European Commission

JOINT RESEARCH CENTRE

FAIRMODE

FAIRMODE
An overview

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The Cyprus Institute

Presentation for the InDust Air Quality Workshop

March 11-12, 2019, Rome, Italy

- Overview of the initiative
- Benchmarking methodologies
- Application in Cyprus
- Application in dust products

The Cyprus Institute

FAIRMODE

Forum for Air Quality Modelling in Europe.

Launched in 2007 as a joint response initiative of the European Environment Agency (EEA) and the European Commission Joint Research Centre (JRC).

Air quality modelling in the context of the Air Quality Directives.

- HARMONISATION AND STANDARDISATION
- GUIDANCE
- CAPACITY BUILDING AND COMMUNICATION

FAIRMODE

Dealing with Air Quality Challenges of planning, forecast, model quality and source & emissions.

SCALE:

- Country
- Region
- City

- PURPOSE:
- Assessment
- Source Apportionment
- Planning
- Emissions

FAIRMODE

A methodology to benchmark model performances according to a common scale and common template.

Model quality objectives (MQO) based on observation uncertainty have been developed.

Methodology embedded and consolidated in the software known as DELTA tool.

Applicability of the methodology to other pollutants and robustness for various model applications and various scales.

FAIRMODE

Complementary but essential topics:

Modelling and monitoring data is a crucial: use of monitoring data in model applications for assessment and scientific purposes.

Spatial representativeness of monitoring stations: Station redundancy, network coverage, timescale representativeness

Use of models in formal reporting by Member States: limited.

(current practises, objection reasons, recommendations to stimulate the use of models for air quality management and the formal reporting)

FAIRMODE

- STATISTICS CANNOT PRODUCE UNDERSTANDING
- STATISTICS ARE AN AIDING MECHANISM TO THINKING
- IF UNDERSTANDING IS LACKING STATISTCS CAN DERAIL

- Is a model (or spatiotemporal configuration, or physicochemical parameterization, or input data, or particular period) adequate, conservative or accurate for the particular application?

- By identifying ‘compliant’ or ‘non-compliant’ metrics a comprehensive analysis of the contributing components can be produced.

- IS MY MODELLING APPROACH GOOD ENOUGH FOR POLICY?

FAIRMODE

DELTA software (among other approaches like regional & local assessments, inter-comparison exercises, composite mapping…)

an IDL-based software that supports the evaluation of model applications performed in the frame of the Air Quality Directive.

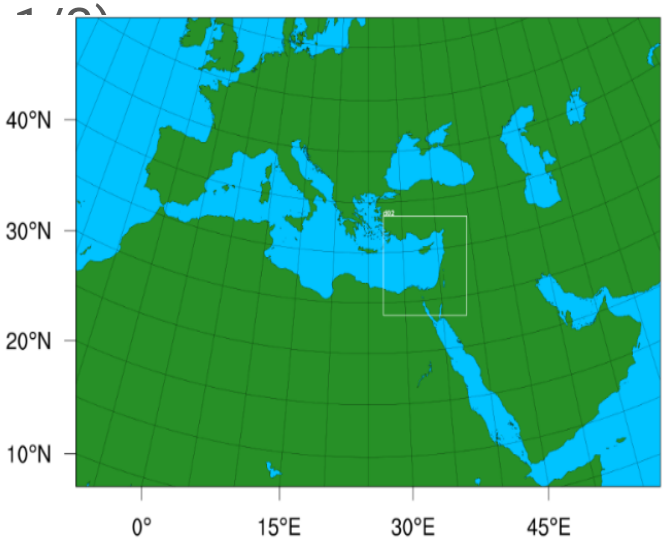
DELTA offers rapid diagnostic of model performance in terms of various statistical indicators and diagrams, based on paired modelled and monitored data.

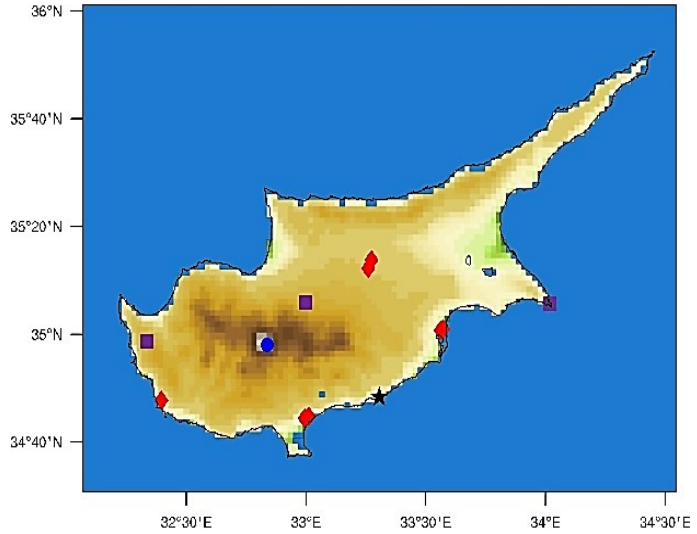
These statistical indicators are evaluated against bound values (i.e. model performance criteria) to facilitate the benchmarking of the model application against agreed quality standards.

