

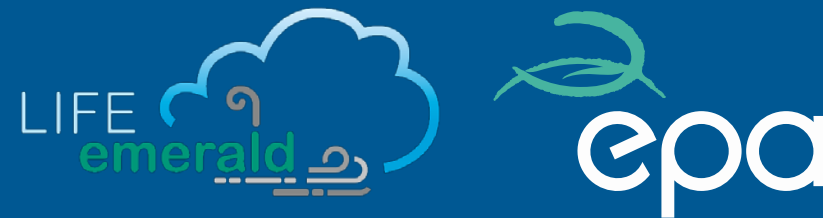


LIFE Emerald – Forecast Development for Ireland

FAIRMODE Technical Meeting 2023,
Athens, Greece,
Wednesday 5th October 2023.

Dermot Burke, Air Specialist, National Ambient Air Quality Unit, EPA
Jana Pauwels, Researcher, VITO

Project Details



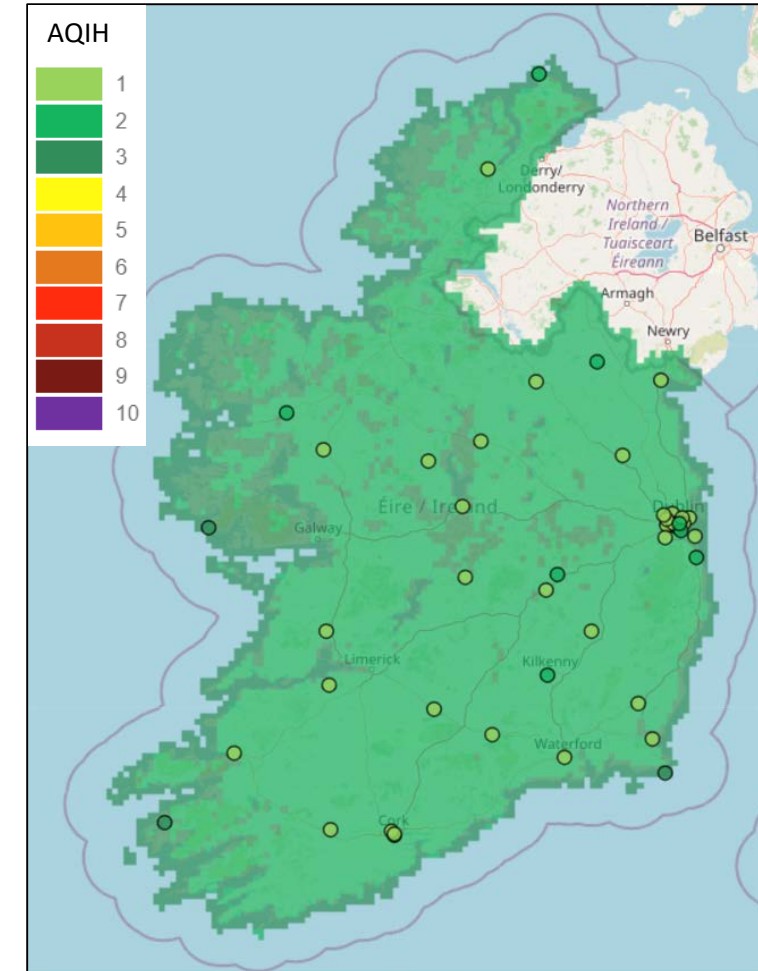
- LIFE19 GIE/IE/001101- LIFE Emerald
- Emissions ModEling and FoRecasting of Air in IreLand
- Start: 01/01/21 - End: 30/09/24
- Total: €1.6 million 52% of which is EC Co-funded
- Coordinating Beneficiary – EPA
- Associated Beneficiaries - ASI , DECC , HSE , UCC, VITO



