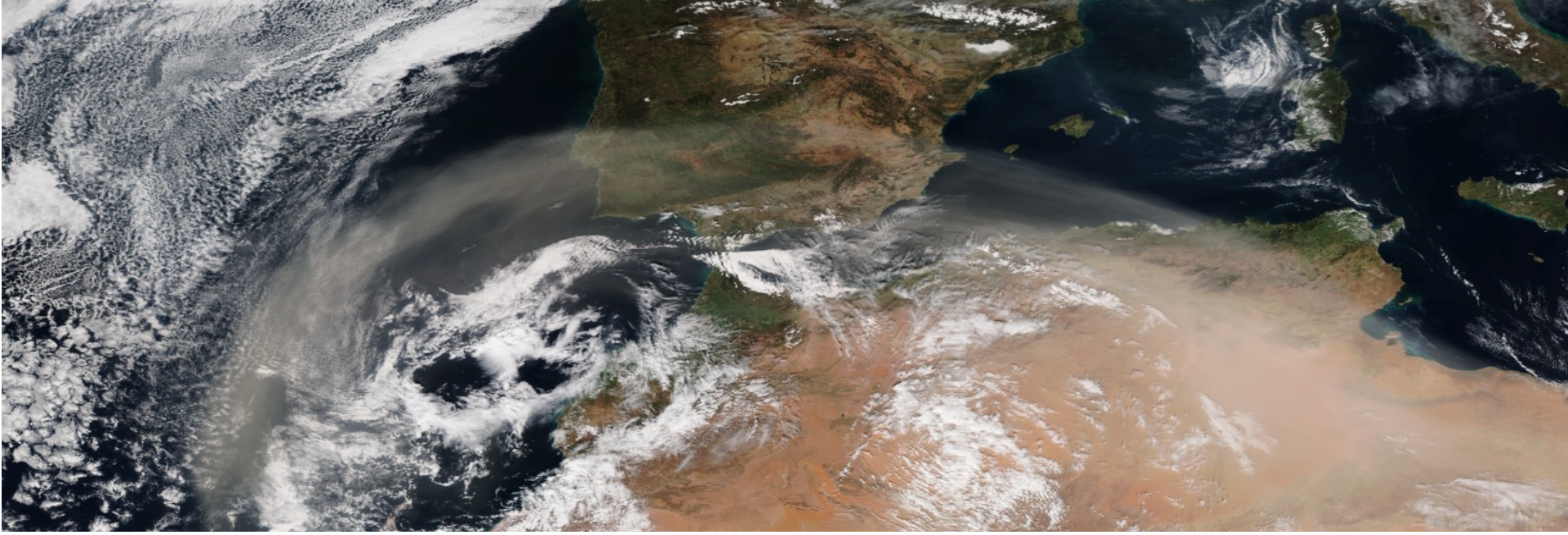


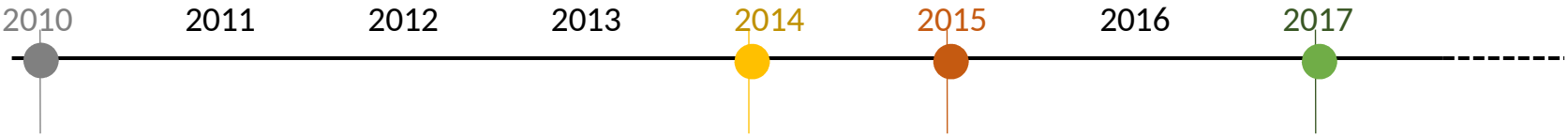
DUST EVENTS IN PORTUGAL
a modelling perspective

Alexandra Monteiro | Carla Gama

Universidade de Aveiro

Dust events in Portugal | papers

Dust forecast modelling in Portugal **timeline**



BSC-DREAM model starts to be applied in Portugal

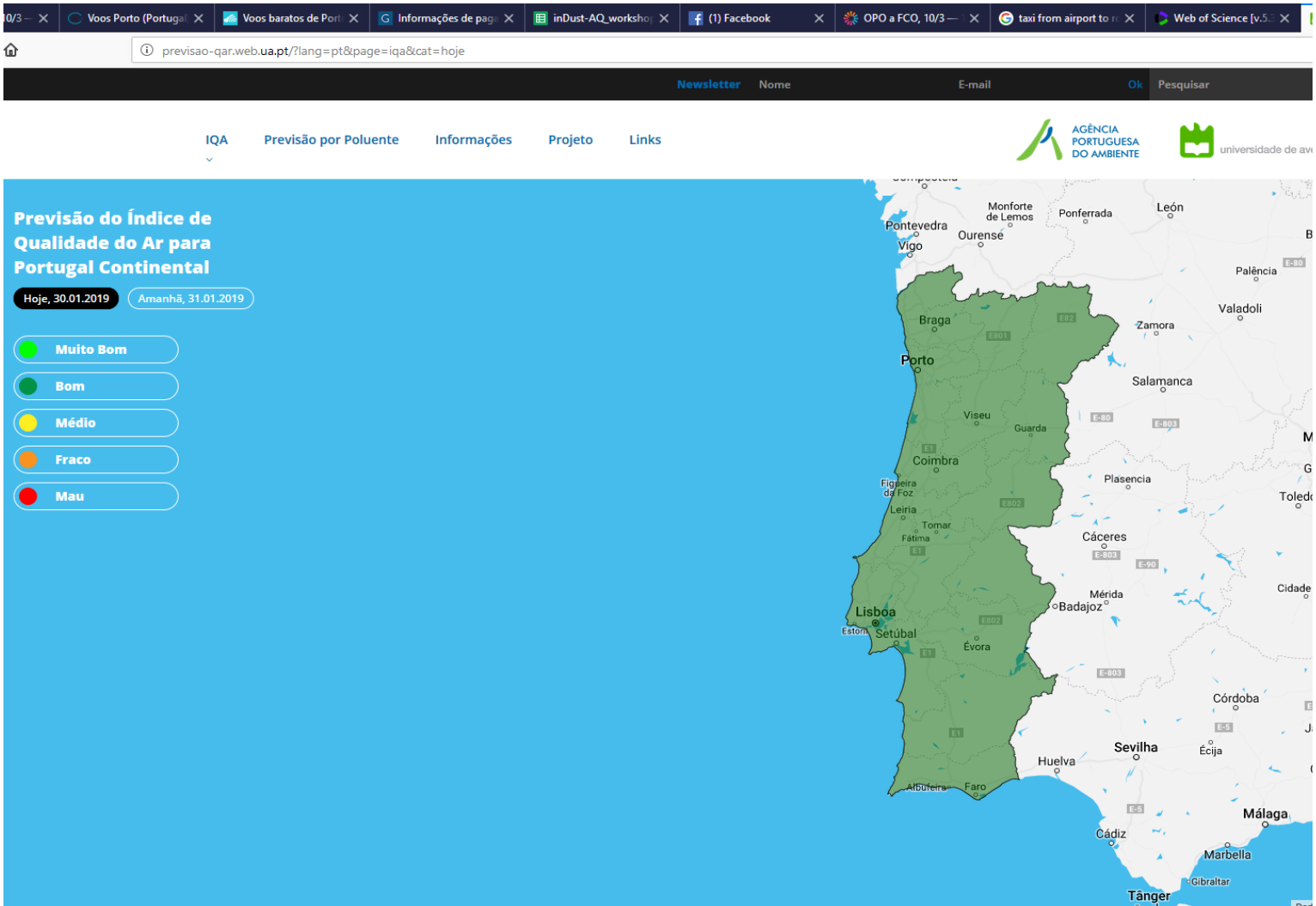
dust prediction added to PM10 forecast values