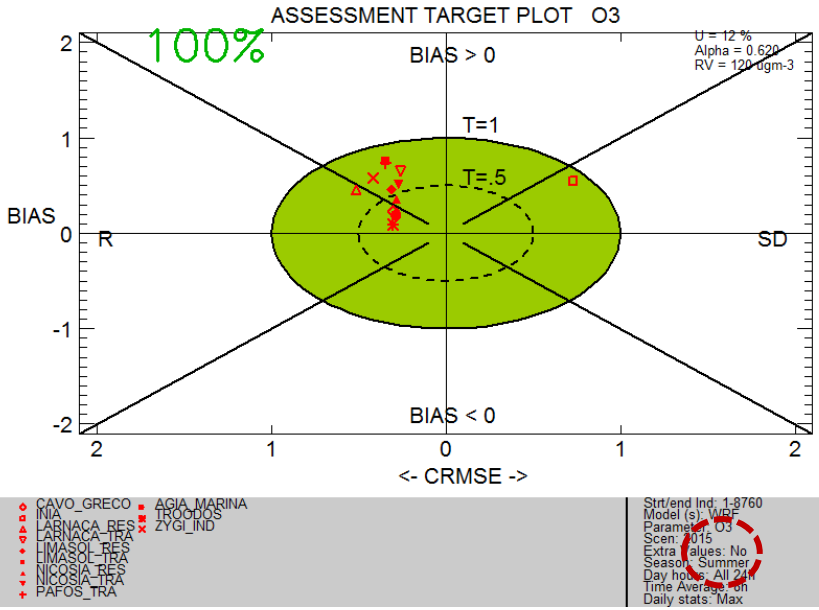
FAIRMODE

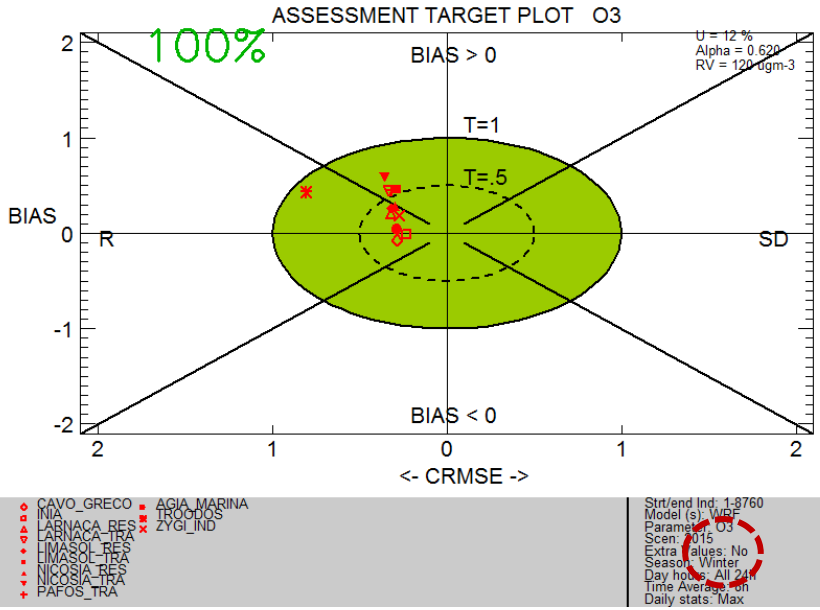
Application over Cyprus considering performance indicators reflecting regulations for air quality standards, including the maximum daily eight-hourly mean ozone (O3), hourly nitrogen dioxide (NO2) and daily fine particulate matter (PM2.5) concentrations:

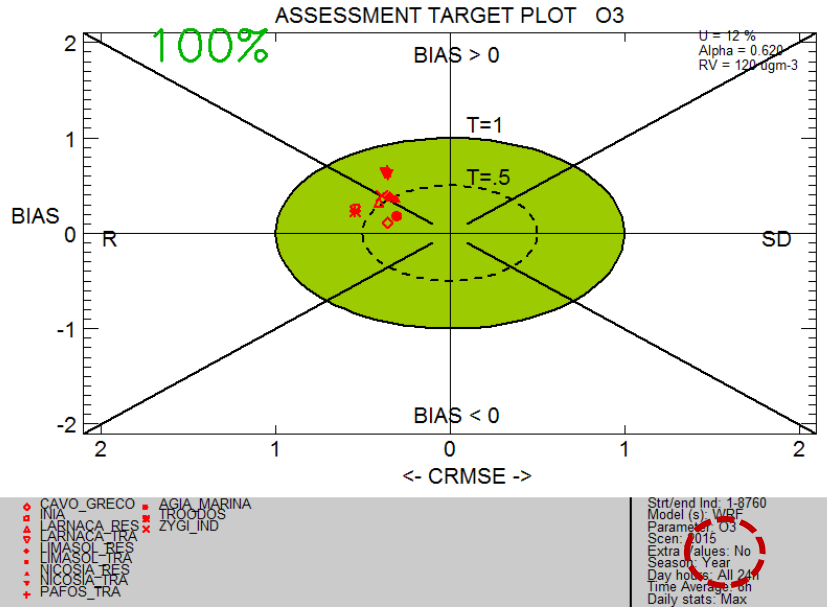
(12 stations: Only 3 rural background stations, PM2.5 only in





