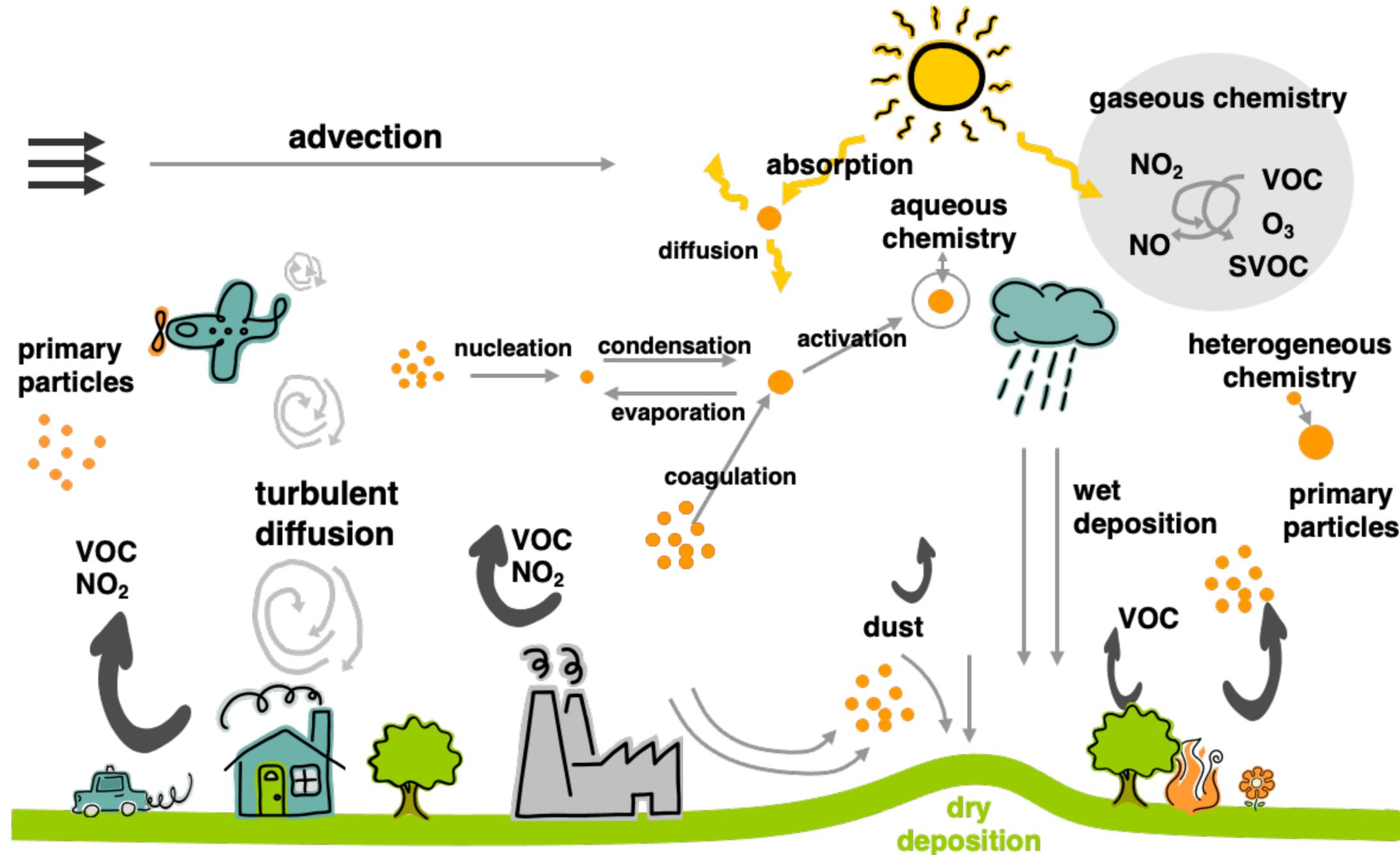# Forecasting atmospheric pollutants over Portugal

Carla Gama, Alexandra Monteiro, Ana Isabel Miranda
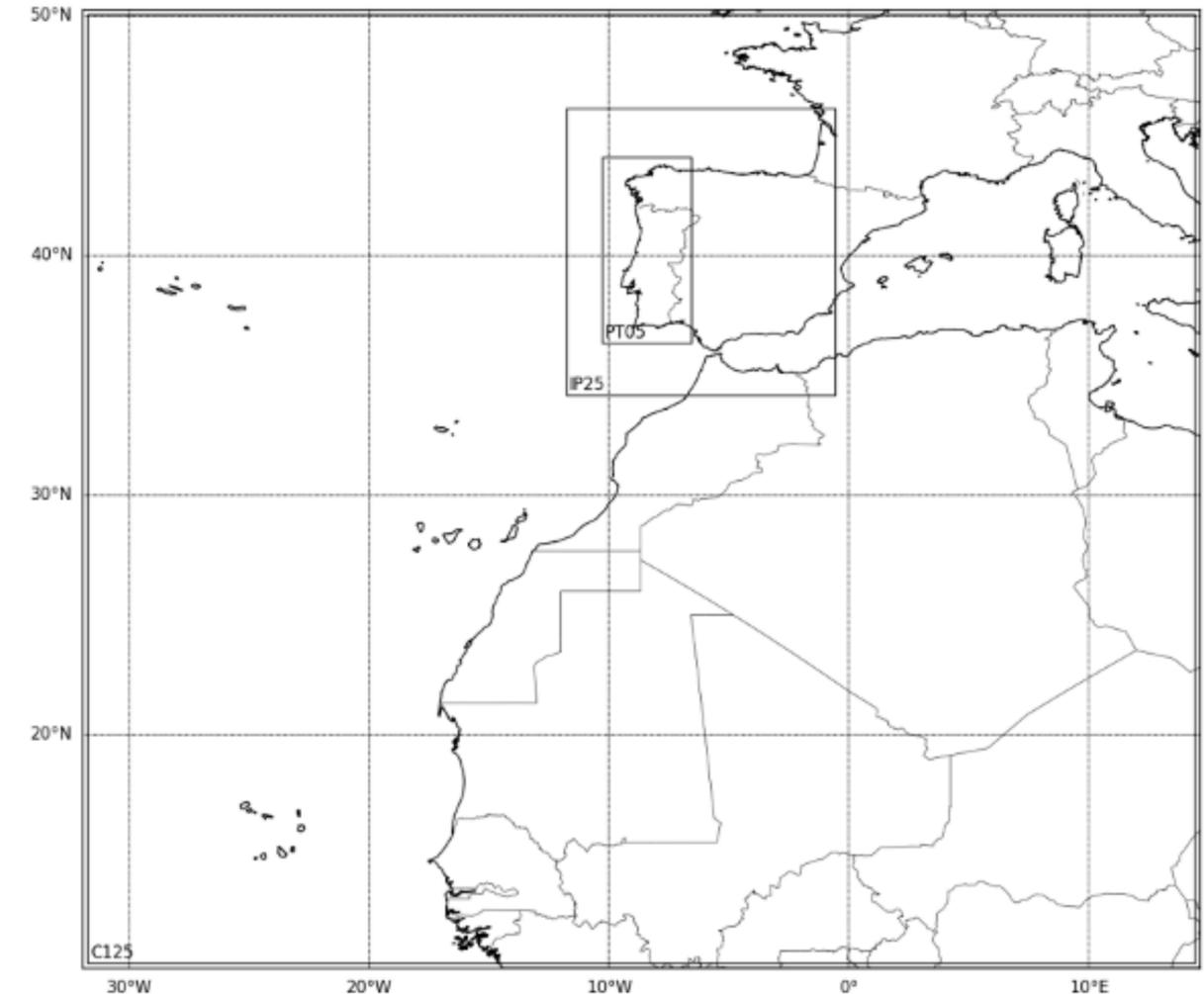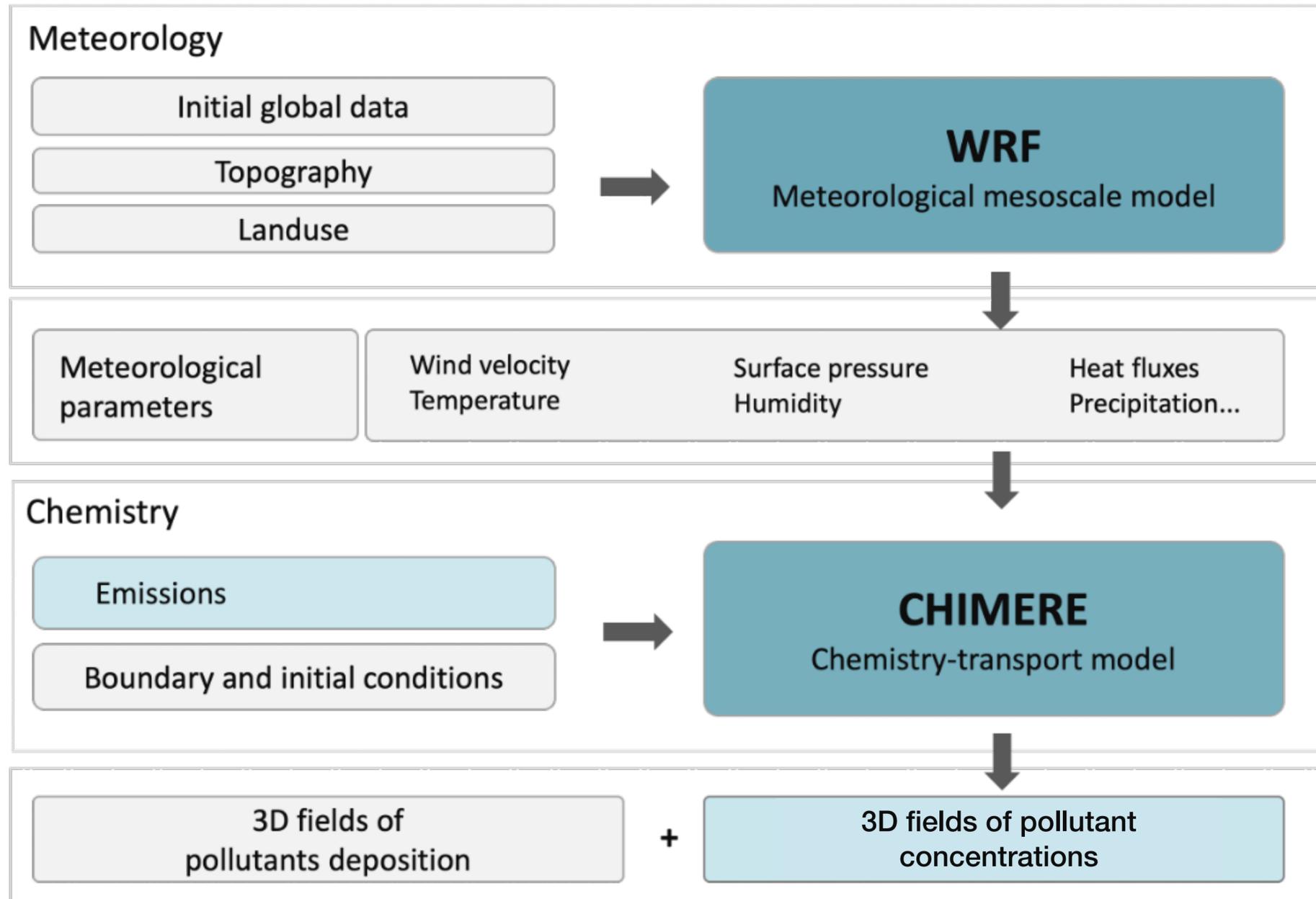
CESAM & Department of Environment and Planning, University of Aveiro