CHIMERE with dust module starts to be applied

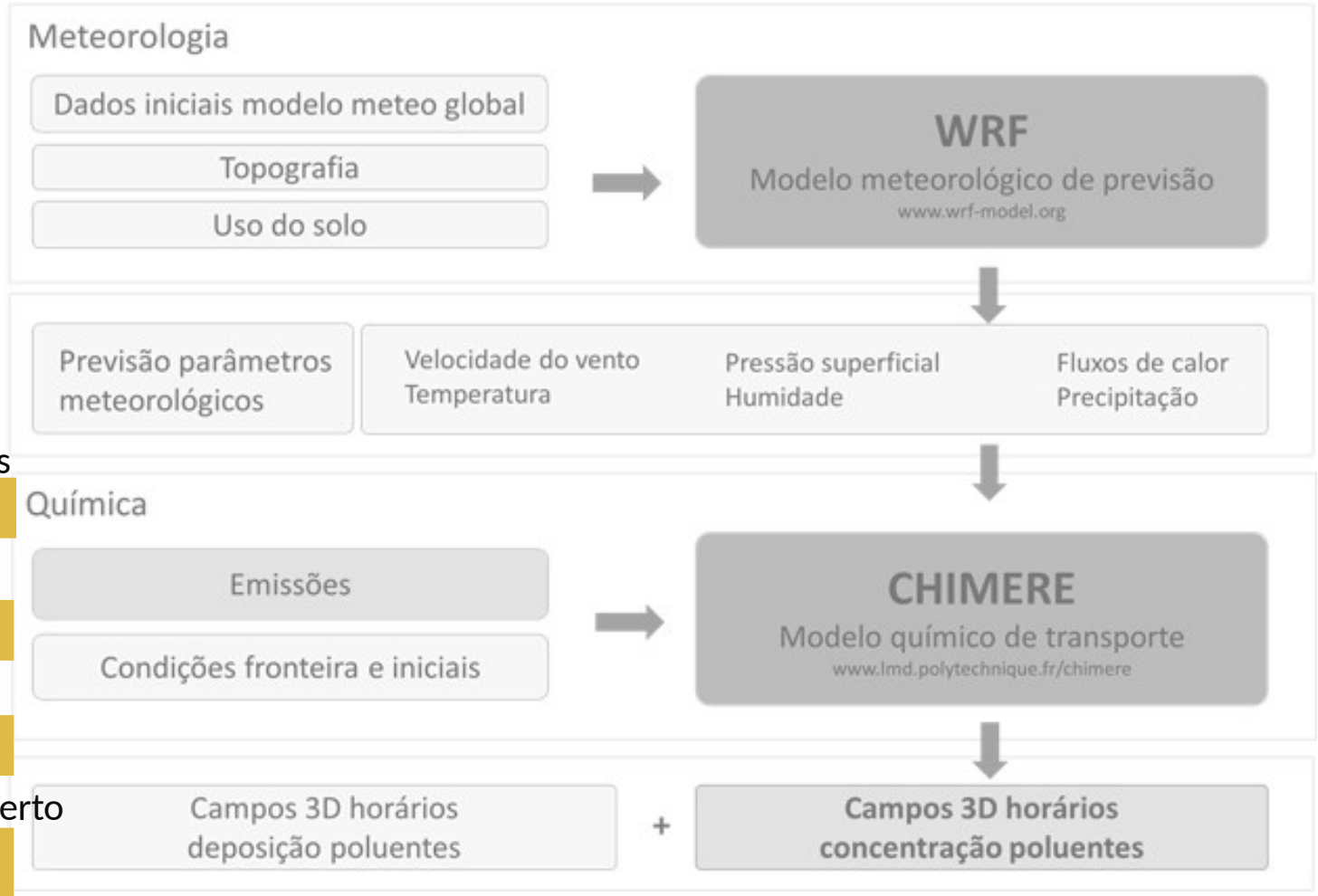
dust module was **tested and adjusted to Portugal** domain

