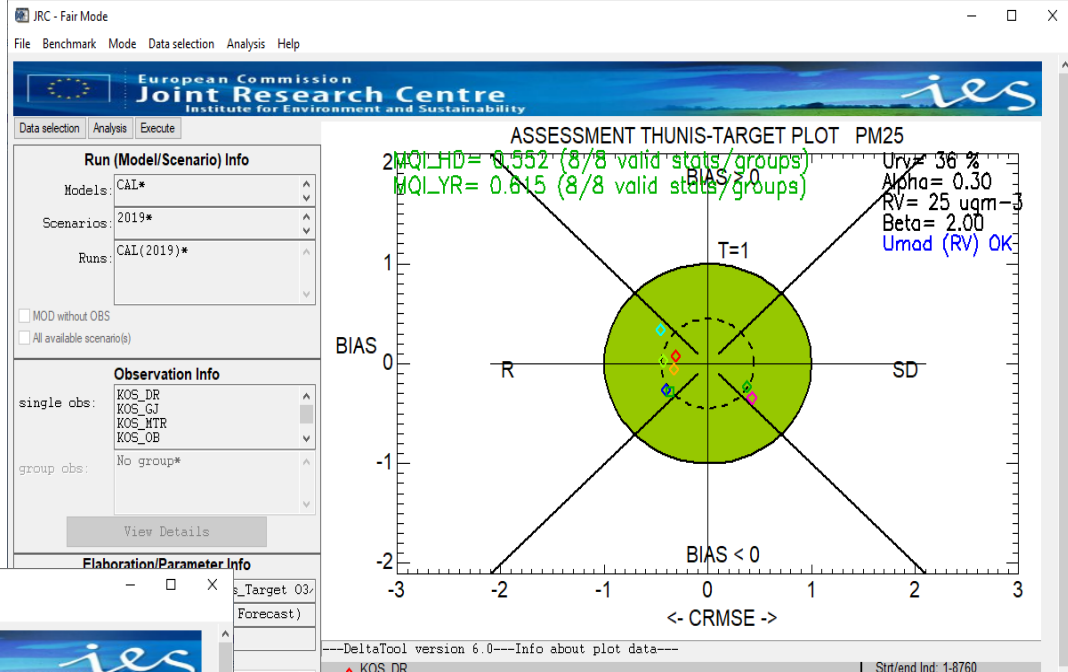
$$GSS = \frac{a}{a + b + c}$$

Indicator	IHKM Pristina	Pristina - Rilindja
compatibility of AQI	72%	77%
% of cases with 2 level difference of AQI	1%	1%
correct indentifaion of the main pollutant for AQI	65%	74%
overestimation of AQI	21%	6%
udnerestimation of AQI	19%	22%
GSS >= moderate	0,43	0,46
number of cases	60	131
GSS >= poor	0,00	0,06
number of cases	13	31
GSS total	0,42	
number of cases	789	