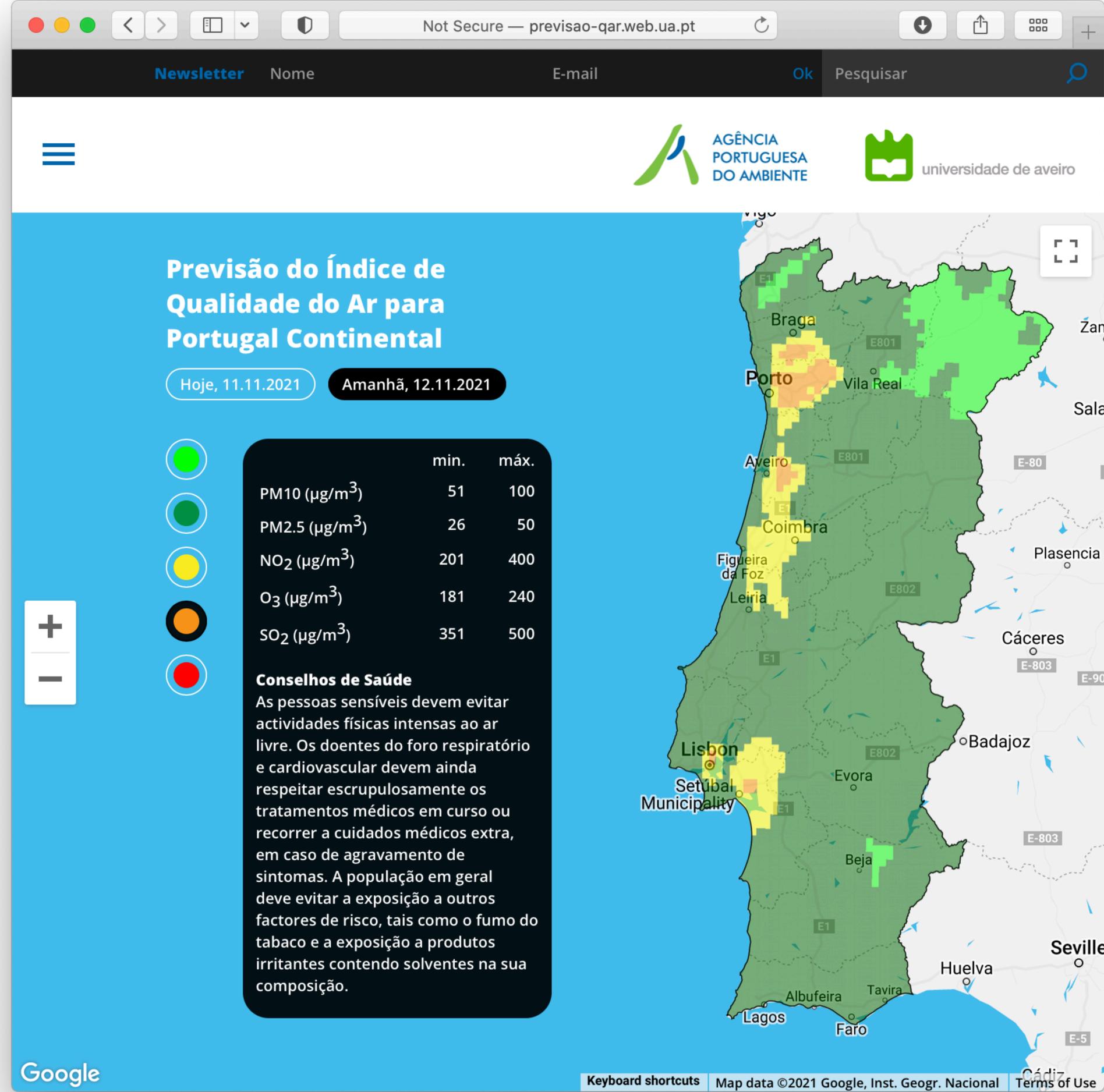# Chemical Transport Models [Air Quality Models]

The Portuguese Air Quality Forecast system

3 nested domains
C125: 125 x 125 km²
IP25: 25 x 25 km²
PT05: 5 x 5 km²

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

- Air Quality Index

- Concentrations for specific pollutants

  - PM10

  - PM2.5

  - NO_2

  - O_3

  - SO_2

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AGÊNCIA PORTUGUESA DO AMBIENTE

universidade de aveiro

Previsão do Índice de Qualidade do Ar para Portugal Continental

Hoje, 11.11.2021   Amanhã, 12.11.2021

	min.	máx.
PM10 ($\mu g/m^3$)	51	100
PM2.5 ($\mu g/m^3$)	26	50
NO_2 ($\mu g/m^3$)	201	400
O_3 ($\mu g/m^3$)	181	240
SO_2 ($\mu g/m^3$)	351	500

Conselhos de Saúde
As pessoas sensíveis devem evitar actividades físicas intensas ao ar livre. Os doentes do foro respiratório e cardiovascular devem ainda respeitar escrupulosamente os tratamentos médicos em curso ou recorrer a cuidados médicos extra, em caso de agravamento de sintomas. A população em geral deve evitar a exposição a outros factores de risco, tais como o fumo do tabaco e a exposição a produtos irritantes contendo solventes na sua composição.