Forecast Development



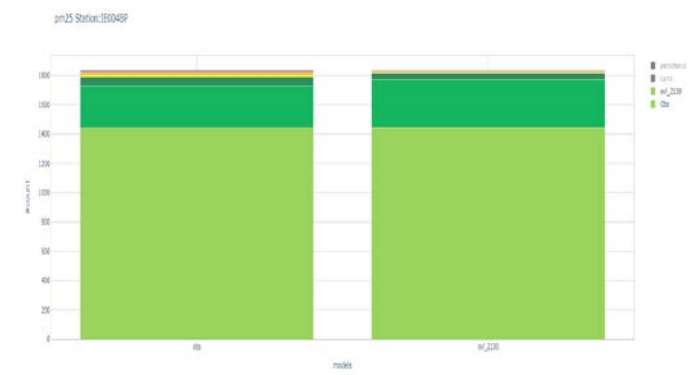
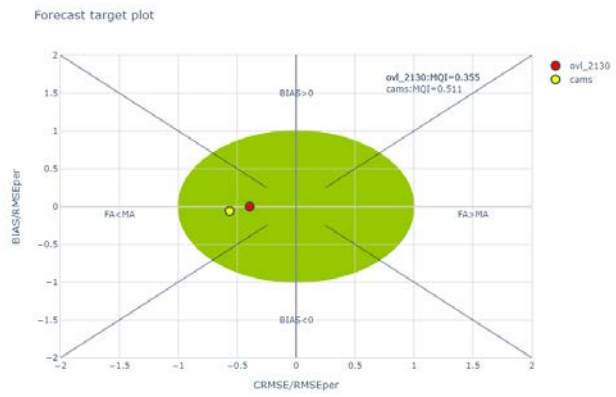
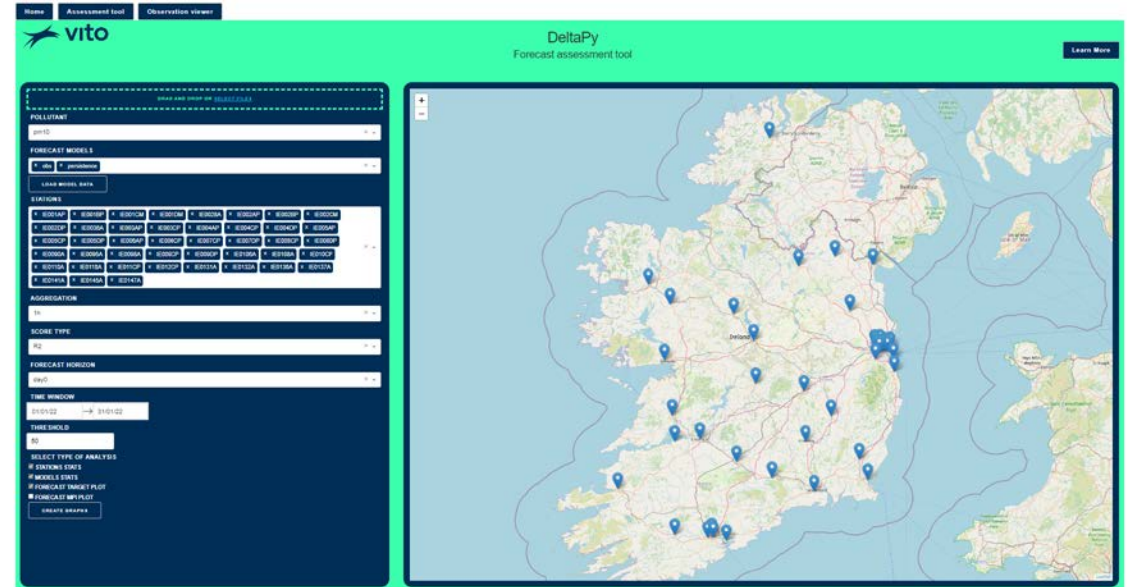
- OPAQ-OVL: statistical air quality forecast model on station-level
 - Feature variables: meteo (ECMWF) and CAMS forecasts
- Forecast maps are made by interpolating with OPAQ-RIO
- Maps produced PM_{10} , $PM_{2.5}$, O_3 , NO_2 & AQIH for 3 days
 - today, tomorrow & day after tomorrow
- Provided twice daily at 9:00AM (GMT) and 5:00PM (GMT)
- Forecast model trained with and without CAMS
- Forecast system will be launched in November 2023 on www.airquality.ie