Forecasting DUST over Portugal

http://previsao-qar.web.ua.pt/



Dust modelling forecast over Portugal



emissões antropogénicas

EMEP 50x50 km

emissões biogénicas

MEGAN

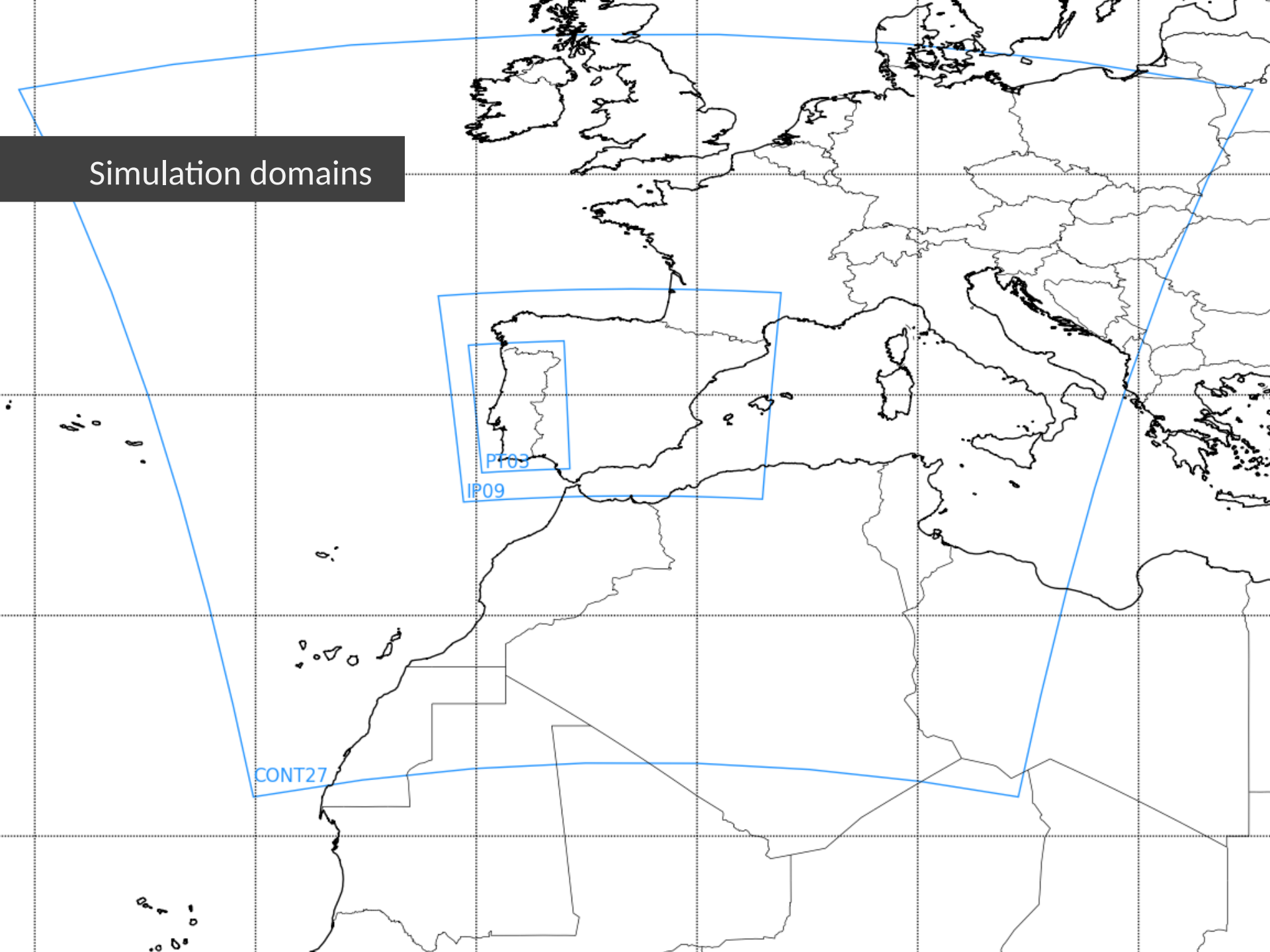
emissões marinhas

MONAHAN

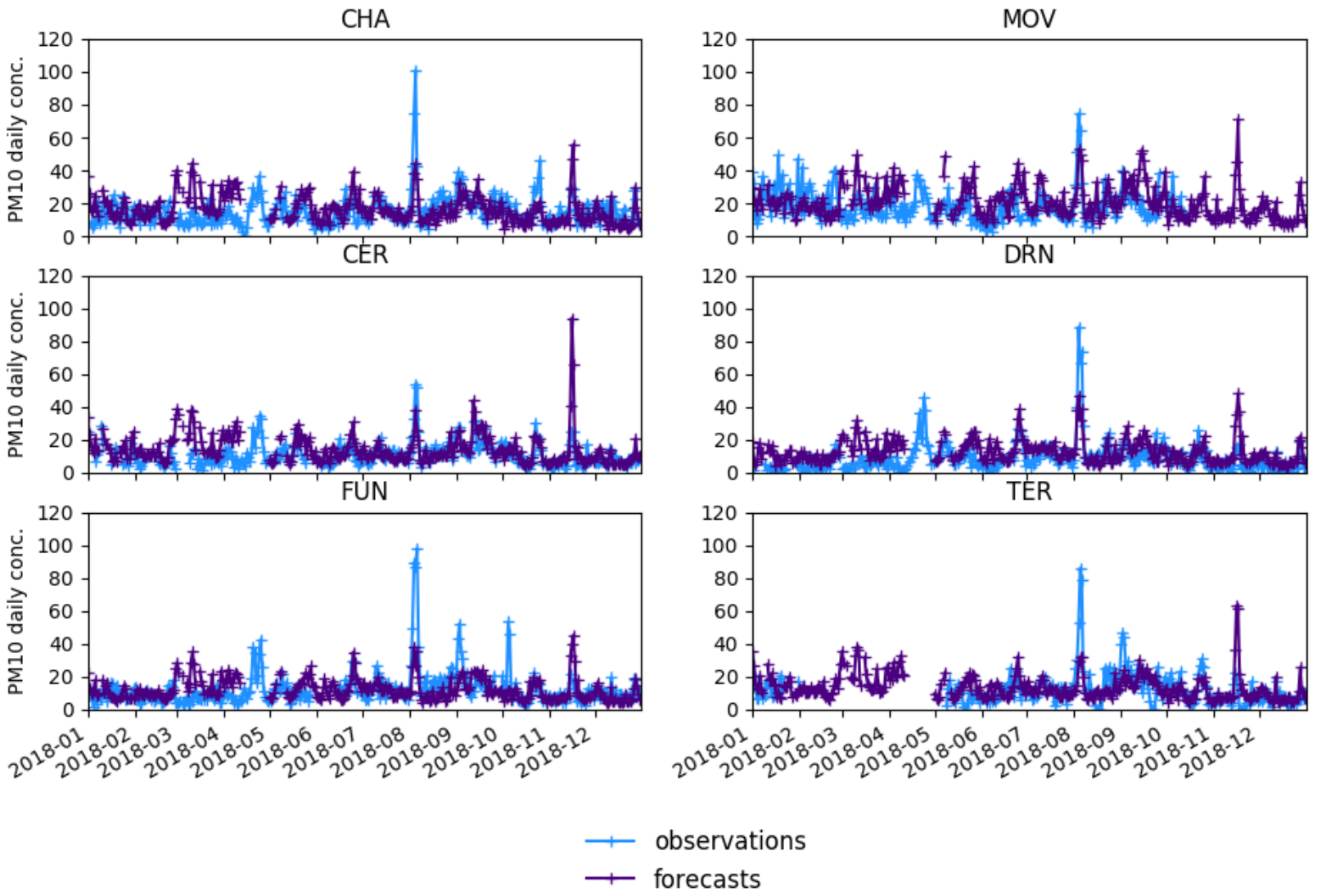