QUALAR
informação sobre qualidade do ar

Google

Keyboard shortcuts   Map data ©2021 Google, Inst. Geogr. Nacional   Terms of Use
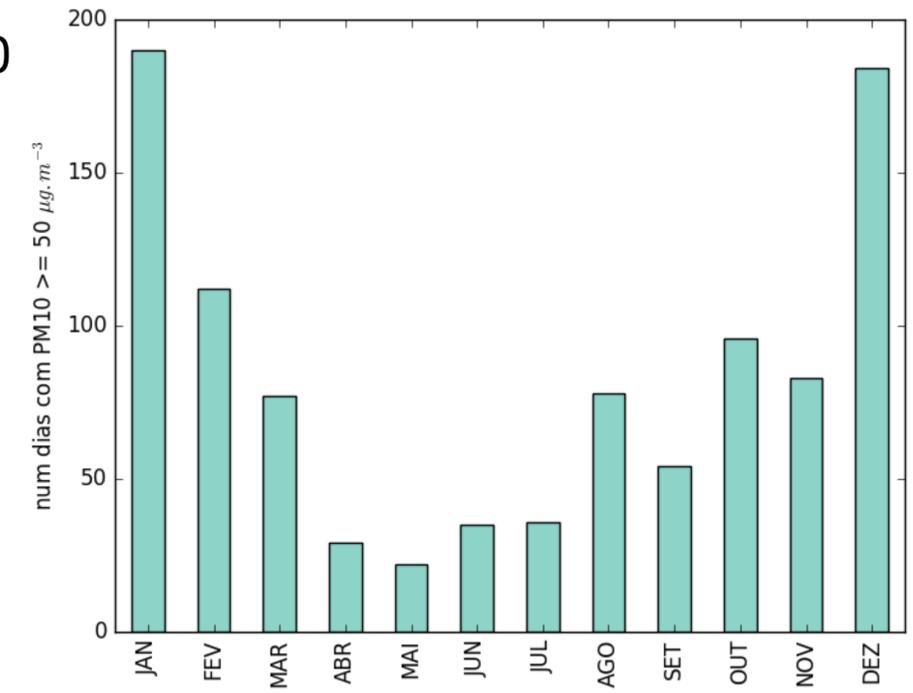
Main pollutants: particulate matter and ozone