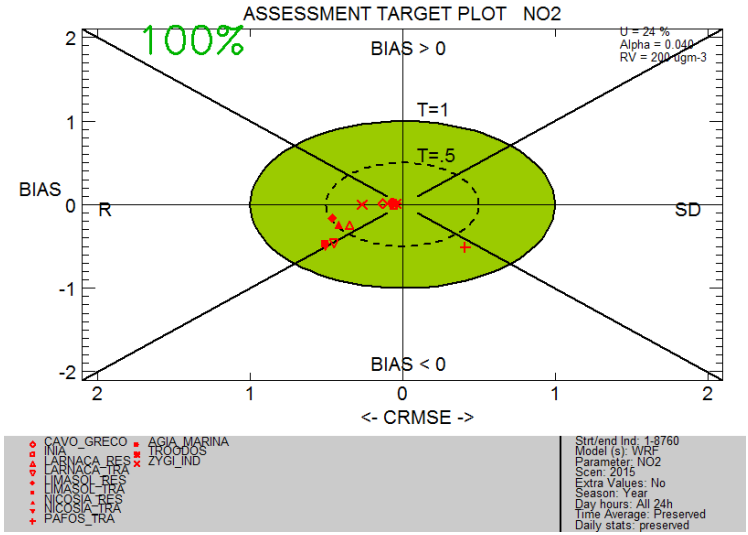


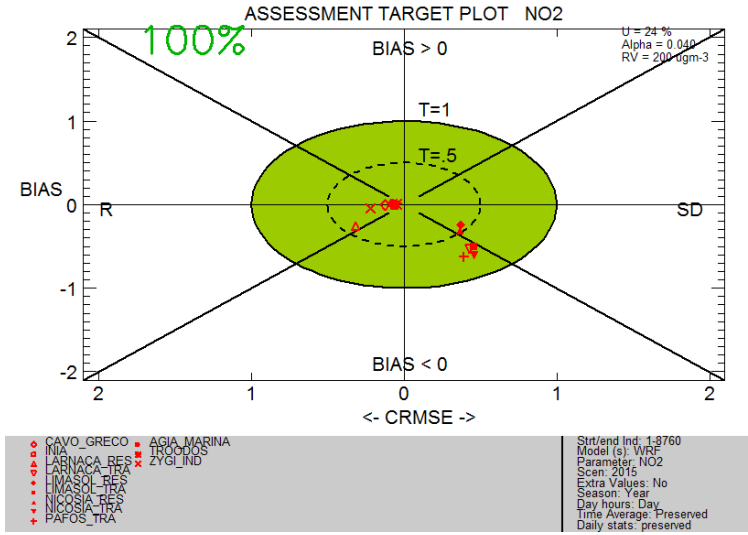


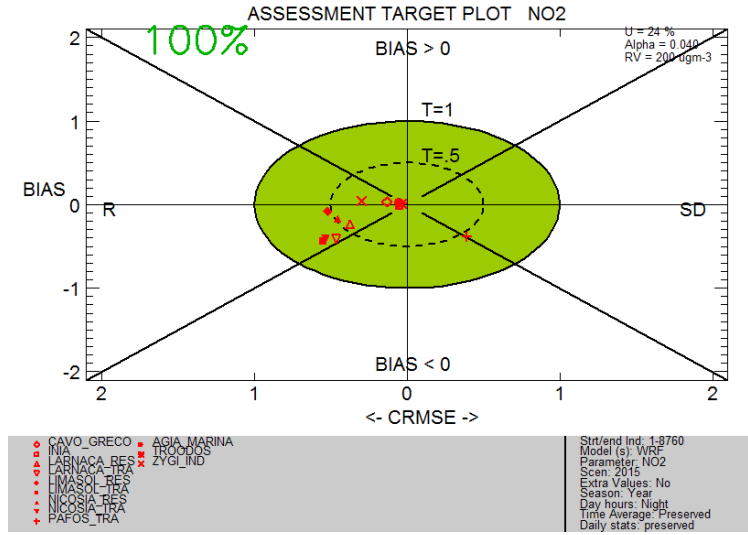


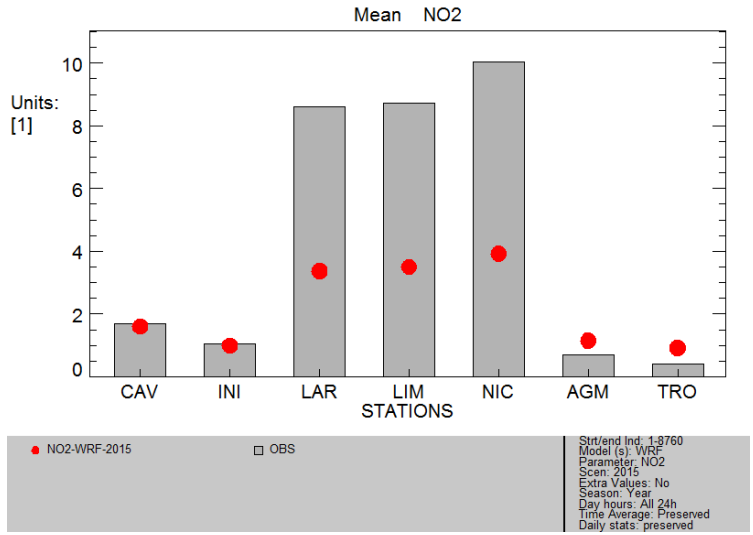
Systematic error: positive bias -> model overestimation