emissões poeiras do deserto

ALFARO & GOMES

Simulation domains

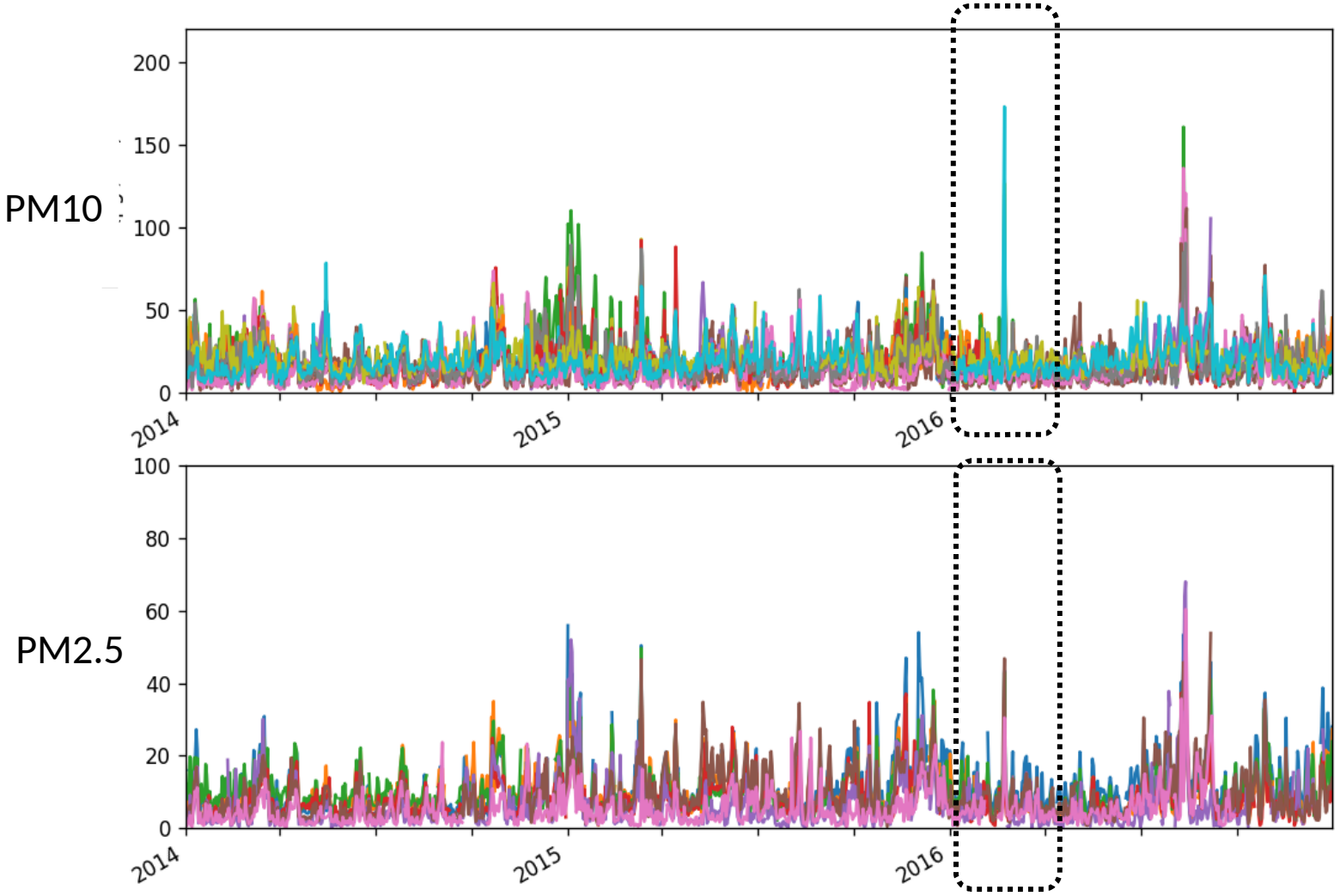


Model validation

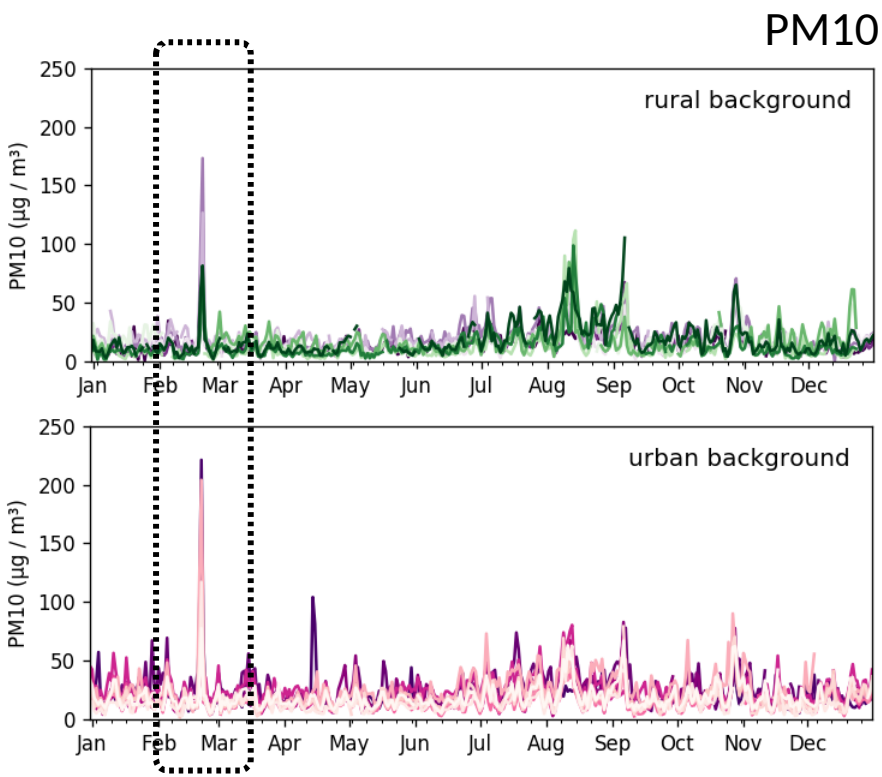


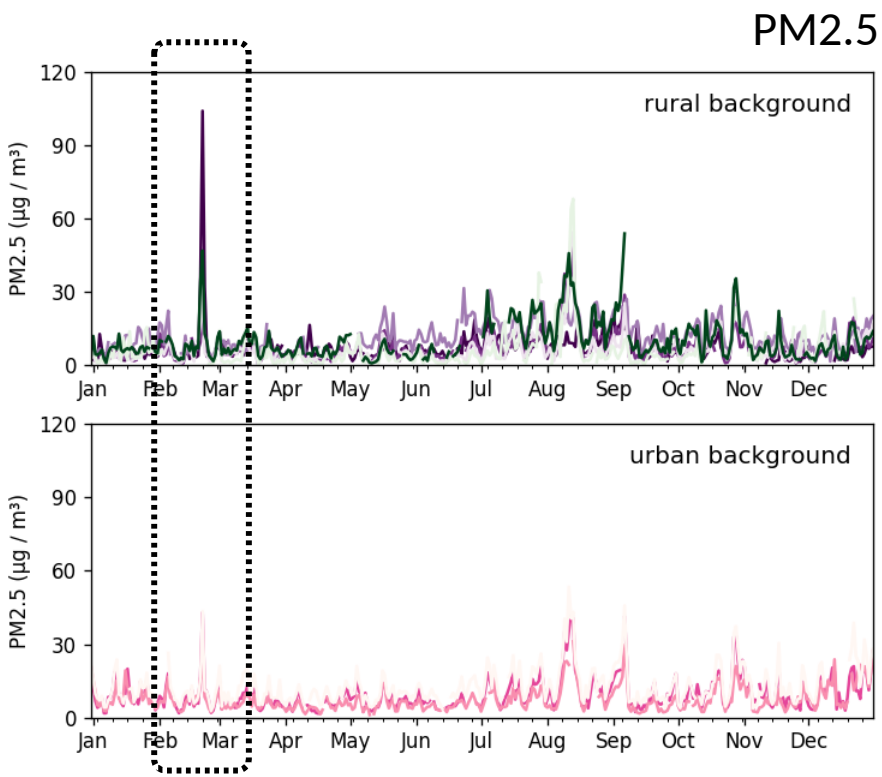
An outlook over the highest dust episode of the last years…