Number of days with concentrations above thresholds for the protection of human health
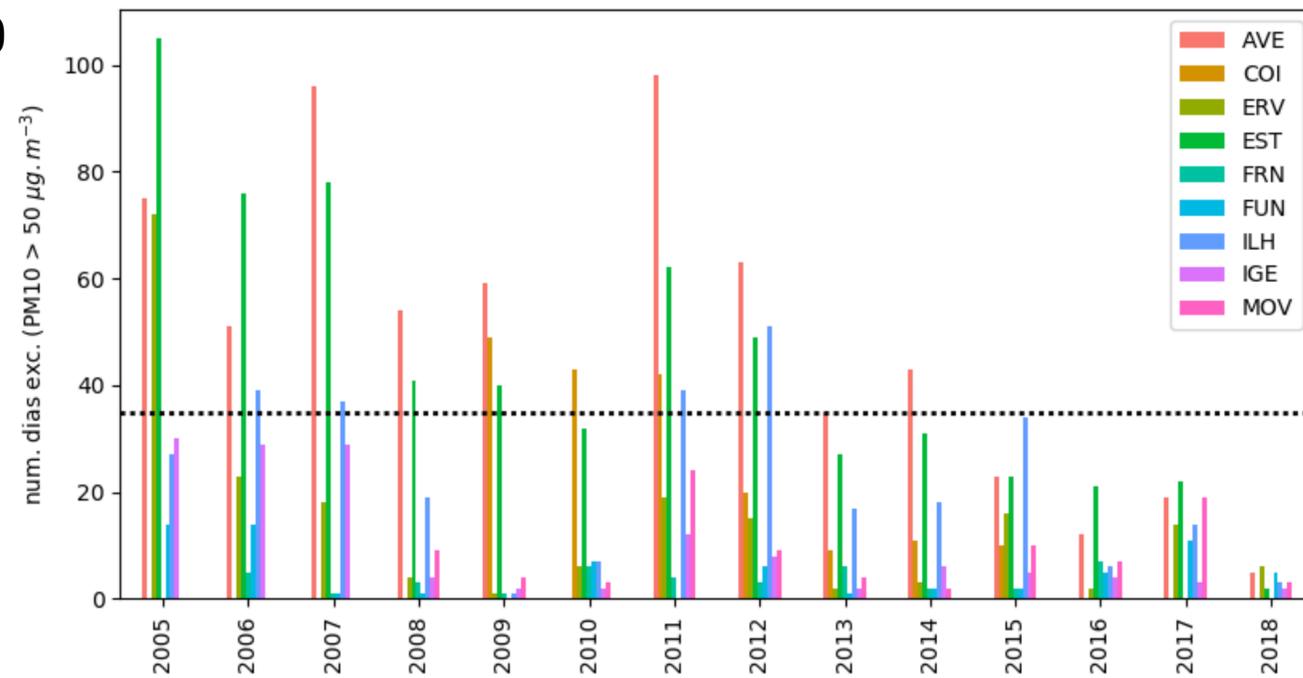
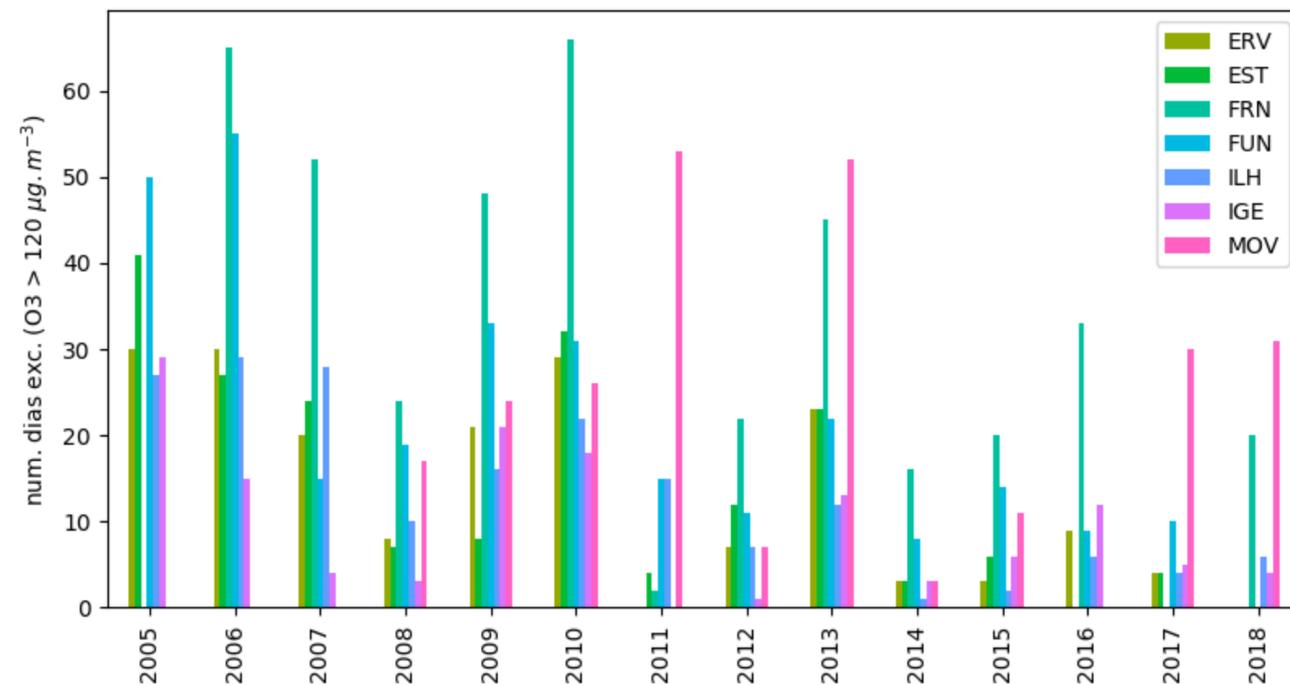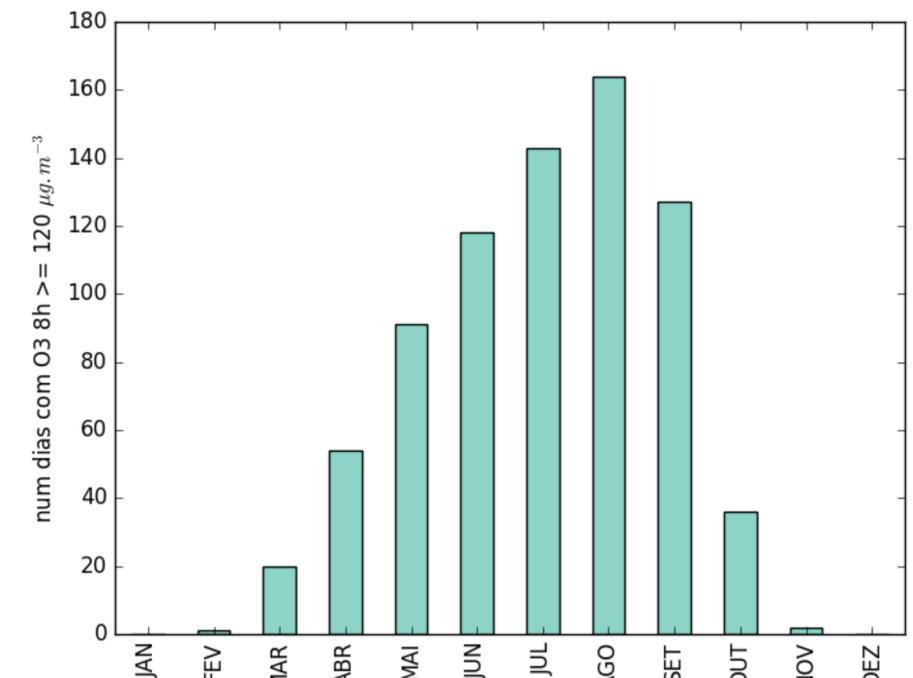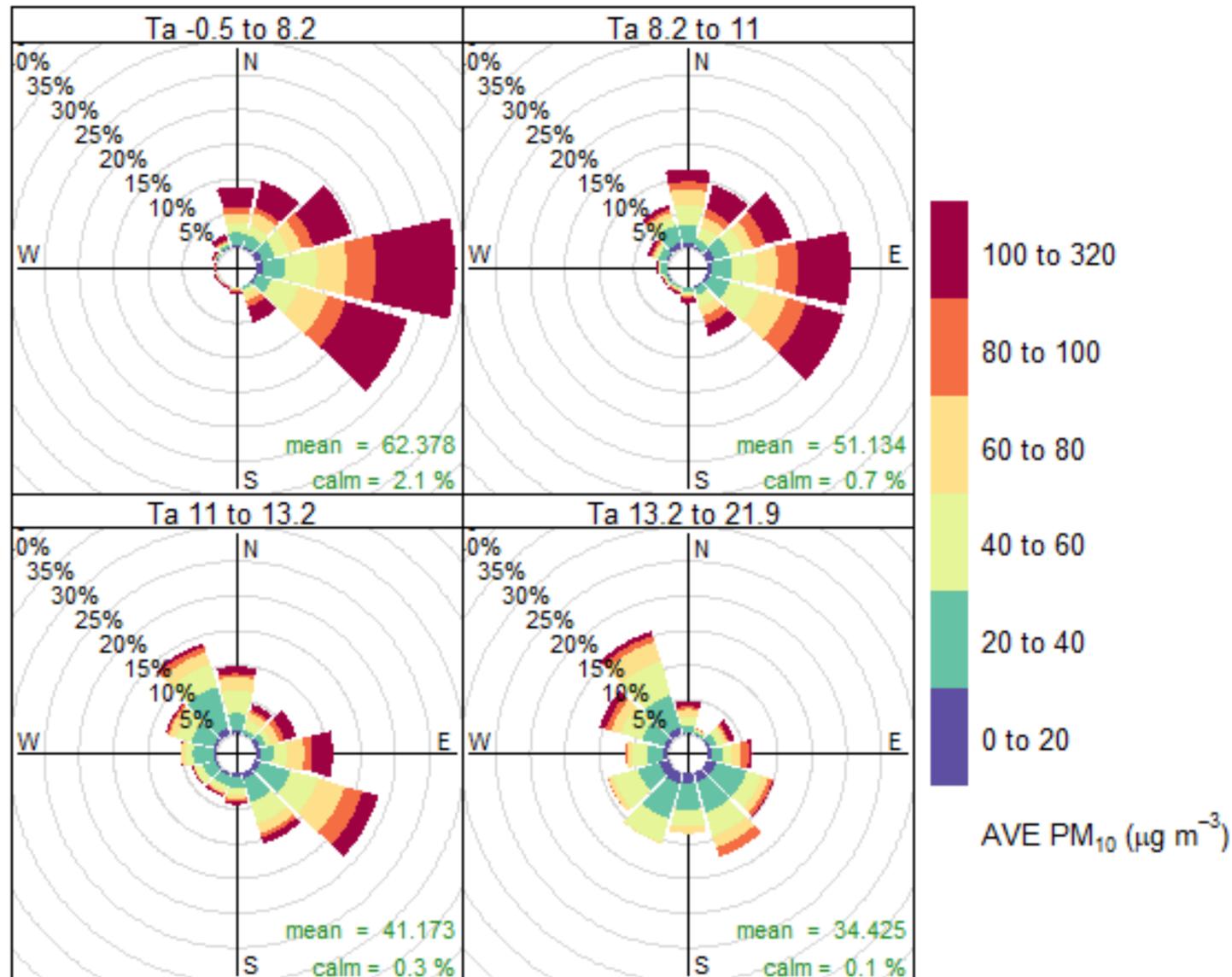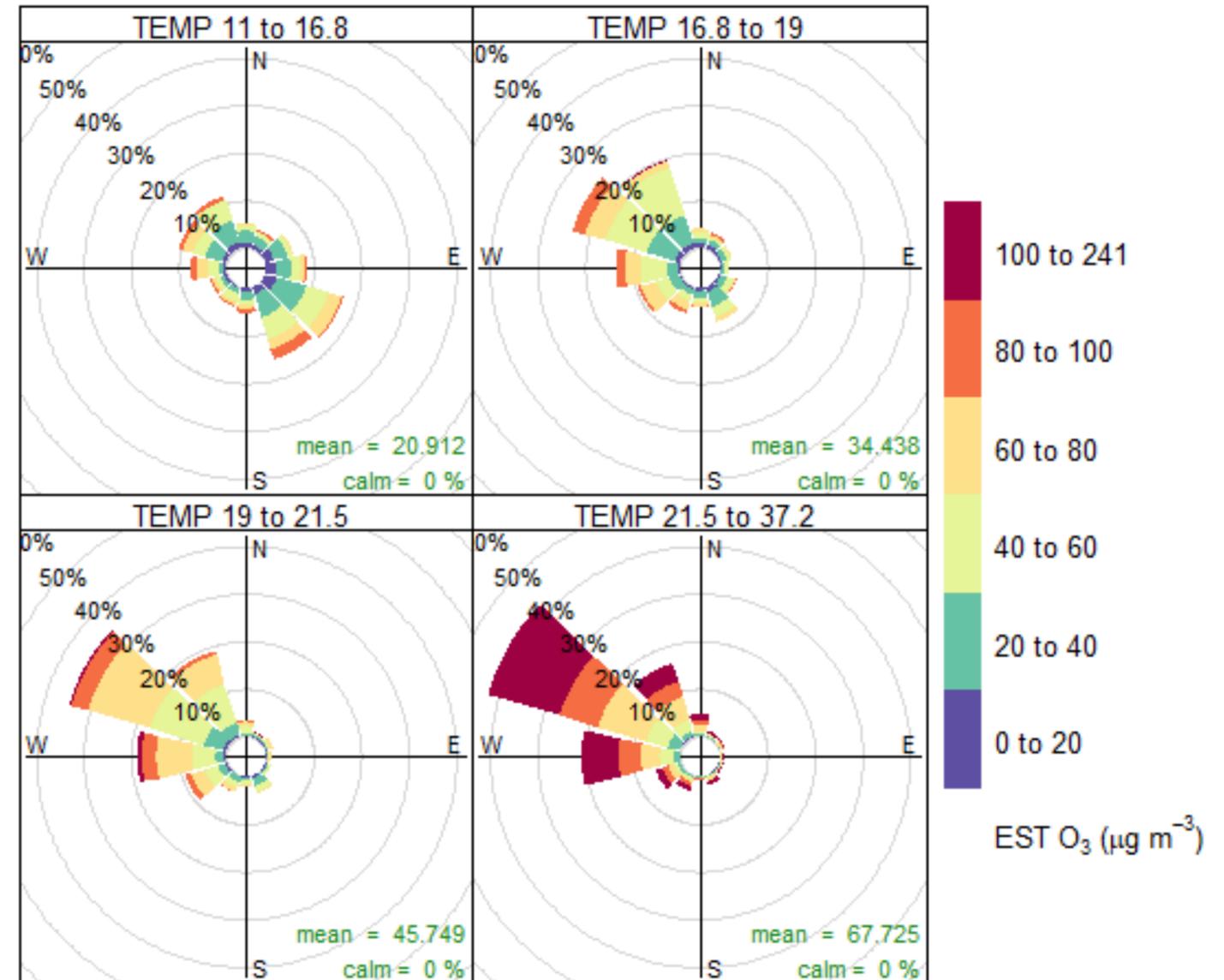Monthly distribution of those days