FAIRMODE metrics

- The Deltatool is integrated in the python toolbox
 - more flexible use during model training, configuration & intercomparison
 - Target plot with MQI
 - MPI plot
 - Statistical indicators
 - Exceedances indicators

- Persistence model and CAMS are used as benchmarks



FAIRMODE metrics



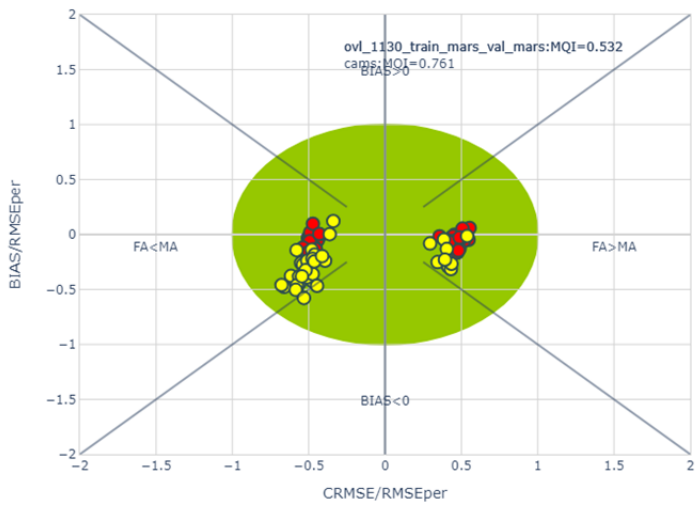
PM₁₀

The daily limit for PM₁₀ is 50 µg/m³

Time window: Jan 2022 – Dec 2022

FC: day1 (tomorrow fc)

Forecast target plot



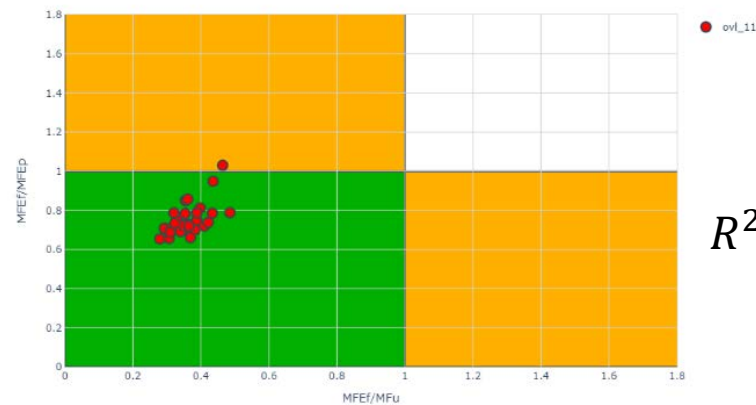
■ CAMS
■ OVL

Agg: da
Thresh: 50 ug/m3
MQI : 0.53
MQI_CAMS: 0.74
Fc_hx : day1 (tomorrow)

90th station percentile

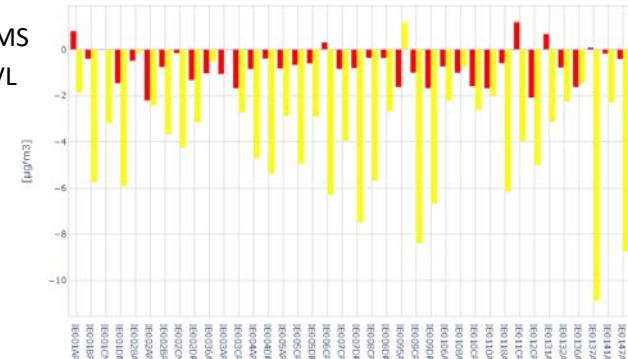
stations	MQI
IE0141A	0.36
IE005DP	0.4
IE0118A	0.4
IE001BP	0.43
IE005AP	0.43
IE008CP	0.43
IE0132A	0.43
IE0137A	0.43
IE001CM	0.45
IE002CM	0.45
IE0036A	0.45
IE007CP	0.45
IE007DP	0.45
IE009CP	0.45
IE0108A	0.47
IE010CP	0.47
IE004AP	0.48
IE009DP	0.48
IE011CP	0.48
IE003AP	0.49
IE006CP	0.49
IE0147A	0.49
IE002DP	0.49
IE003CP	0.5
IE004DP	0.5
IE005CP	0.5
IE008DP	0.5
IE0106A	0.5
IE0136A	0.5
IE0131A	0.51
IE002BP	0.52
IE001DM	0.53
IE0095A	0.53
IE012CP	0.53
IE0028A	0.55
IE002AP	0.55
IE0110A	0.55
IE001AP	0.56