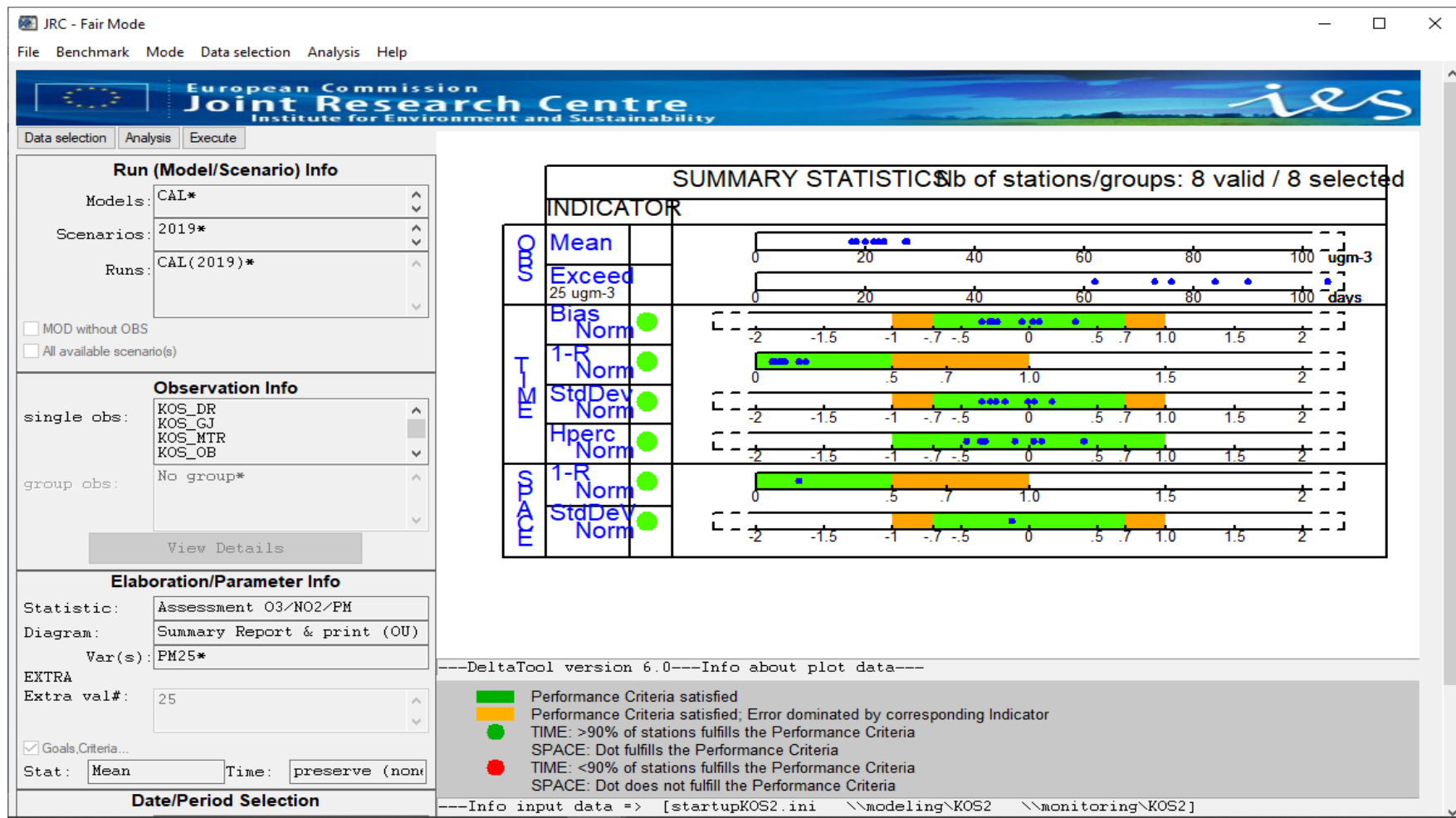


# DeltaTool forecast used in Kosovo