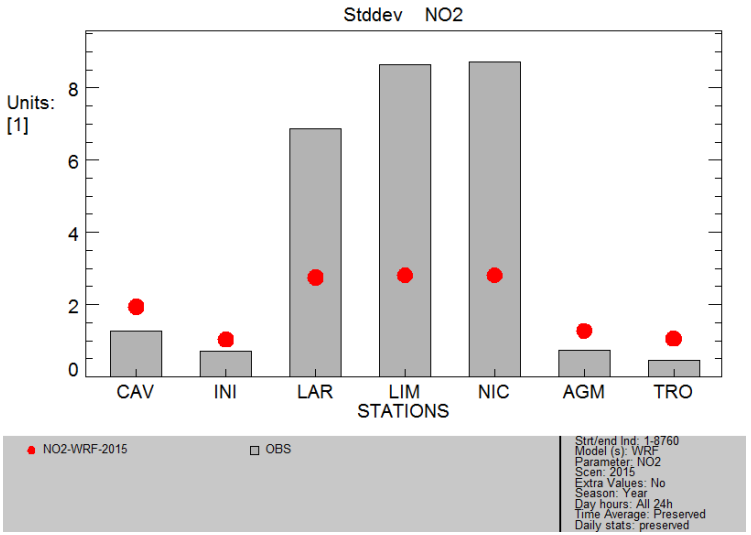
Sub-analysis: overestimation of ozone in urban conglomerates