Forecast mpi plot

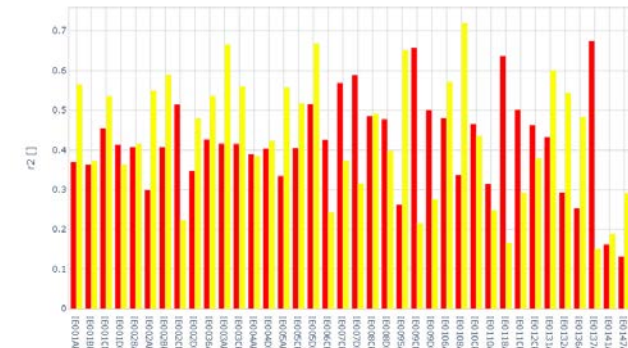


BIAS

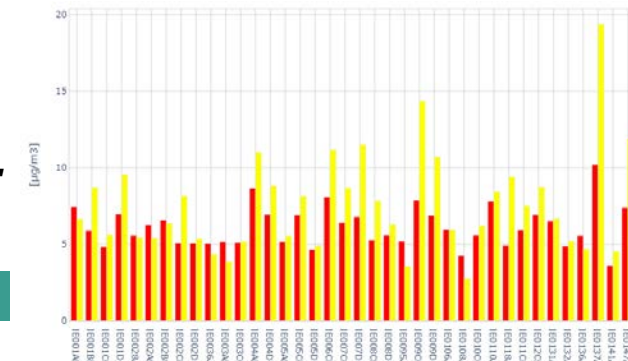
■ CAMS
■ OVL



R²



RMSE



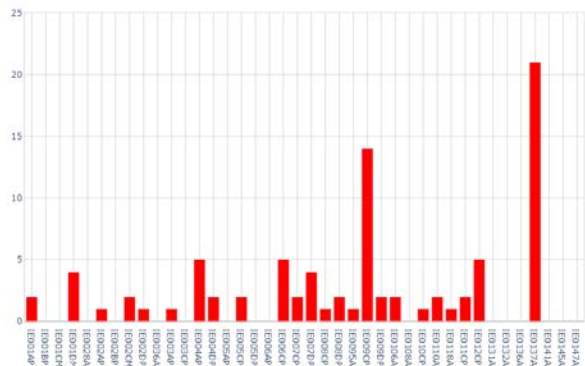
FAIRMODE metrics



MA + GA+

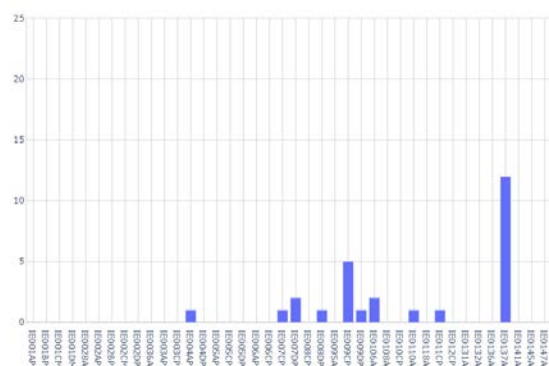
Total Exceedances

days



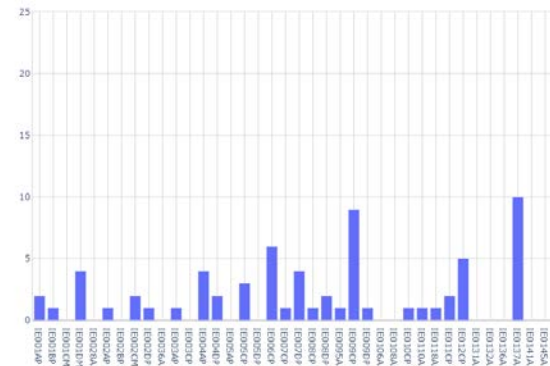
GA+

Good alarms above 50 ug/m3



MA

Missed alarms

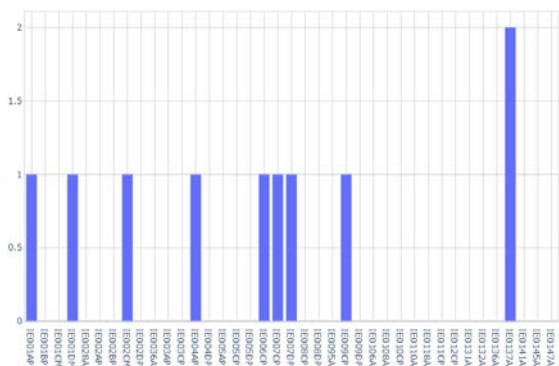


CAMS:
 GA+ = 0
 FA = 0
 MA = All Exceed.