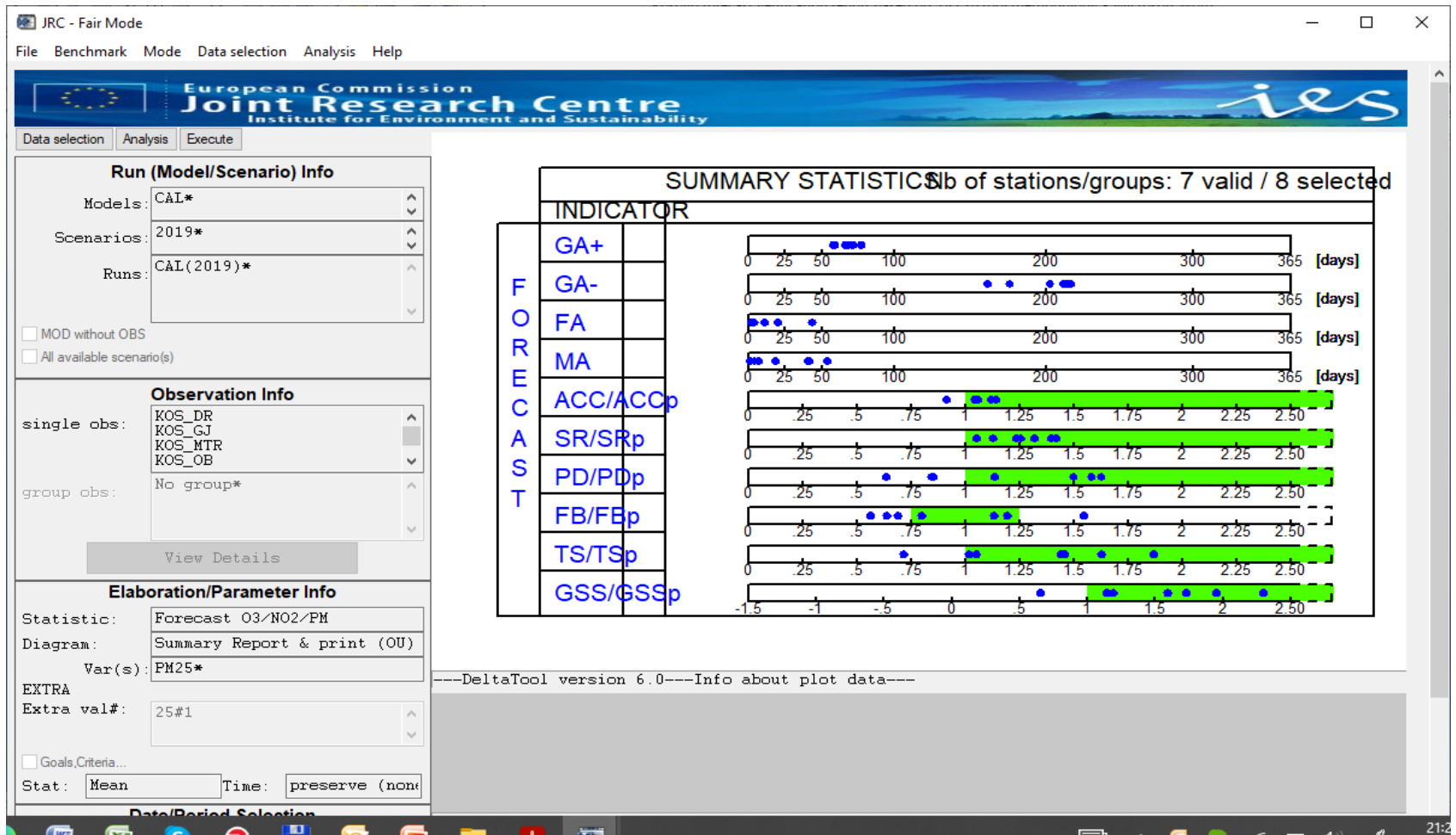
Data used: 1- day forecast for 8 cities from July2020 to May 2021