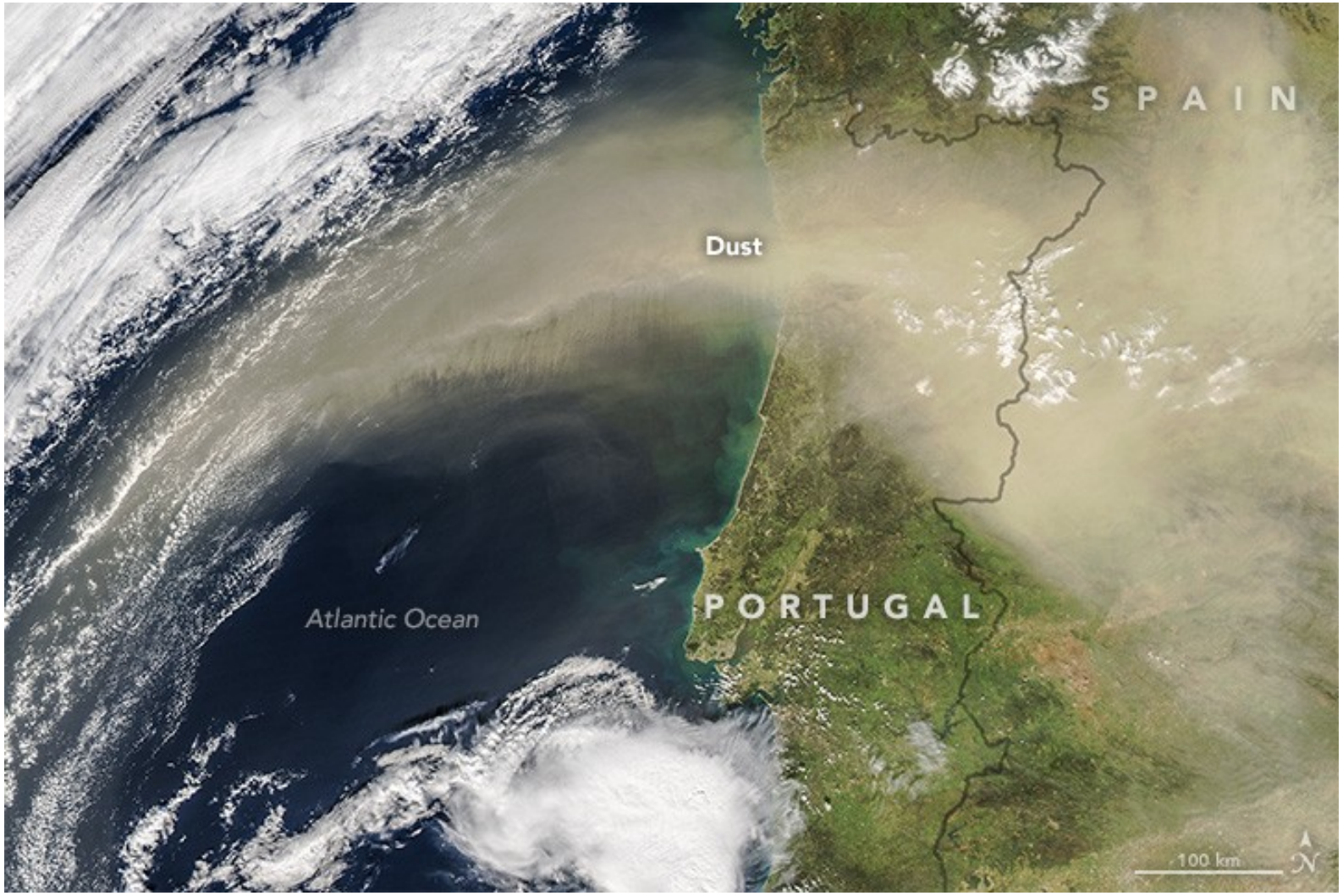
The highest event over the last years…



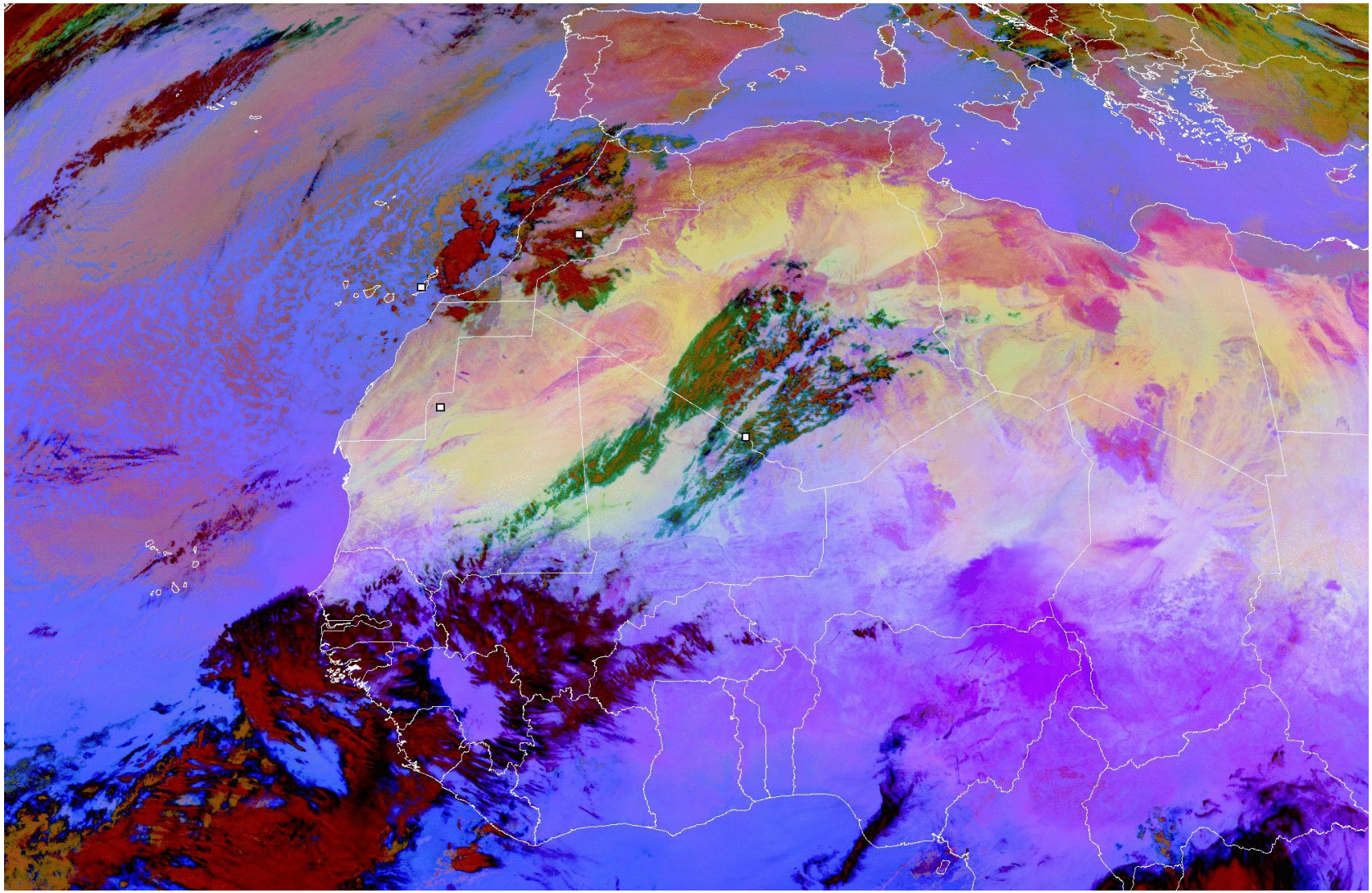
The dust episode





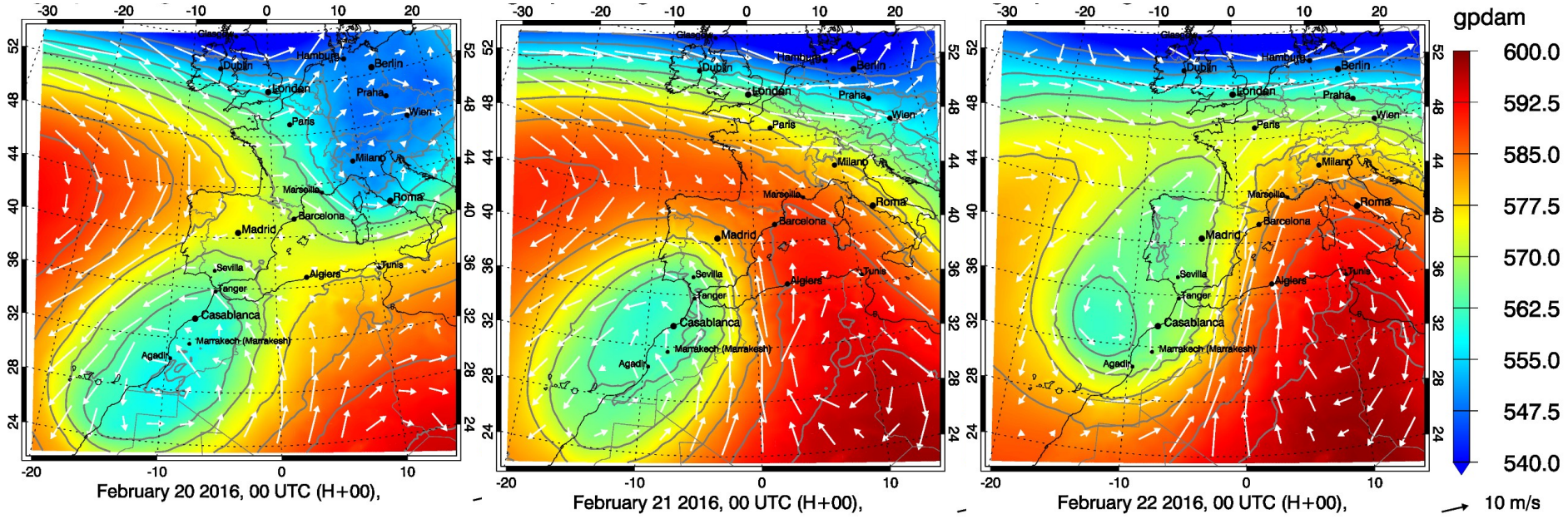


February 21, 2016 14:00 UTC [Aqua – MODIS]



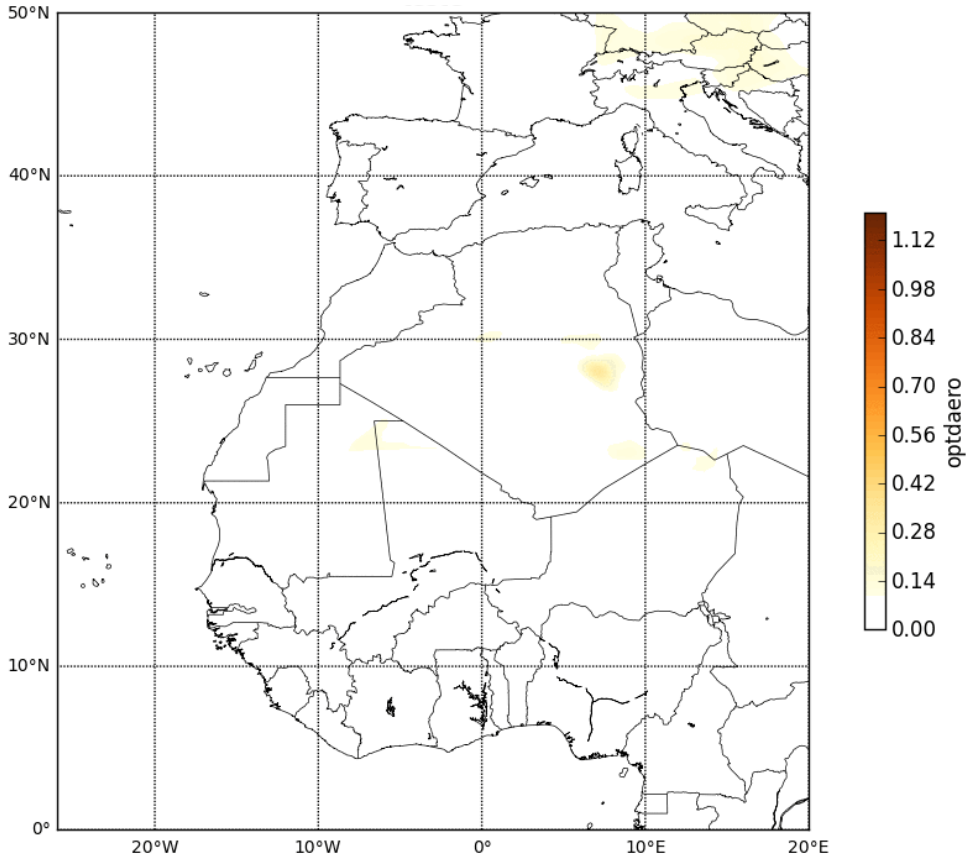
Meteorological fields [WRF simulation]