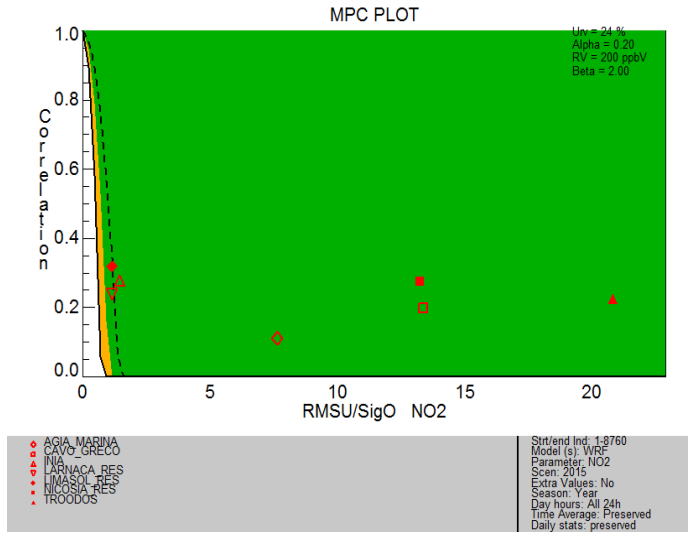


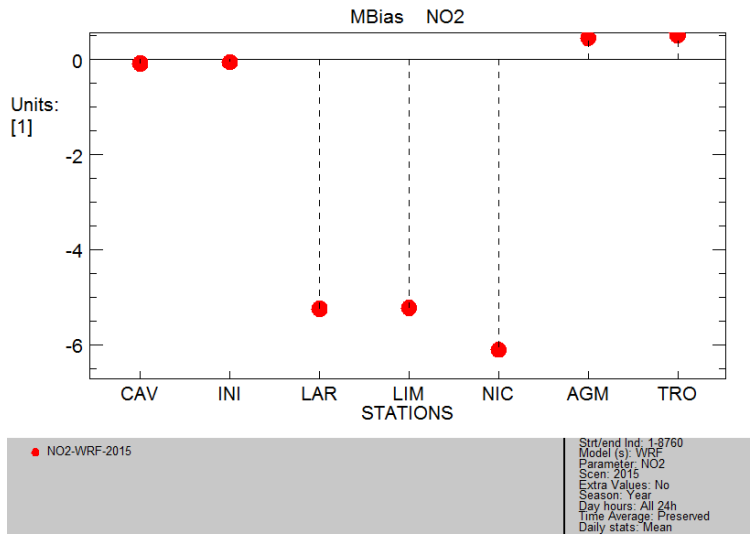


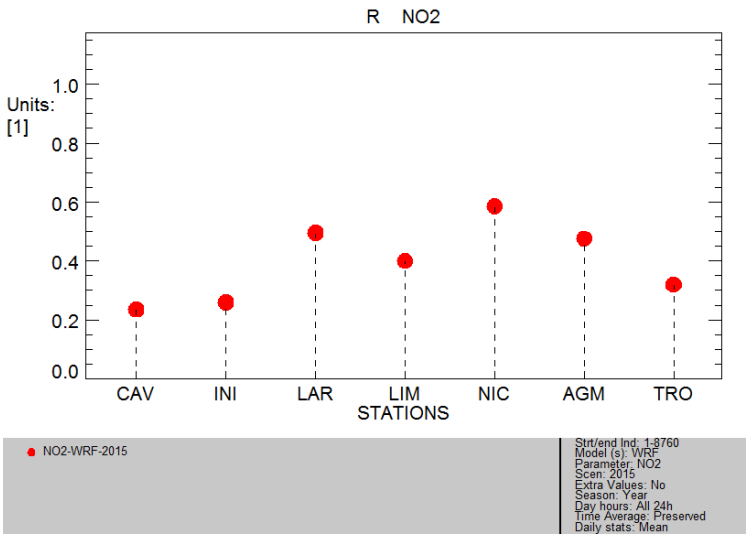


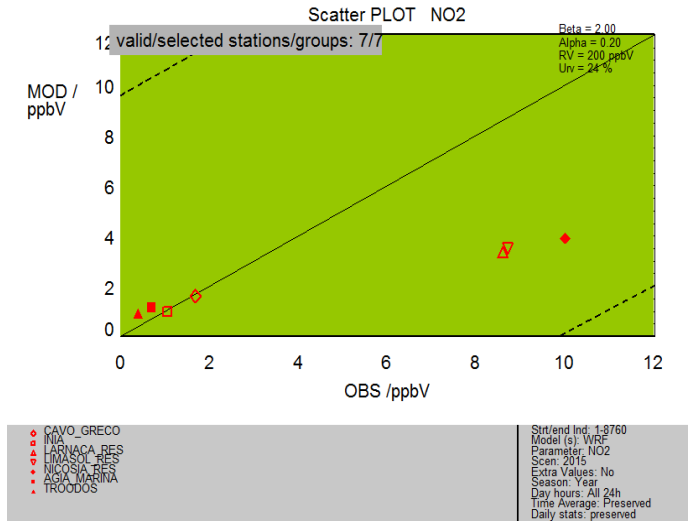




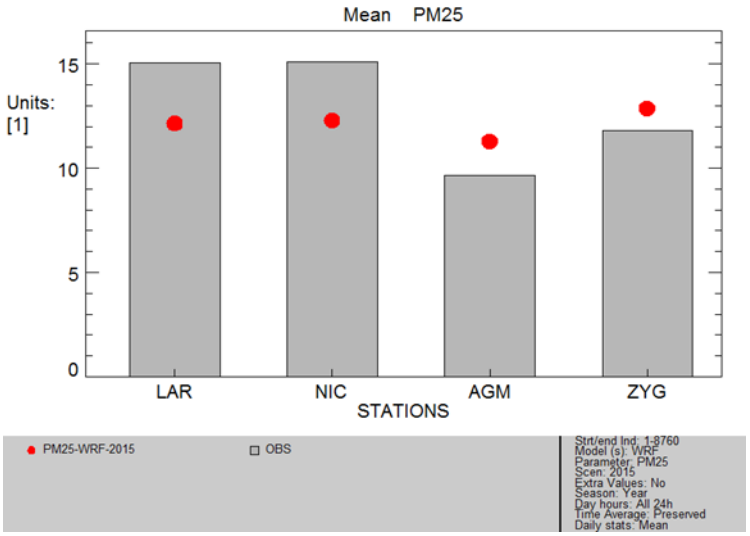