PM10 vs T

AVEIRO | DJF | 2005-2010

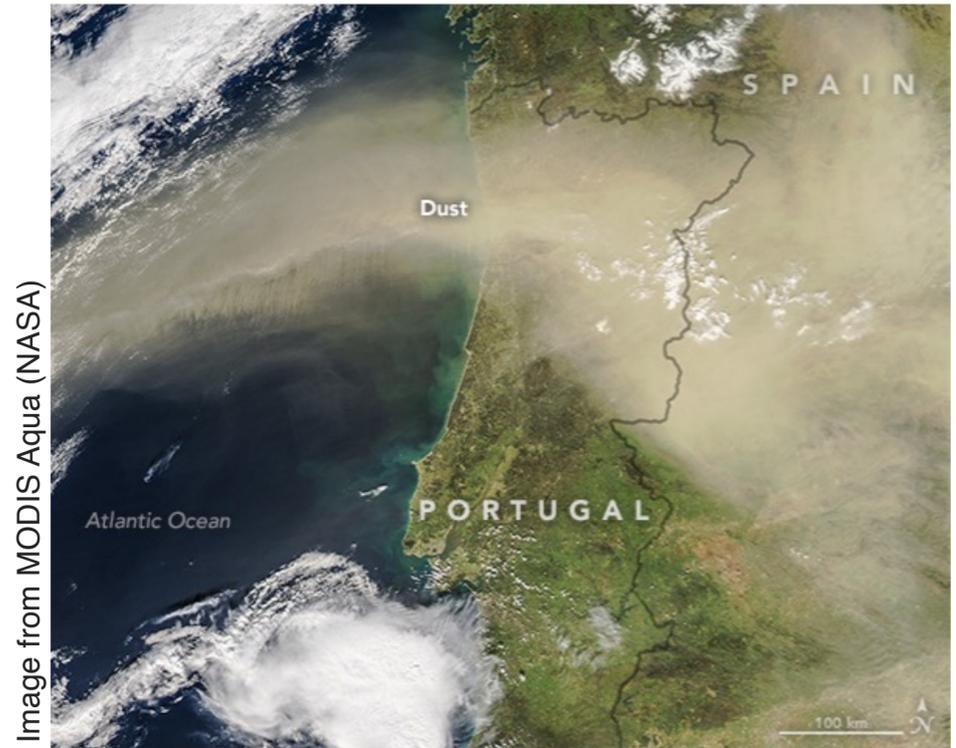Proportion contribution to the mean (%)