geopot. height @ 500 hPa; winds @ 2km

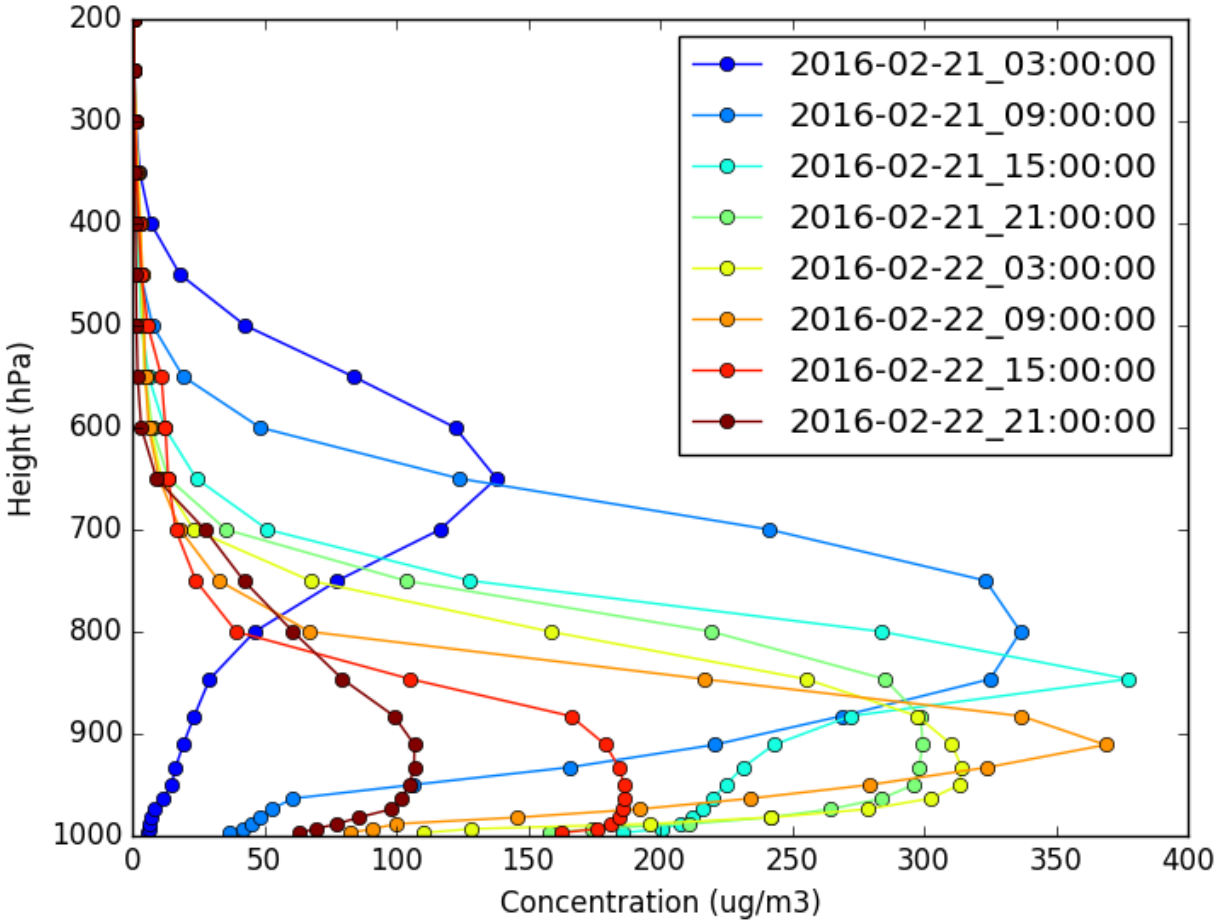


Aerosol Optical Depth

19.02.2016 12h00 – 23.02.2016 12h00

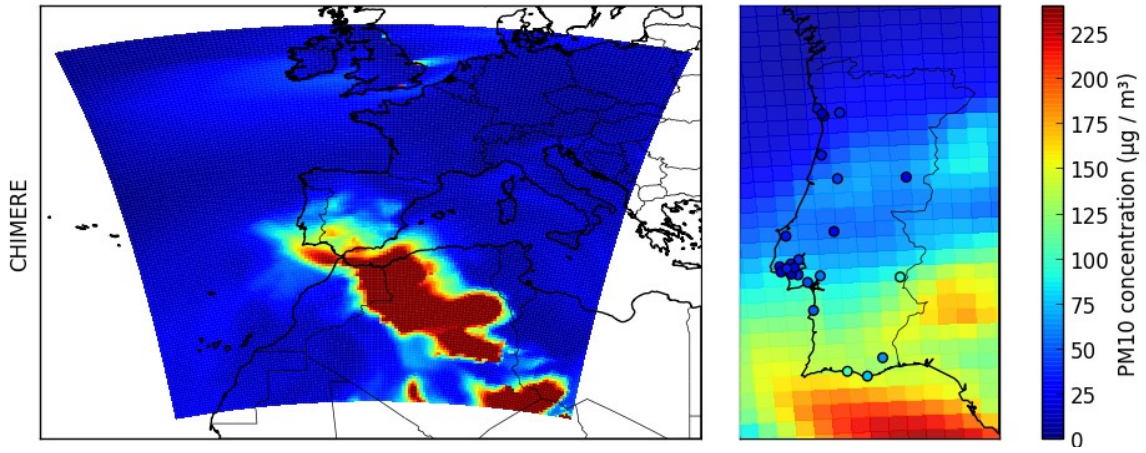


Vertical profile of dust

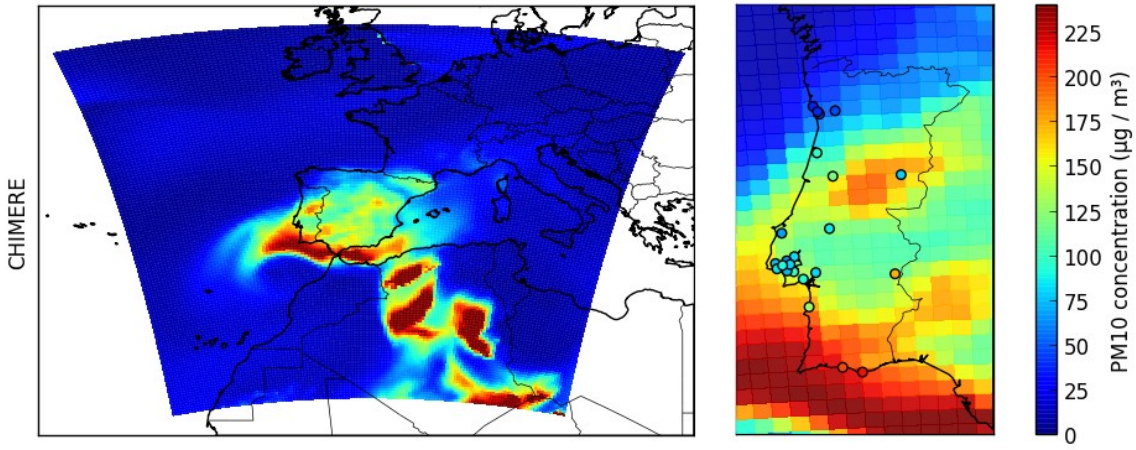


Air Quality [PM10 concentrations]