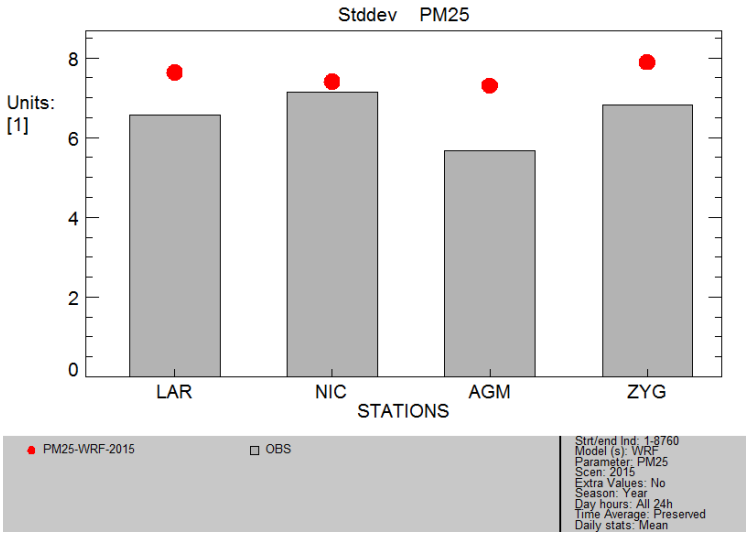


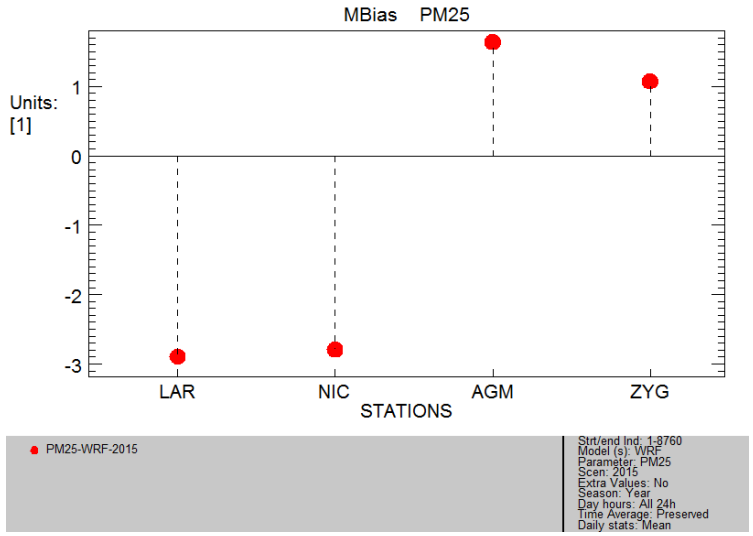


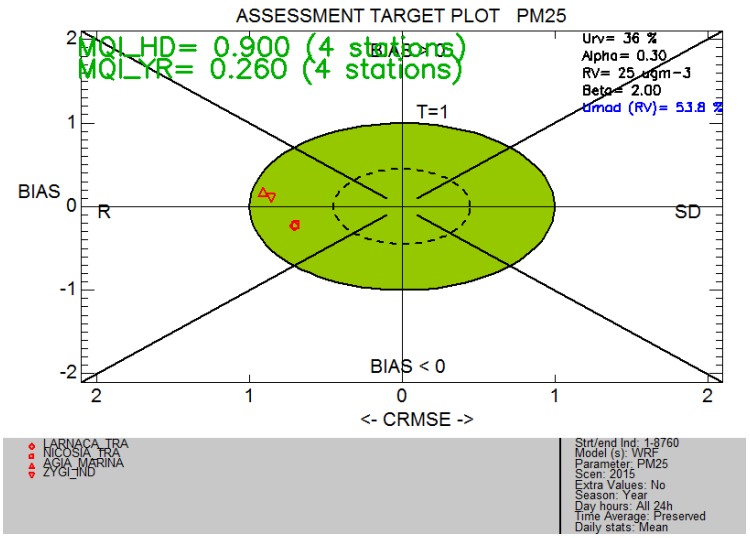


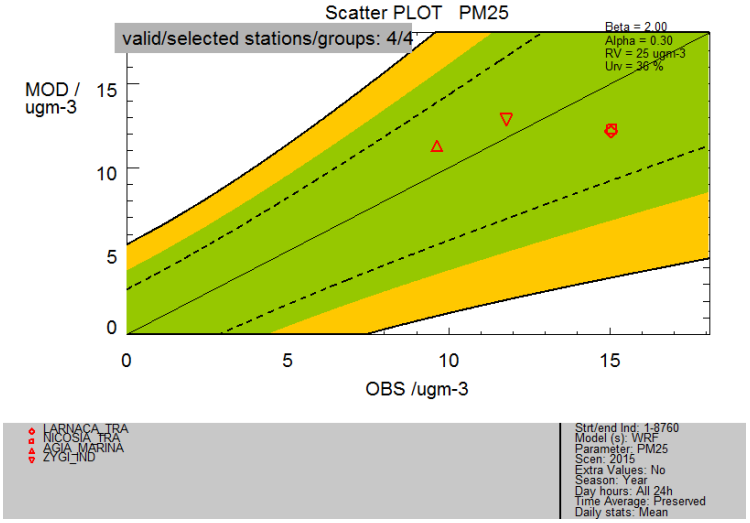
Low concentrations with large measurement uncertainty lead to easily satisfied criteria.