O₃ vs T

ESTARREJA | AUG | 2014-2018

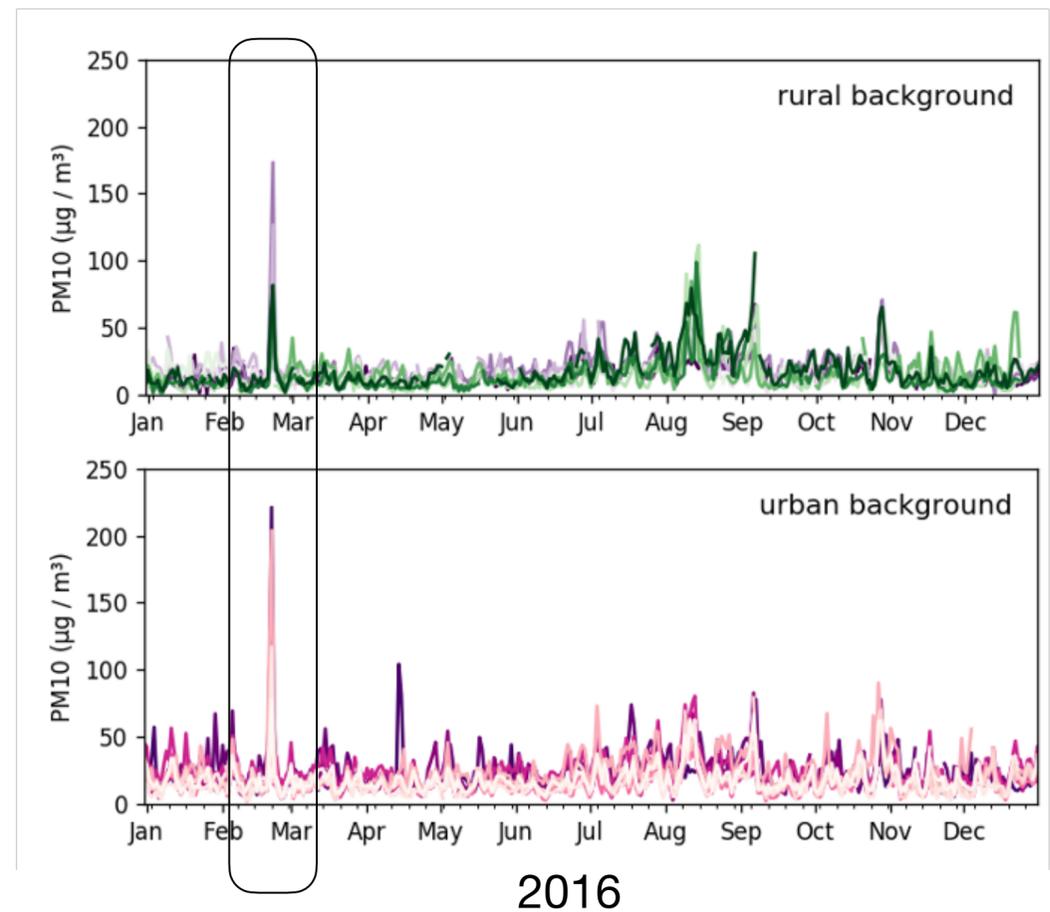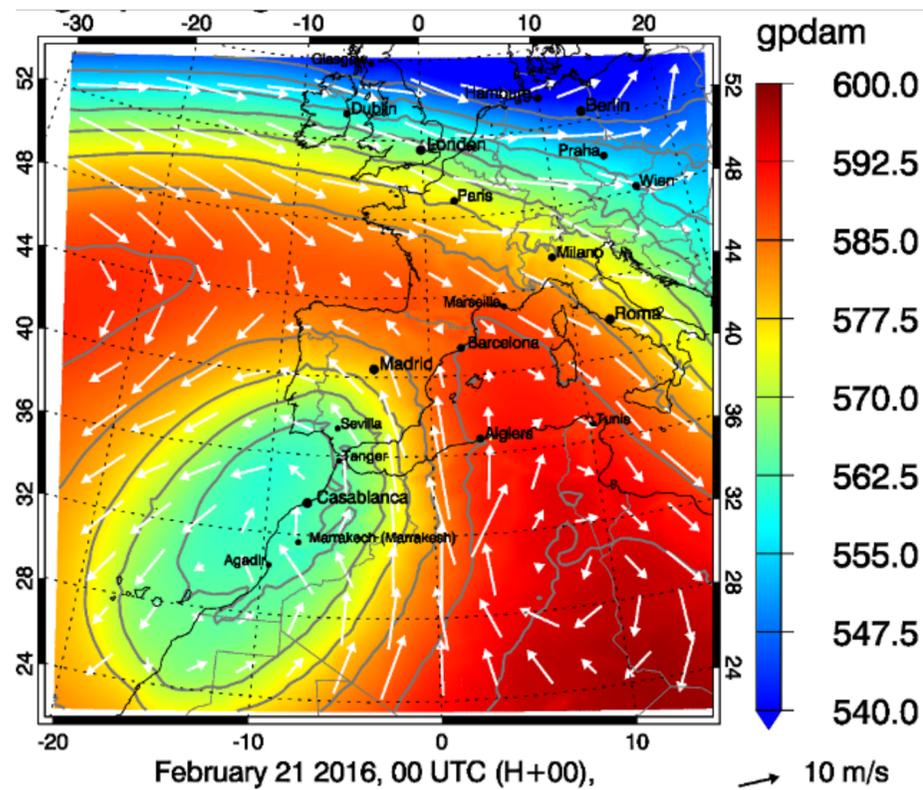Proportion contribution to the mean (%)
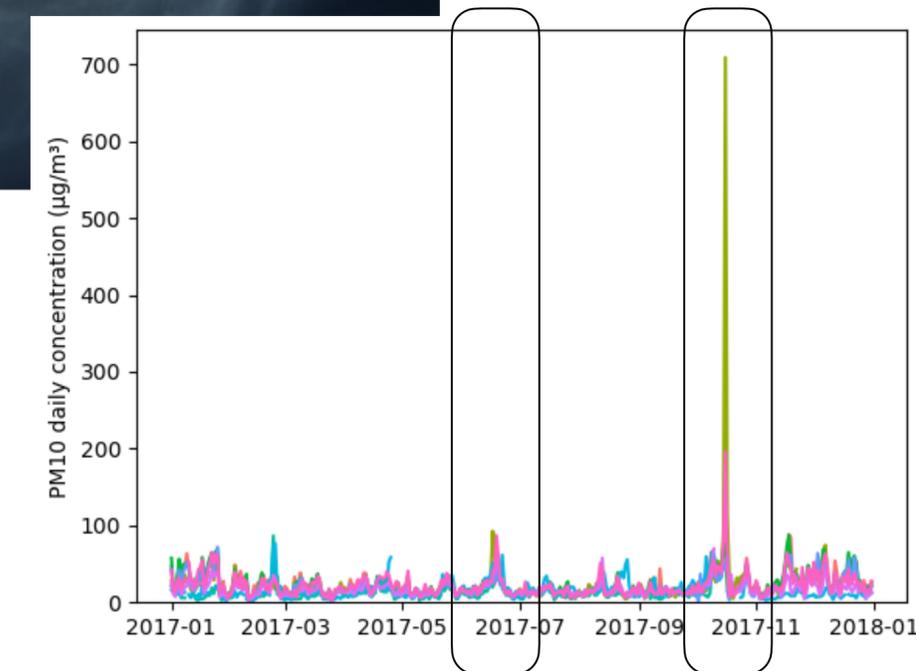
PM10 episodes

Long-range transport of desert dust

Forest fires

Image from MODIS Aqua (NASA)

geopot. height @ 500 hPa; winds @ 2km

February 21 2016, 00 UTC (H+00),

Gama et al., 2019
https://doi.org/10.1016/j.apr.2019.03.005
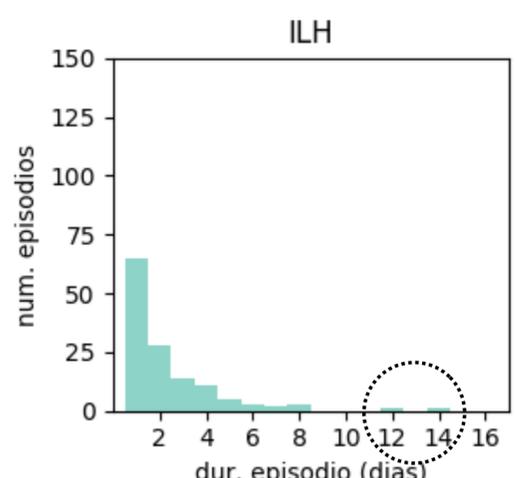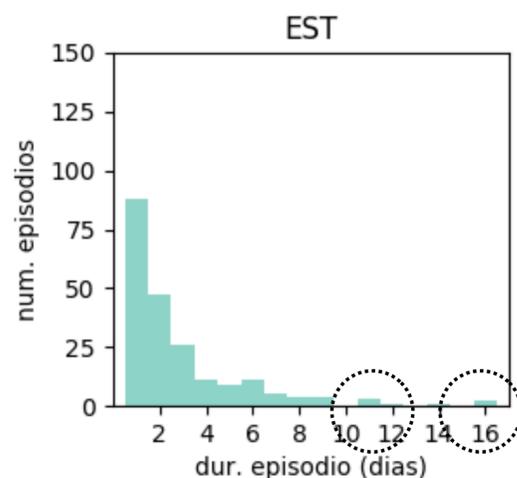

2016

2017

PM10 episodes

Long lasting PM episodes are associated with very cold and dry periods during winter