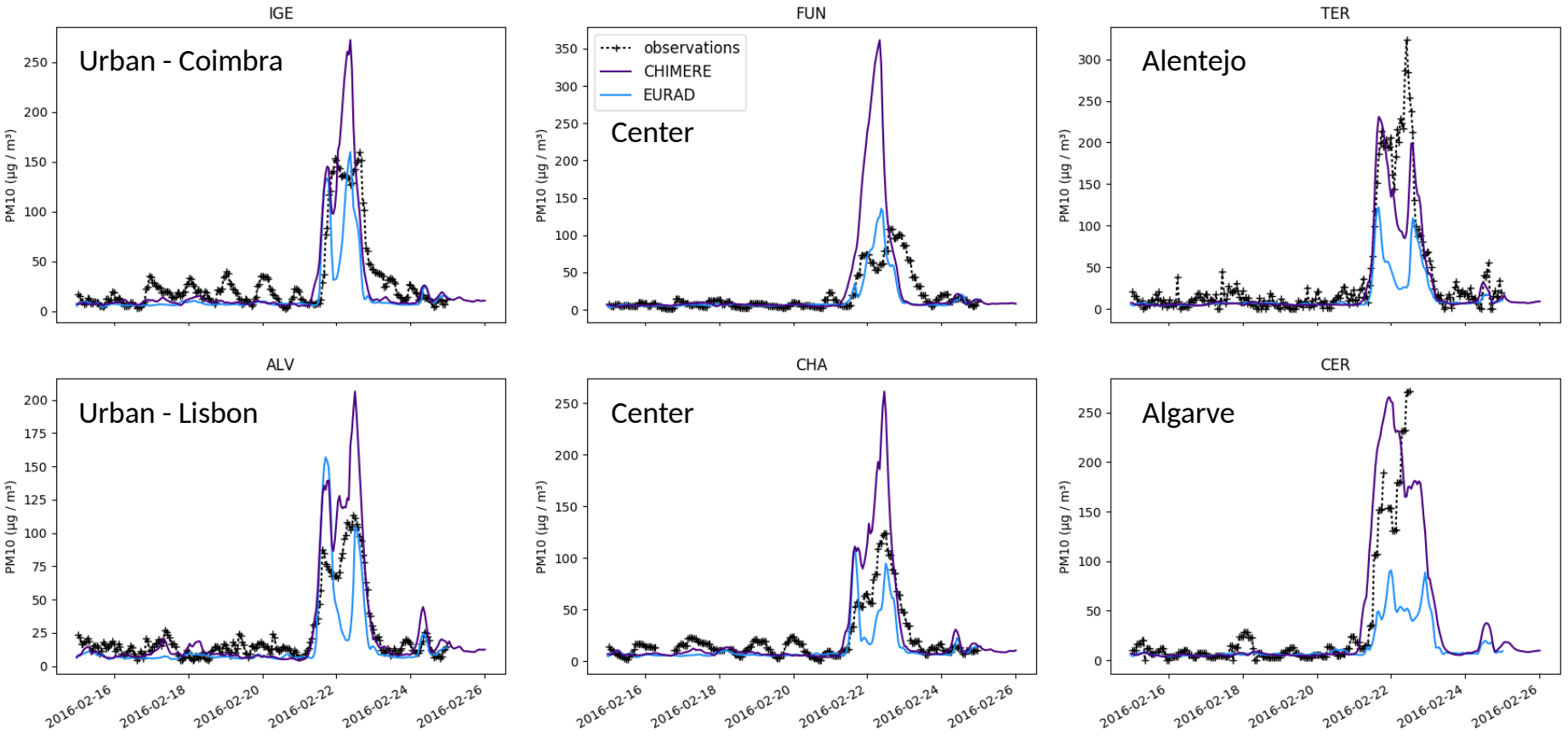
Feb 21



Feb 22

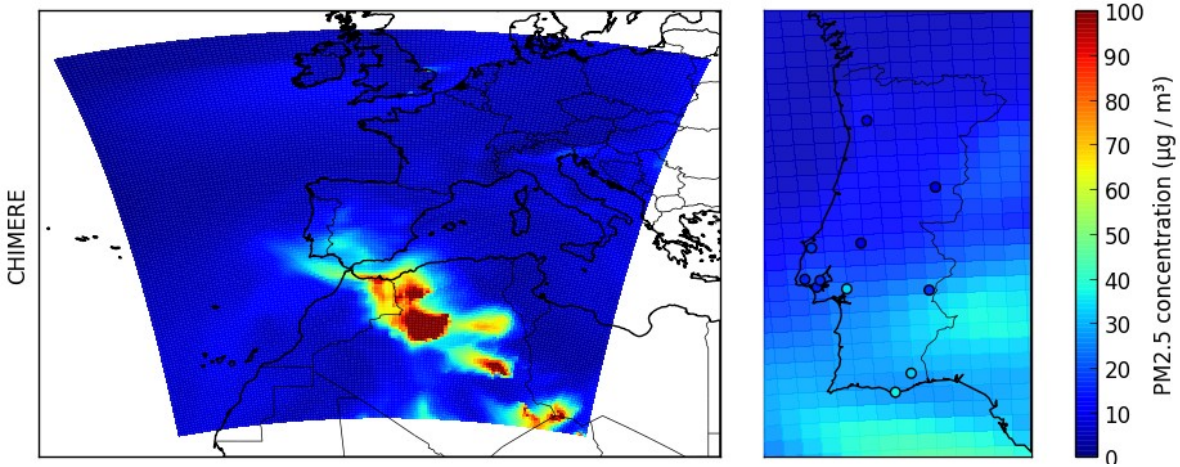


Air Quality [PM10 concentrations]

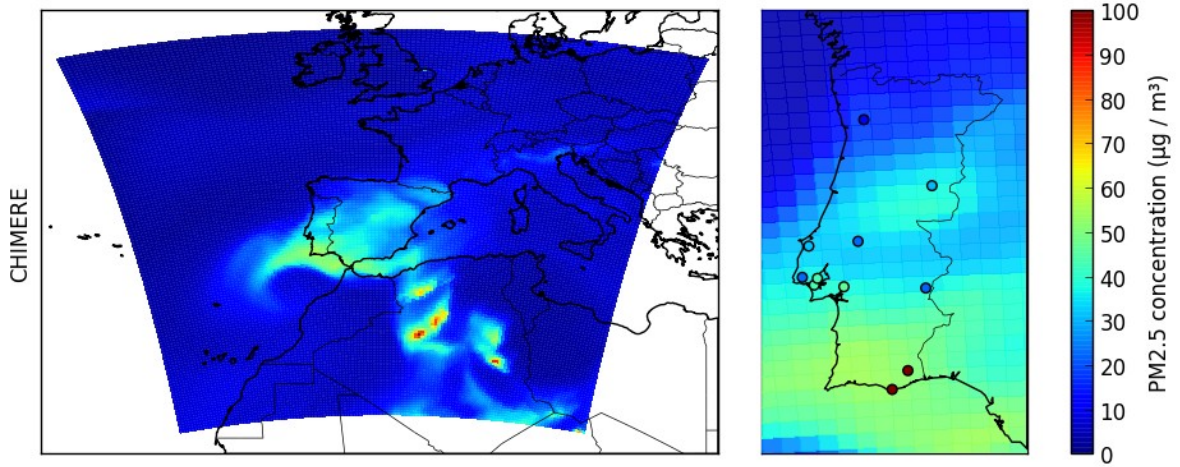


Air Quality [PM2.5 concentrations]