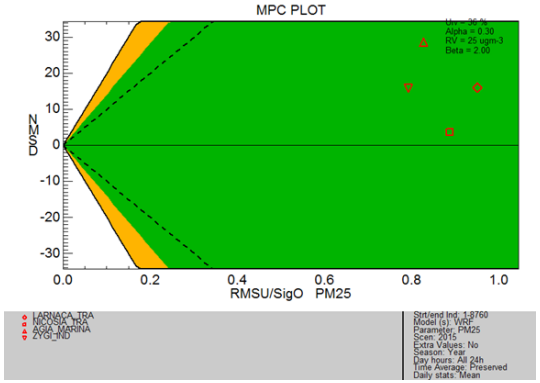


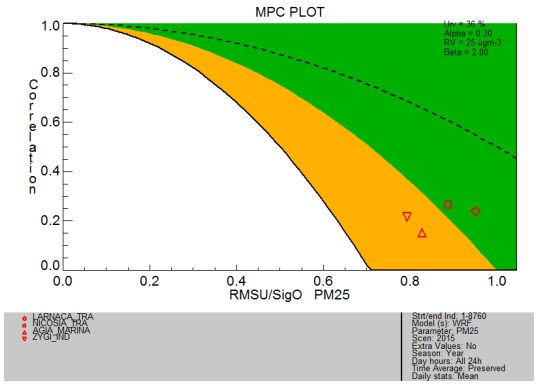






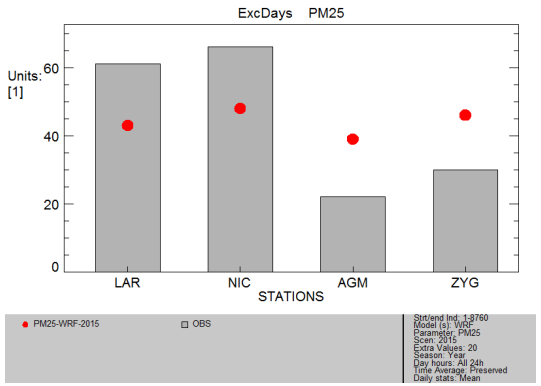


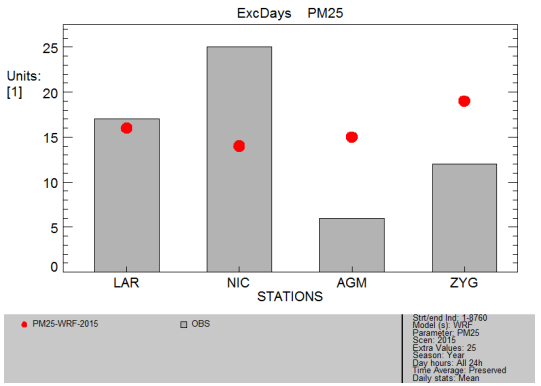


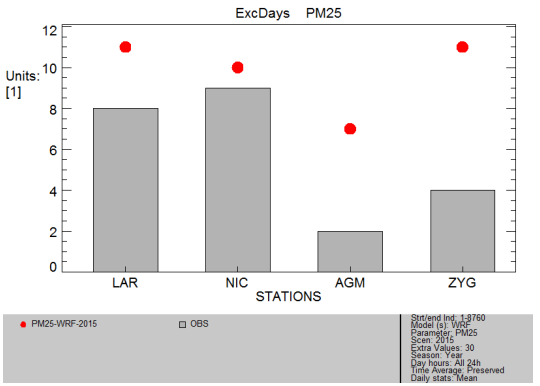


The error related to the correlation coefficient dominates the model performance for all stations.

THRESHOLD EXCEEDANCE Implications for dust







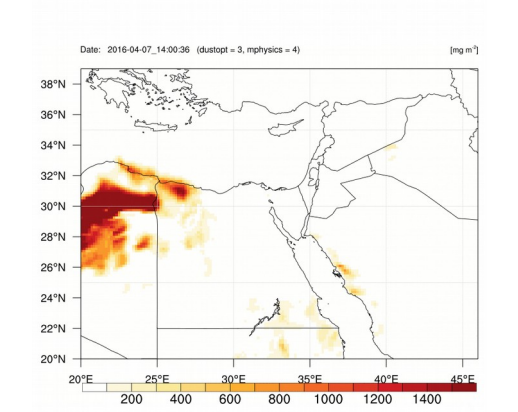
The atmospheric aerosol distribution in the region is influenced by natural contributors (mineral dust, sea salt, black and organic carbon).

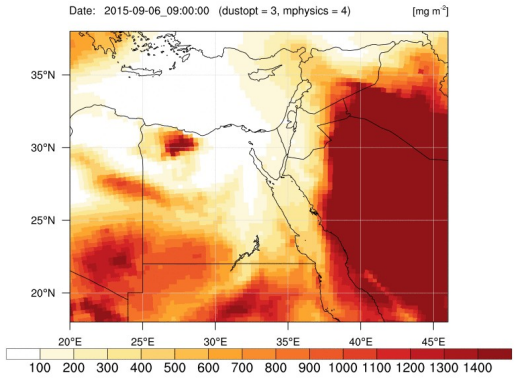
For policy-related applications the contribution of natural sources to mean daily and annual levels of pollutants must be well defined and the option to exclude the periods of episodes from the analysis must be provided, especially with regards to threshold exceedances.

If this methodology is to be applied in forecasting applications, it must provide for solutions to separately assess events of episodic nature and distinguish between threshold exceedances from natural and anthropogenic sources.

Dust in Cyprus

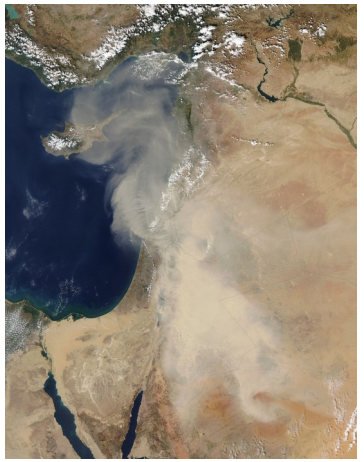
Two sources (with ever-changing characteristics)