17 Dezembro 2011 – 23 Janeiro 2012
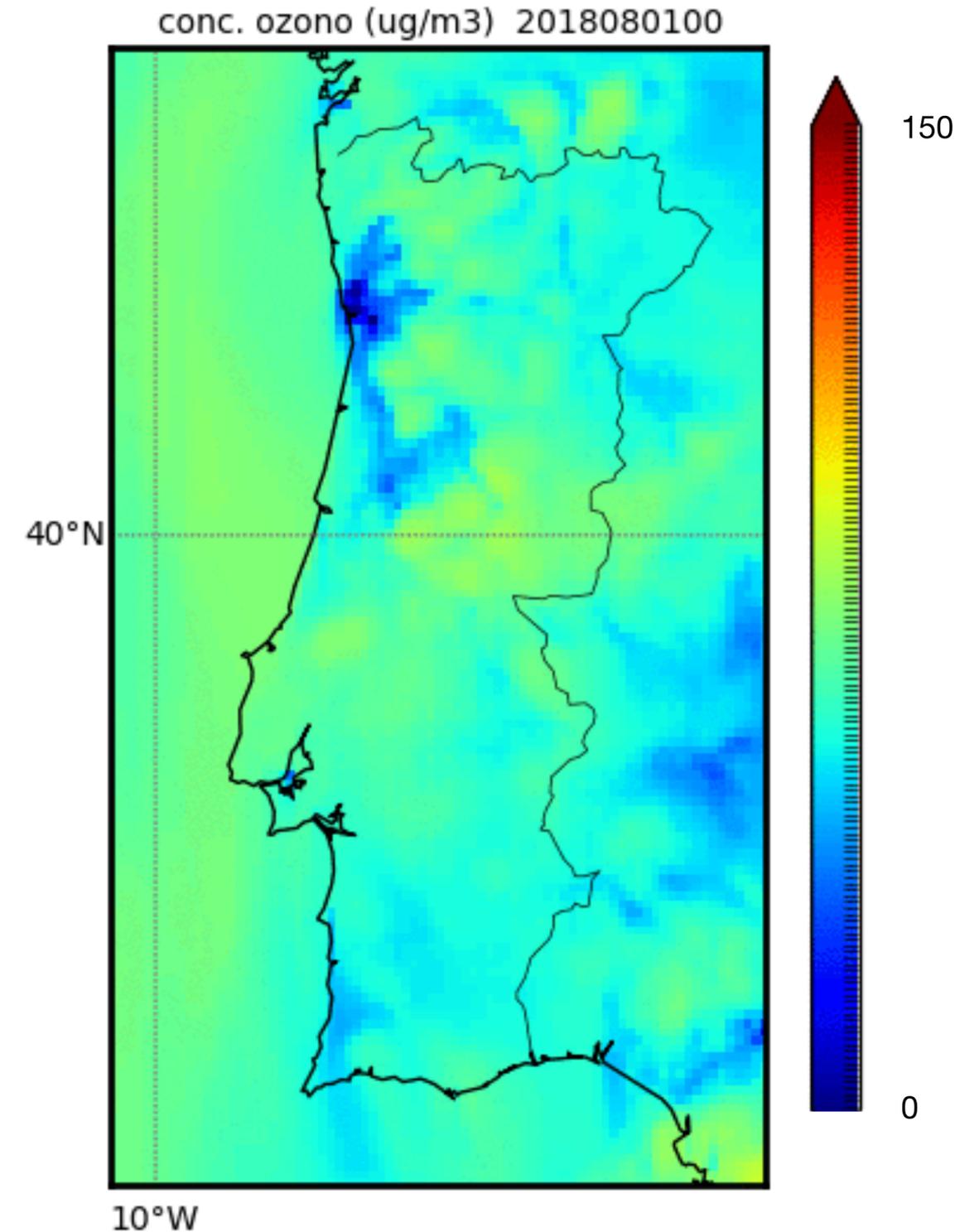
average daily profile during event
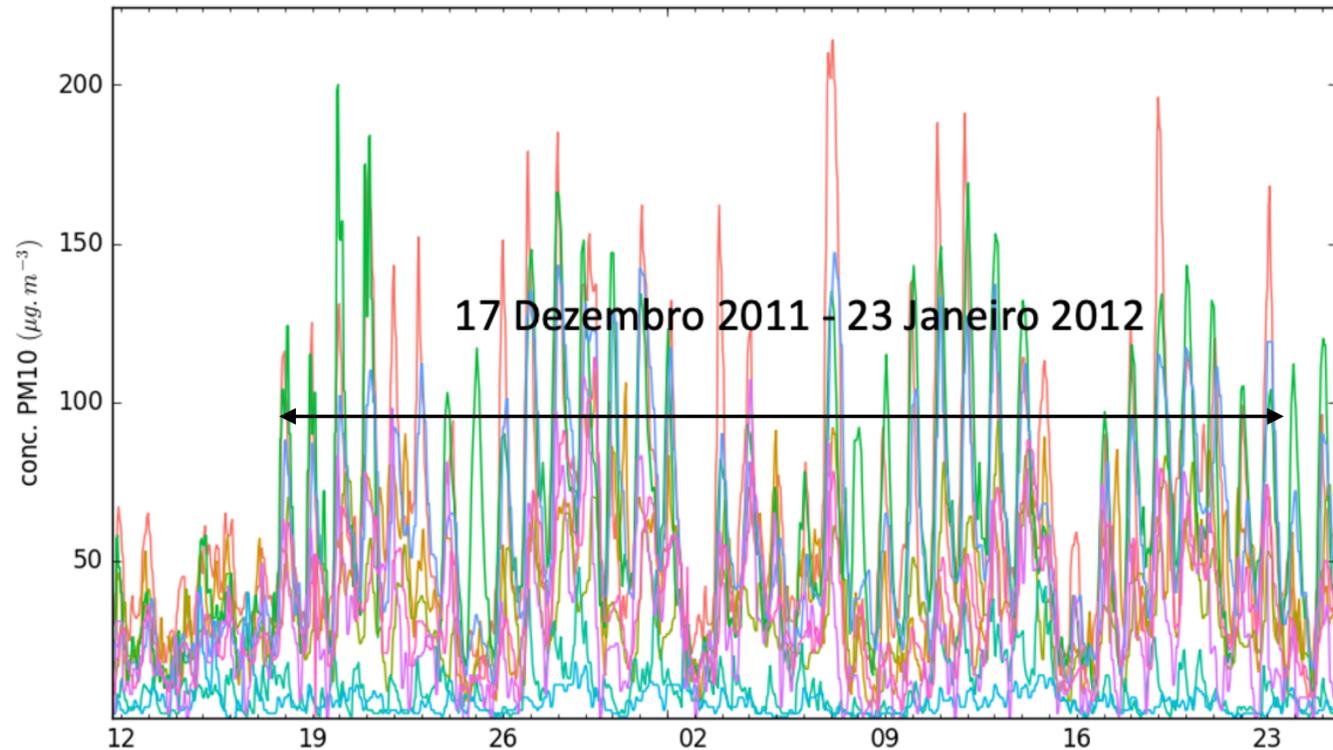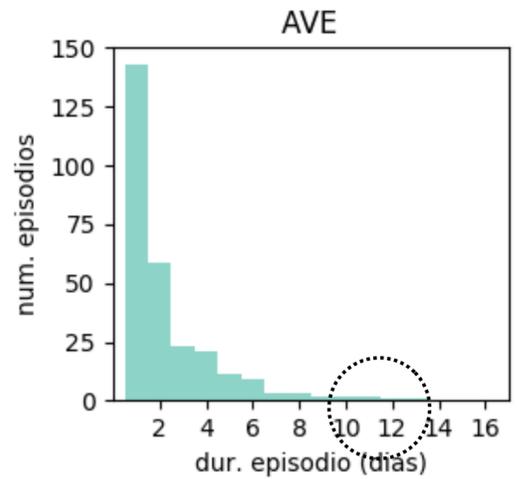
- Increase in domestic heating emissions