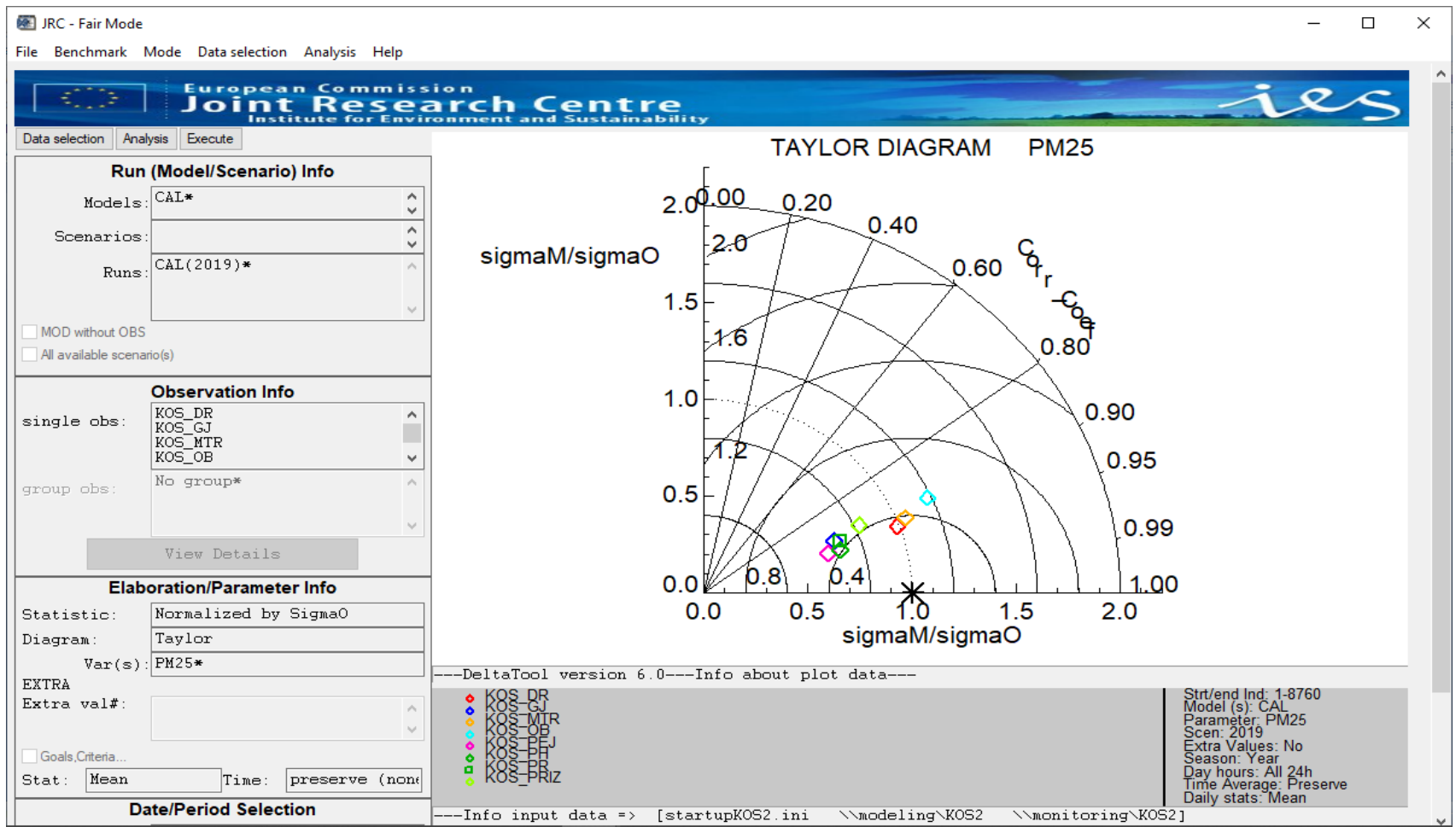
# DeltaTool forecast used in Kosovo



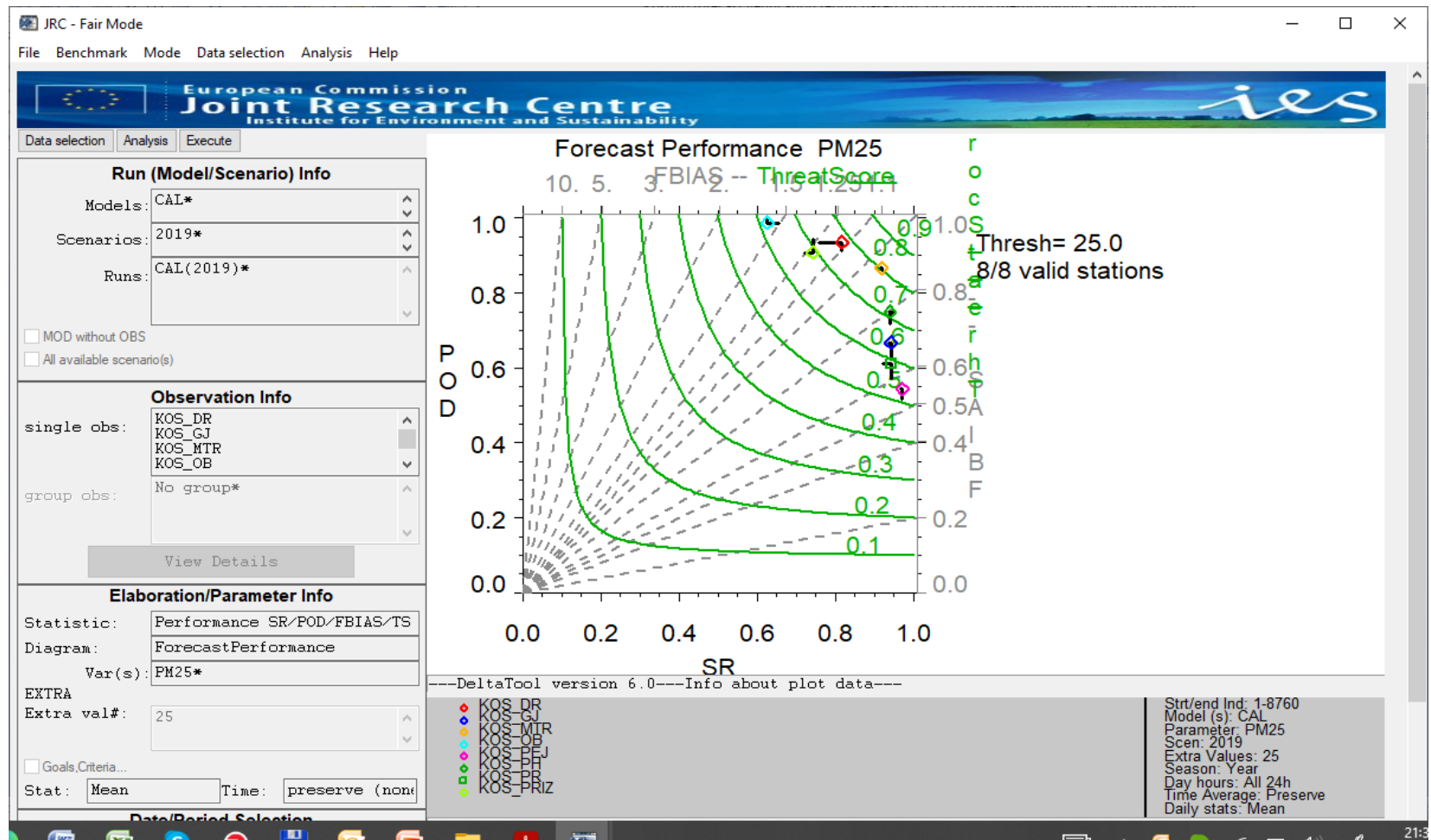
# DeltaTool forecast used in Kosovo



# DeltaTool forecast used in Kosovo

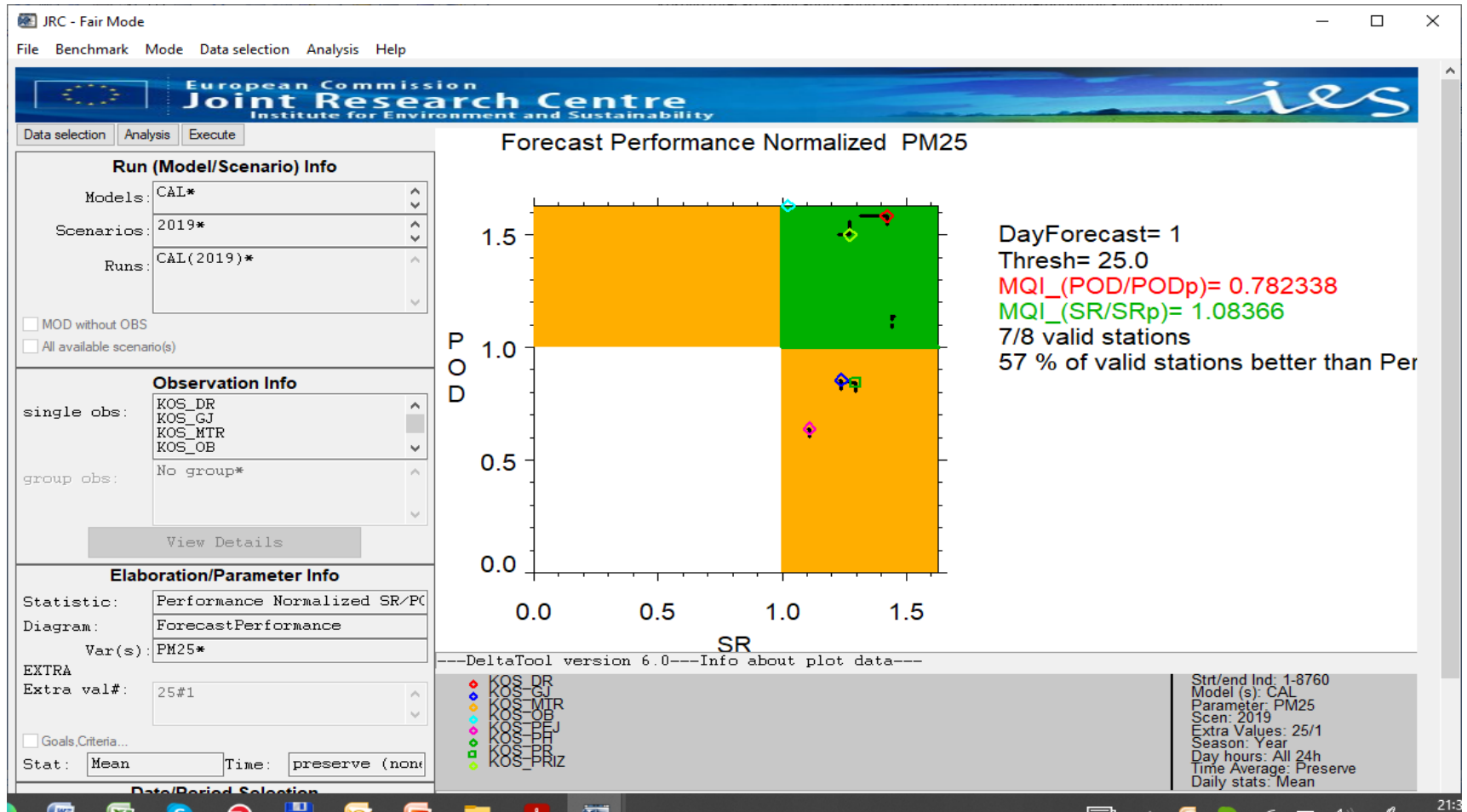


# DeltaTool forecast used in Kosovo

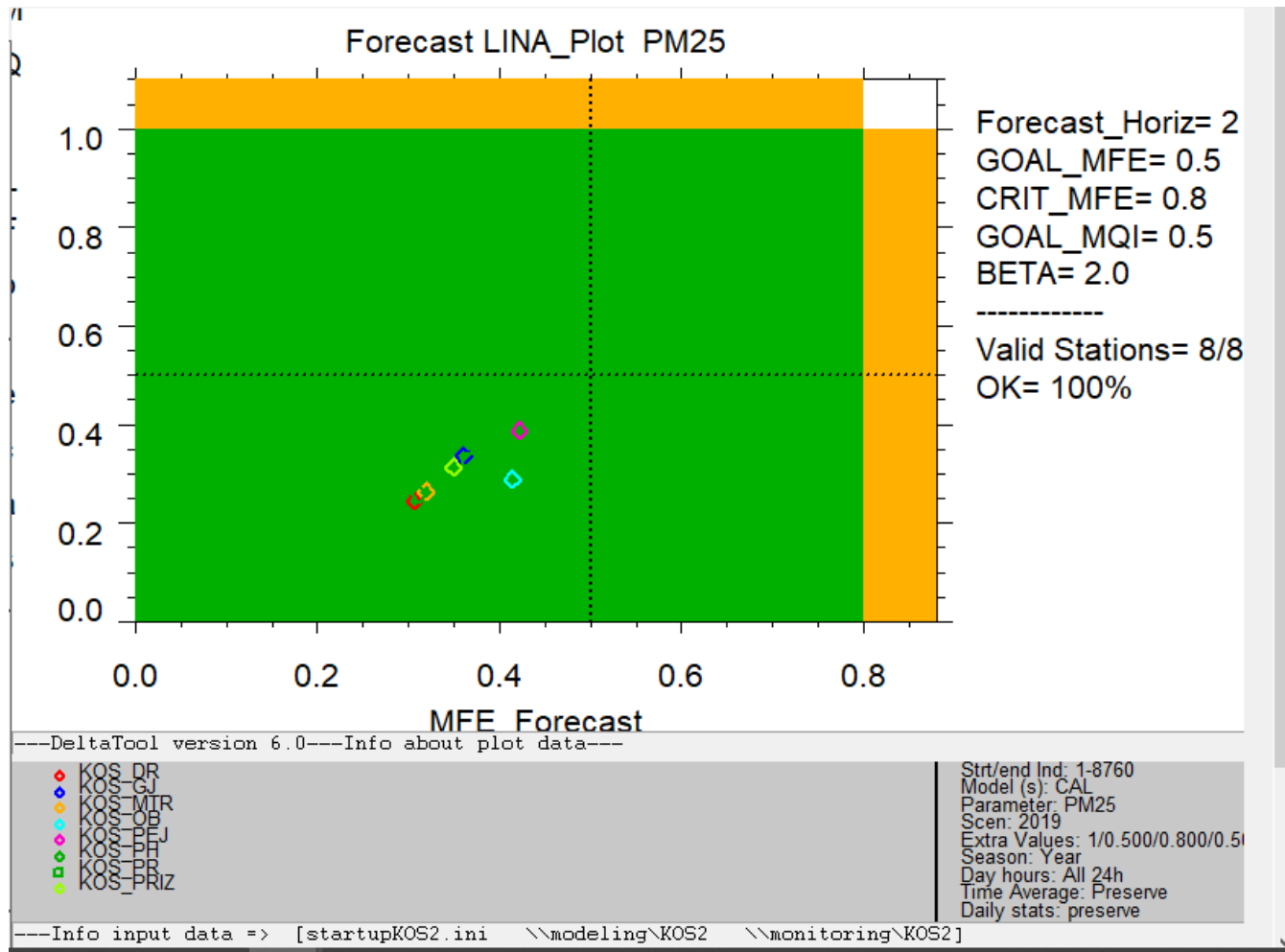




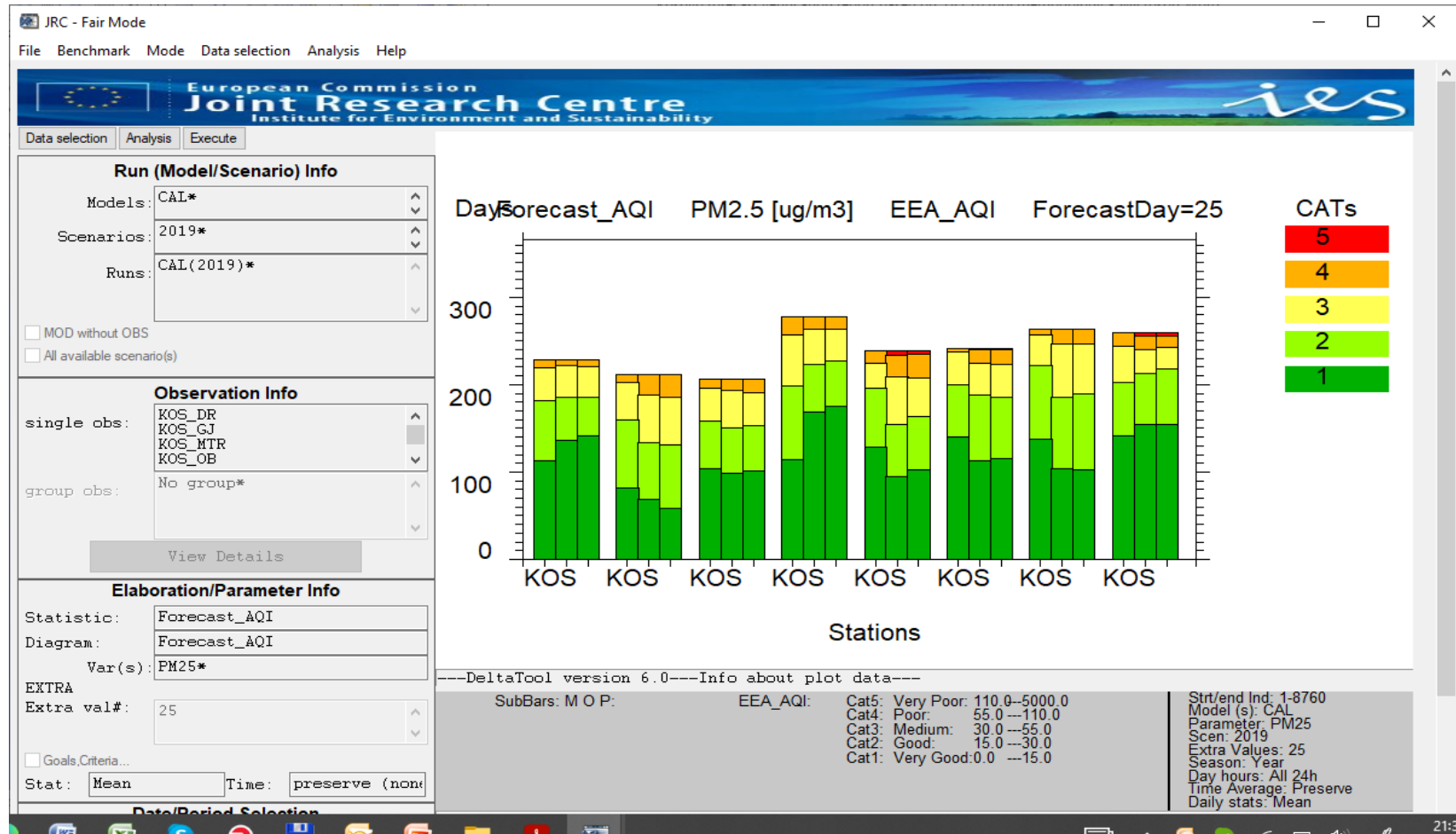
# DeltaTool forecast used in Kosovo



# DeltaTool forecast used in Kosovo



# DeltaTool forecast used in Kosovo



# Issues

- Generally the 1-day forecasts work properly, with good modeling performance indicators
- Interpretation of the persistent model indicators?
  - the model performance is capable to forecast pollution episodes ?
  - or it just gives information that the model is better than forecast based on previous day observation?
- Forecast performance and forecast performance normalized diagrams give some information considering threshold exceedances. However, they are complicated and hard to explained to politicians. There is no information about AQI level related to health advice.
- AQI forecast bar chart gives information about total number of AQI levels but there is no information about timing of the forecasted AQI levels

# CONCLUSIONS

- How to answer to the question: **Are citizens warned against high pollution episodes?**
- GSS using AQI (>moderate or poor AQI level) - is a simple indicator which may be used. However, there is no threshold established
- Indicators use in the project based on hourly AQI:
  - compatibility of AQI
  - correct identification of the main pollutant for AQI
  - overestimation of AQI
  - underestimation of AQI
  - % of cases with 2 level difference of AQIare to detailed for good interpretation
- How to connect number of AQI level with timing in DeltaTool?



# Thank you for your attention

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