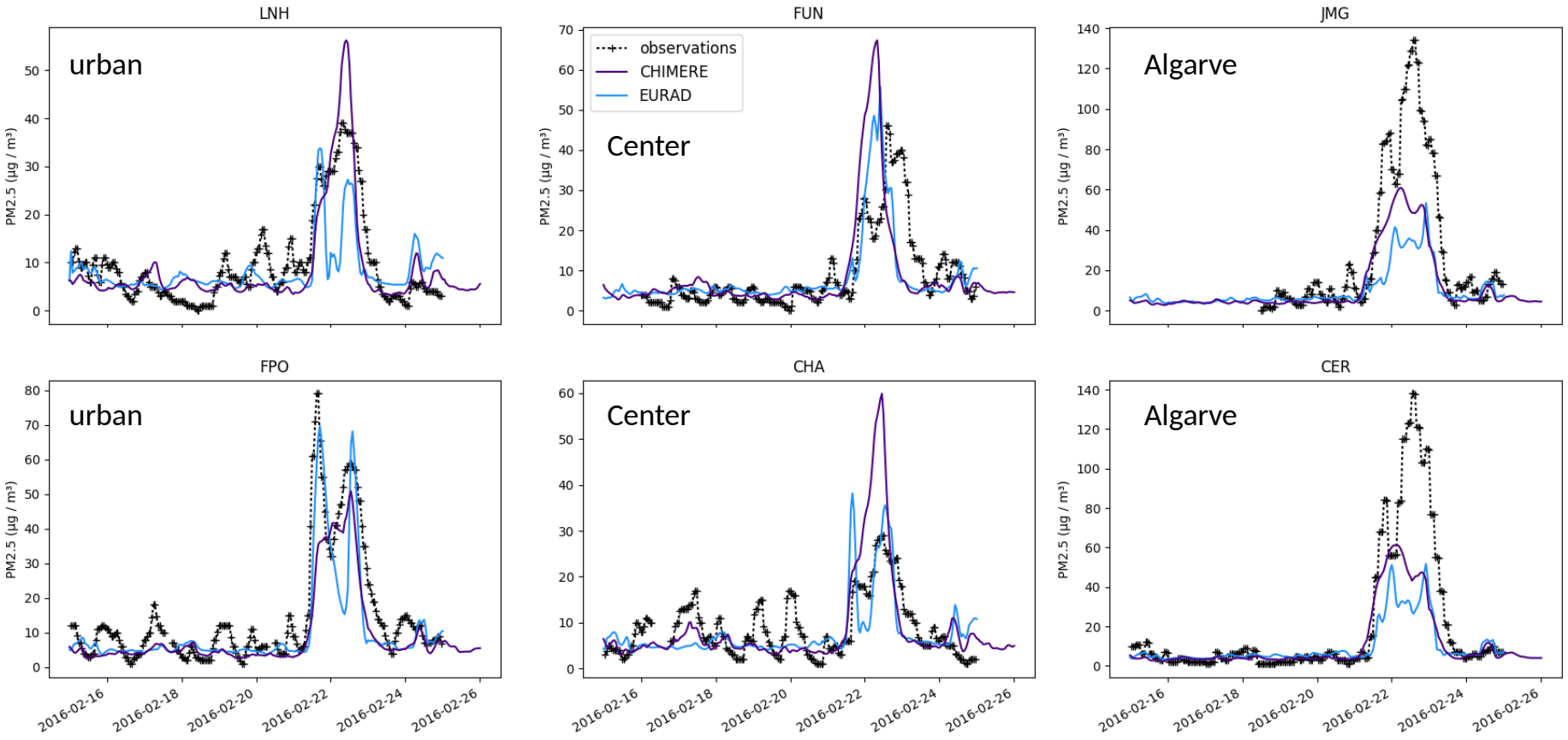
Feb 21



Feb 22

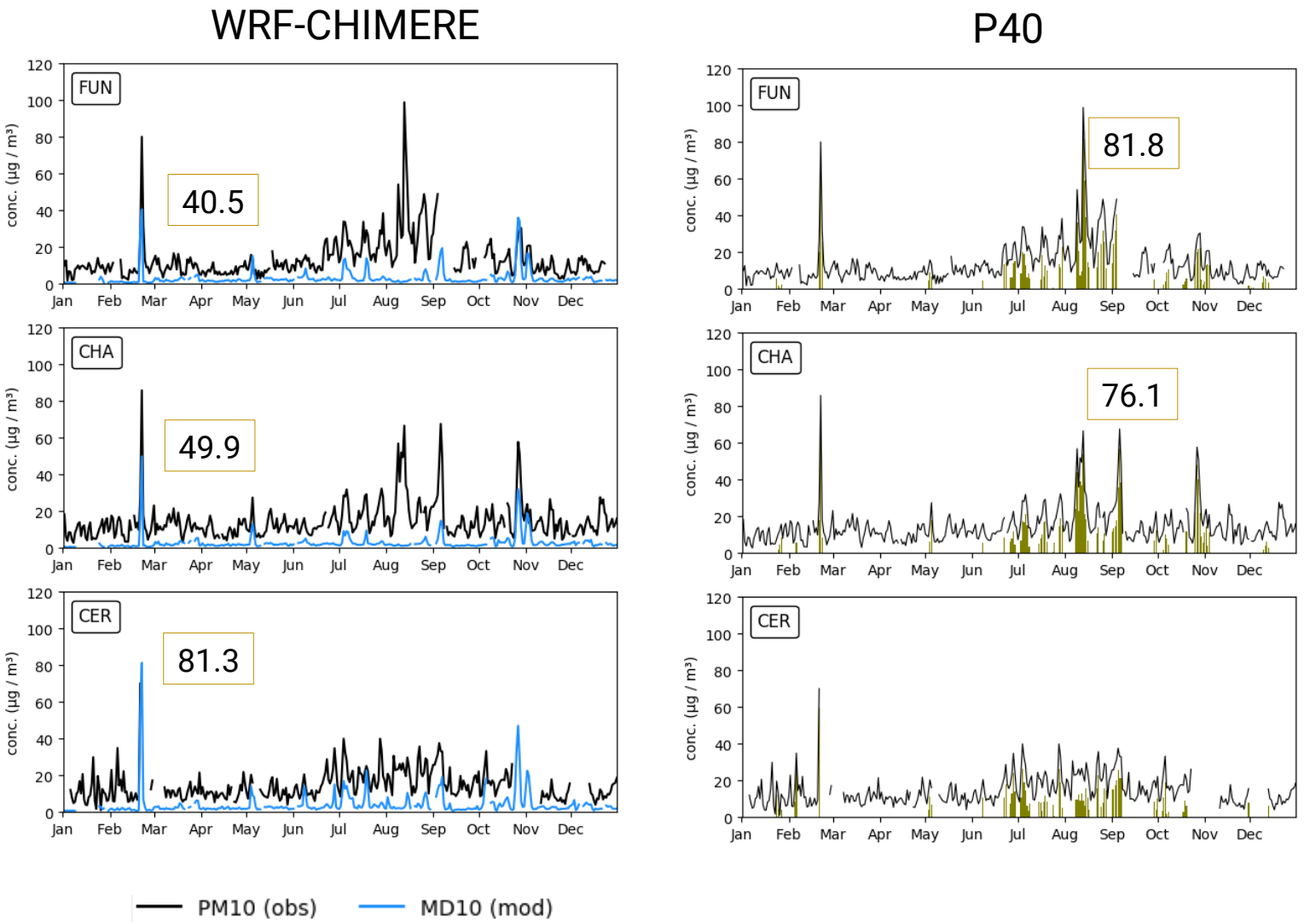


Air Quality [PM2.5 concentrations]

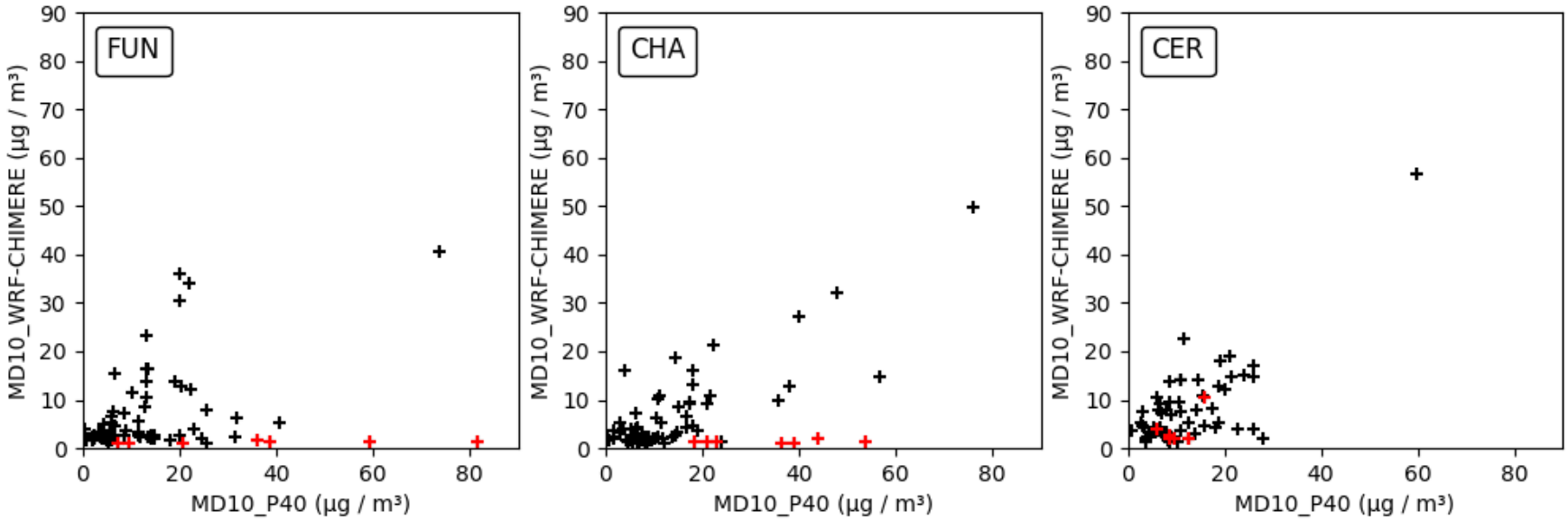


How models could be useful to evaluate dust contribution?

Modelling approach *vs* EC Methodology



Modelling approach *vs* EC methodology



+ 08 a 15 agosto

Forest fires

There is concordance between the 2 methods, but in general dust concentrations estimated by WRF-CHIMERE modelling system are inferior to the P40 methodology

Future challenges to modelling dust

- **Satellite + models** instead of satellites vs models!!
- **More accuracy** on dust modelling -> using models to estimate dust contribution to air quality
- **Real alert system** for AQ/dust
- **Dust-AQ-CC**: Dust-air quality-climate change

Current research...

How dust episodes can influence ozone peaks?

Ana Ascenso[1], Florian Couvidat F[2], Carla Gama[1], Augustin Colette[2], Alexandra Monteiro[1]

[1] CESAM, Department of Environmental and Planning, University of Aveiro, Portugal

[2] INERIS, National Institute for Industrial Environment and Risks, Parc Technologique ALATA, France

Desert dust outbreaks affect air quality in many regions around the world, and the western Mediterranean Countries are an example, where also occurs ozone episodes during summer. This study intends to estimate the influence of dust in the atmosphere on the ozone photochemical production. A summer period, with heat wave and dust event, that occurred last August 2018 over Portugal, is studied using the WRF-CHIMERE modelling system.

This modelling system was applied for the year in analysis, considering three nested domains with horizontal resolutions of 27x27 km^2 (over North Africa and Europe), 9x9 km^2 and 3x3 km^2 (over Portugal). Different runs with the latest CHIMERE model version (recently developed and still in tests) were produced. The idea is to deactivate the process involving dust until we can see no effect of dust onto ozone and therefore to diagnose the importance of each of these processes, namely the formation of coarse nitrate onto dust and heterogeneous reactions; only considering the heterogeneous reactions and also investigating the importance of the processes of coagulation of dust with other particles. The modelling results obtained along these different simulation tests will allow to identify and quantified the importance of each of these processes and to better understand the impact of dust in the atmosphere when there is favourable photochemical conditions for ozone production (Figure 1).

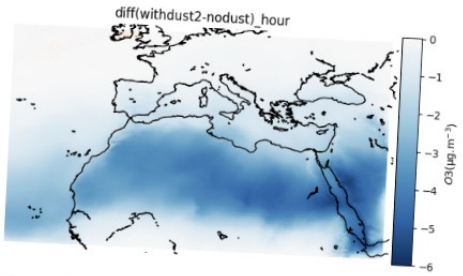


Figure 1. Average spatial differences of hourly ozone concentrations obtained by subtracting the simulation with dust from the simulation without.

This study will allow to improve knowledge on the main atmospheric chemical processes that should be included (take part) of the air quality models, in particular the ones used for air quality forecast services and prediction of both dust and ozone events.

Work to be presented at GLOREAM2019 workshop, Sueden

Thank you!