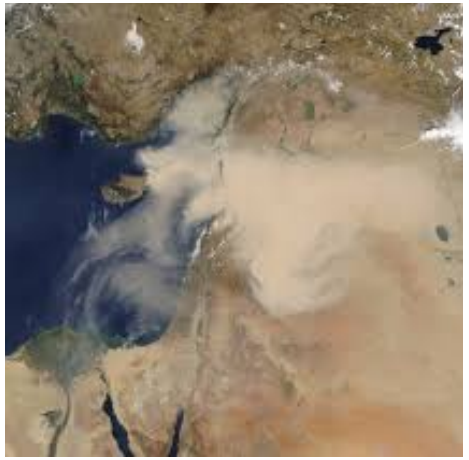




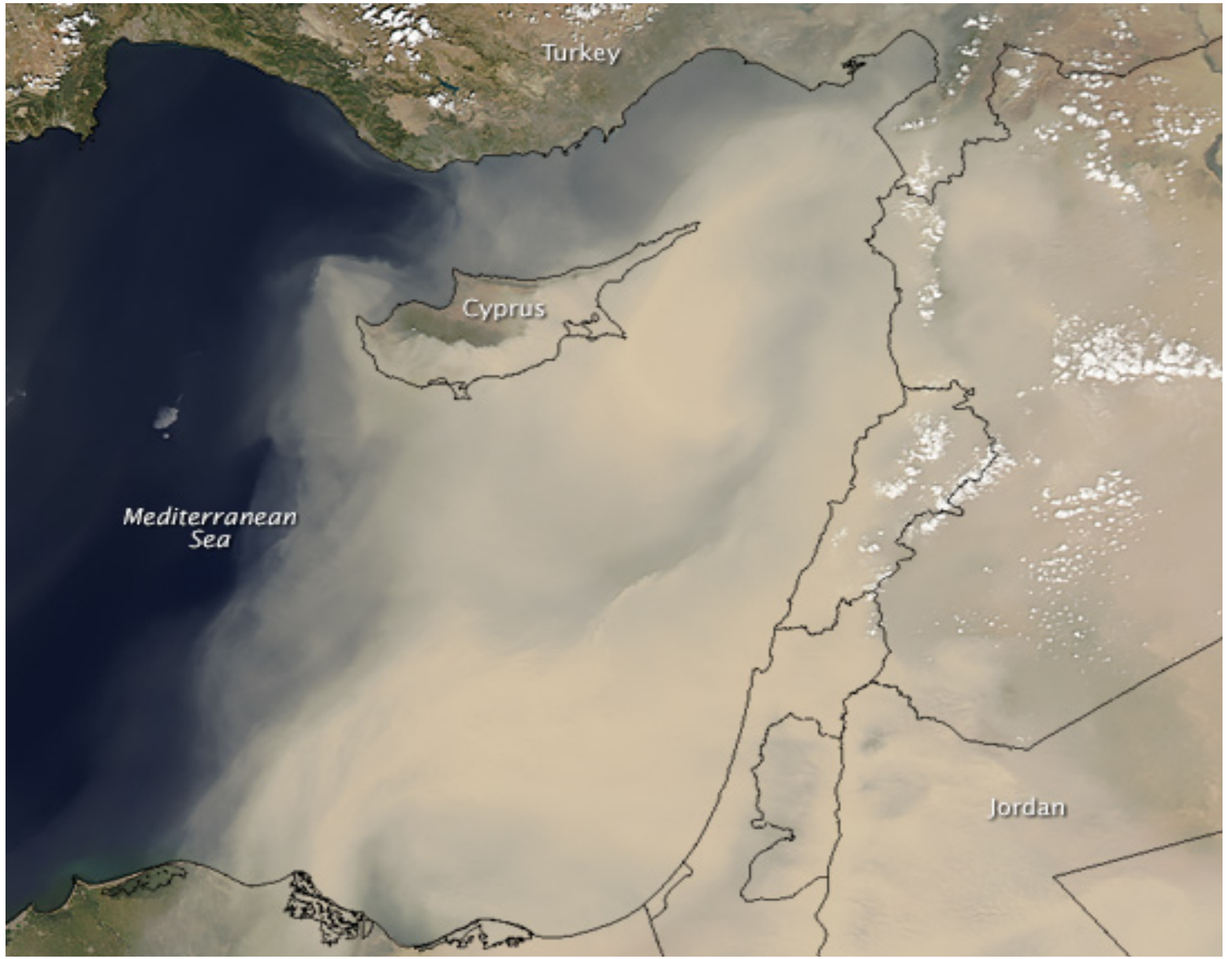
two major events over Cyprus on April 2016 (top) and September 2015 (bottom)

Large spatiotemporal variation in limited area





Dust in Cyprus



FAIRMODE and INDUST

- FAIRMODE reminds us that harmonization procedures are needed for dust models too.
- Dust products from models – observational data interaction a crucial parameter.
- Peculiarities of Cyprus regarding dust: two dust sources, both fragile and responsive to climate change and human factors
- Reassessment of emission sources necessary: climate change impact and geopolitical factors
- Fractional contribution to national levels of PMs robustly assessed with observational and modelling means

March 12 (Day 2)
11:20 - 11:40
Dust events in Cyprus
Dr. Chrysanthos Savvides
Head of Air Quality Section
Department of Labour Inspection
Ministry of Labour, Welfare and Social Insurance of Cyprus

THANK YOU.