FA

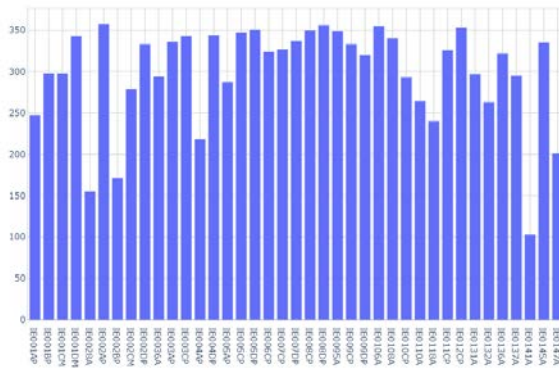
False alarms

days



GA-

Good alarms below 50 ug/m3



PM₁₀

The daily limit for PM₁₀ is 50 µg/m³

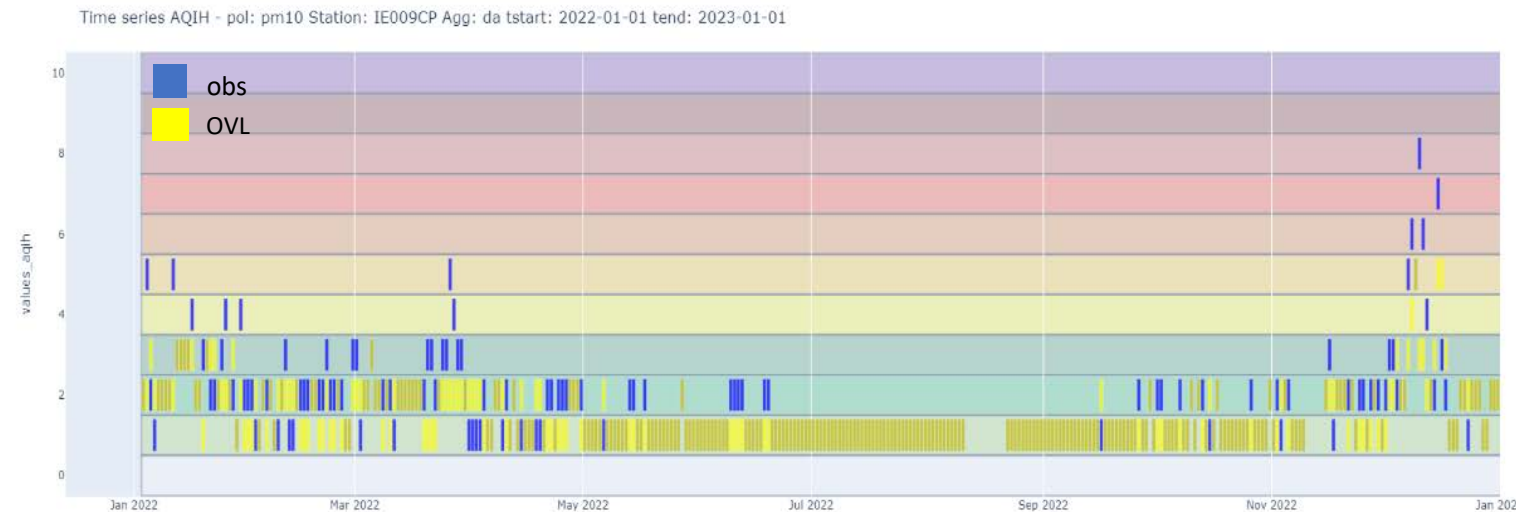
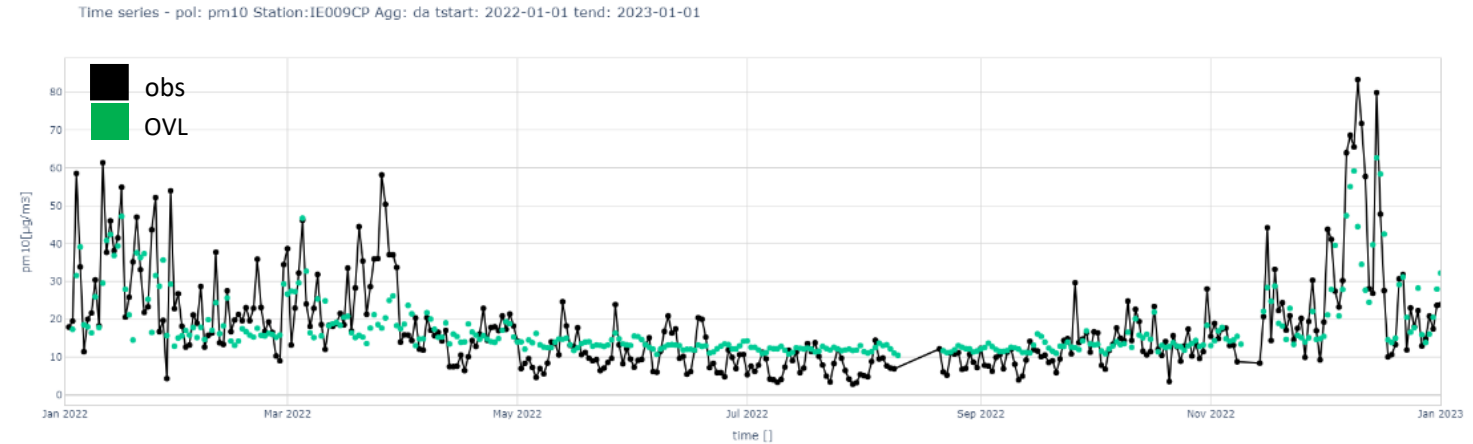
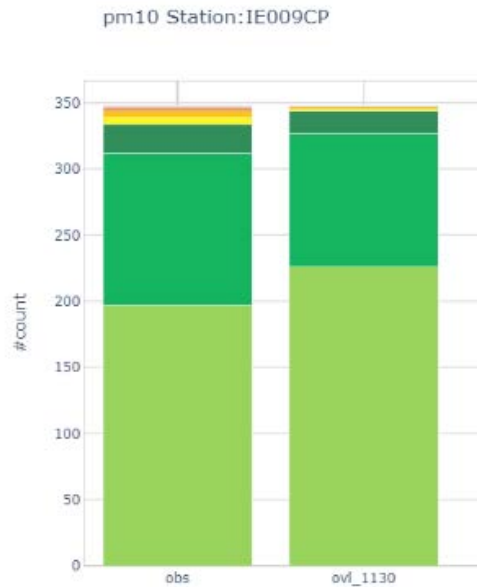
Time window: Jan 2022 – Dec 2022

FC: day0 (today fc)

Extra validation

- Zooming on time series
- Comparing variety of models
- Plotting of the AQIH

PM₁₀
Station: Kerry Tralee library
Time window: Jan 2022 – Dec 2022
FC: day1 (tomorrow fc)



User expectations for forecasts



- As good as possible rather than $MQI < 1.0$
- Much interest on performance during peak episodes (PM in winter)
 - Introduction of winter models: trained only in the winter months
 - For certain stations where peak detection was underperforming
 - Trade-off between good and false alarms