- Atmosphere stability
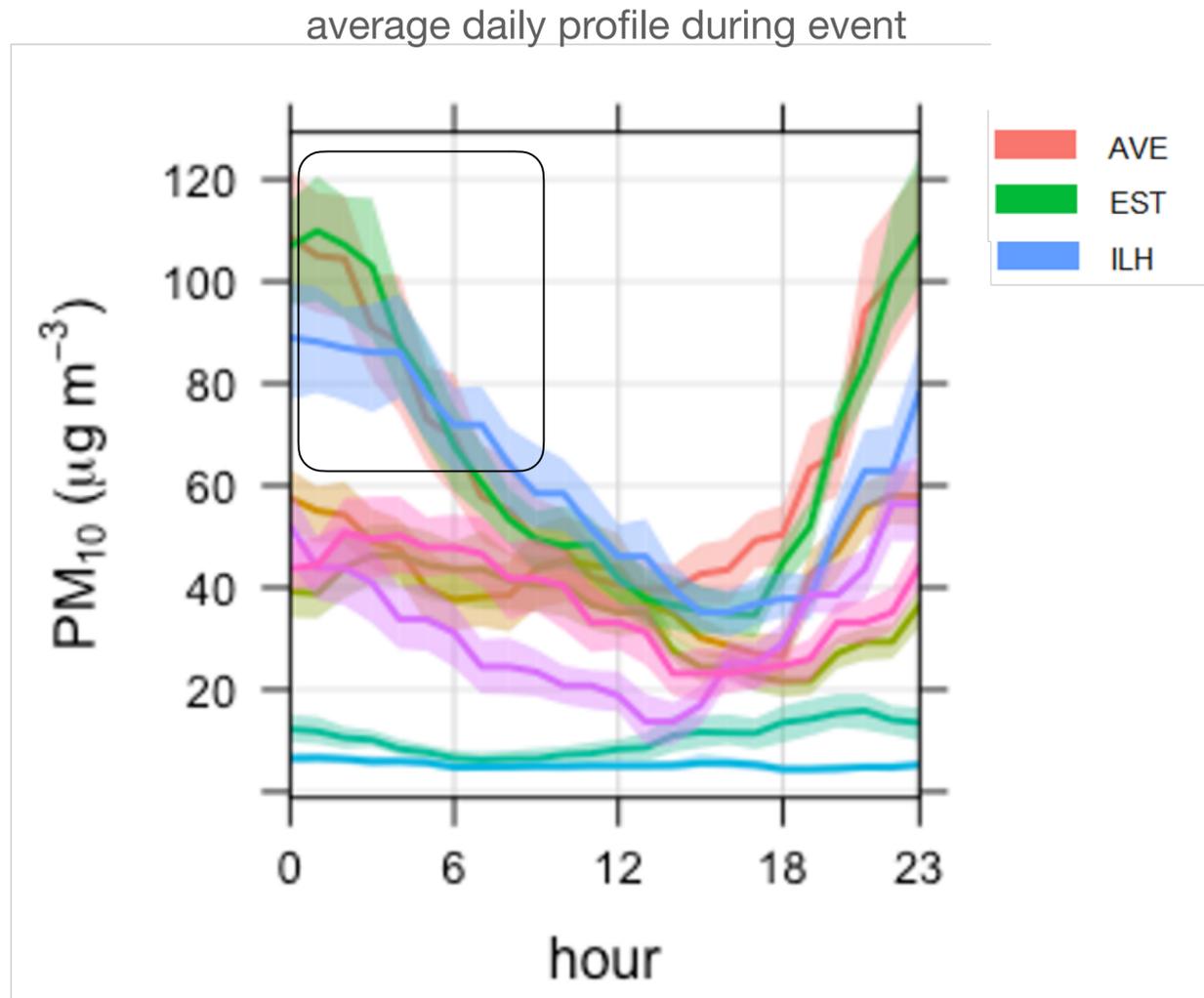
O₃ episodes

- Ground-level ozone is a secondary pollutant formed by complex photochemical reactions between NOx and COV

- Strong temperature dependence

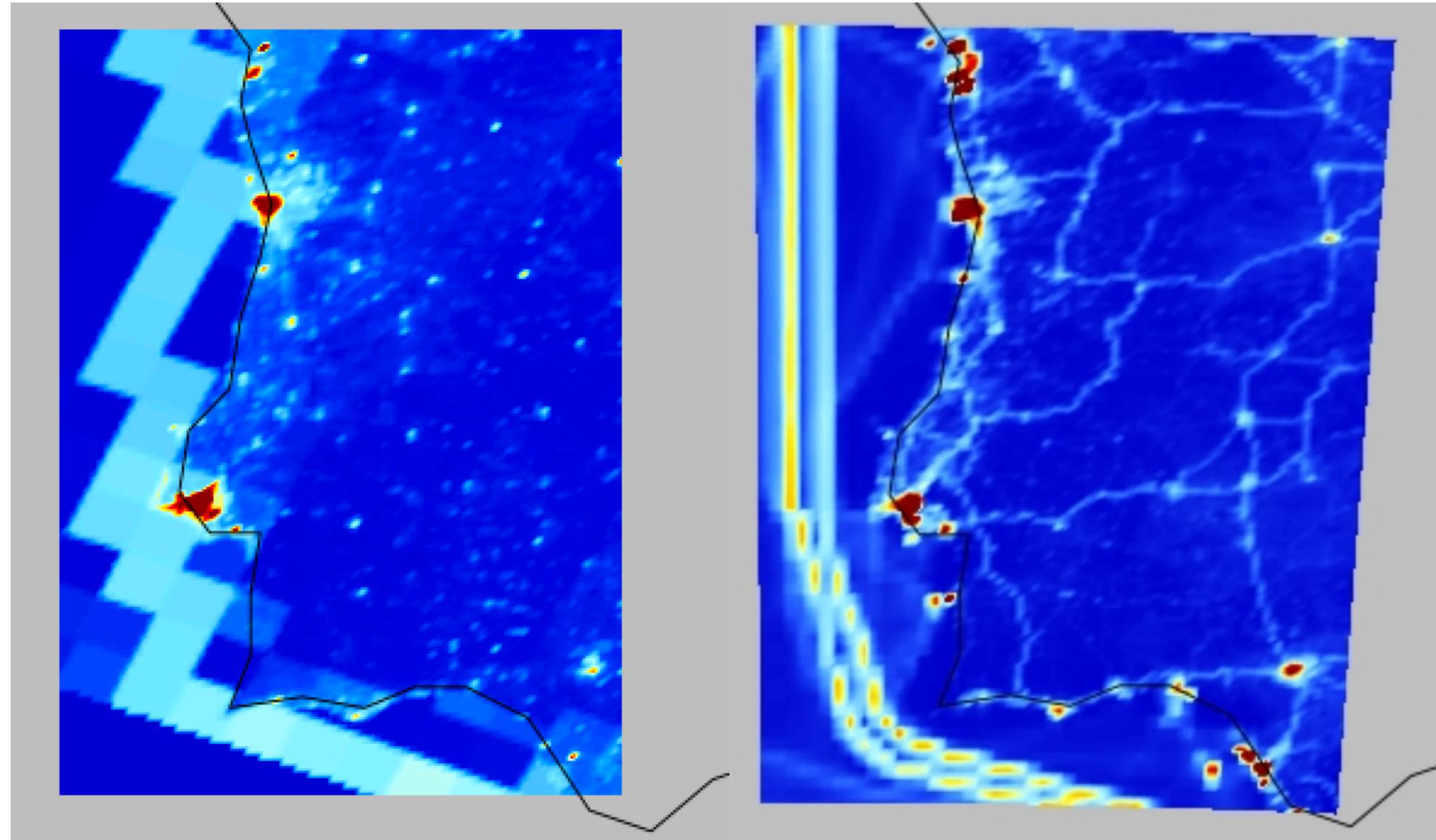- Sea-breeze circulation promotes the transport of polluted air masses from the coast to inland

conc. ozono (ug/m3) 2018080100

Forecast performance

JRC Δ DELTA Benchmarking

Forecasting PM concentrations is a great challenge!

Improving the anthropogenic emissions inventory

EMEP emission inventory

- annual total by activity sector (SNAP or GNFR)

- spatial and temporal disaggregation

  - monthly, daily & hourly profiles

  - landuse

  - spatial proxies: population; population & road

50 x 50 km² resolution

0.1° x 0.1° resolution
new proxies for spatial disaggregation

NO Emission (molecule/cm2/s)

| 1.0E+07 | 6.0E+10 | 1.2E+11 | 1.8E+11 | 2.4E+11 | 3.0E+11 |

Convention on Long-range Transboundary Air Pollution

emep

Co - operative programme for monitoring
and evaluation of the long-range
transmissions of air pollutants in Europe
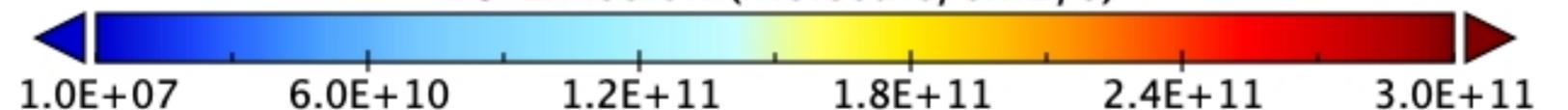
Modelling performance
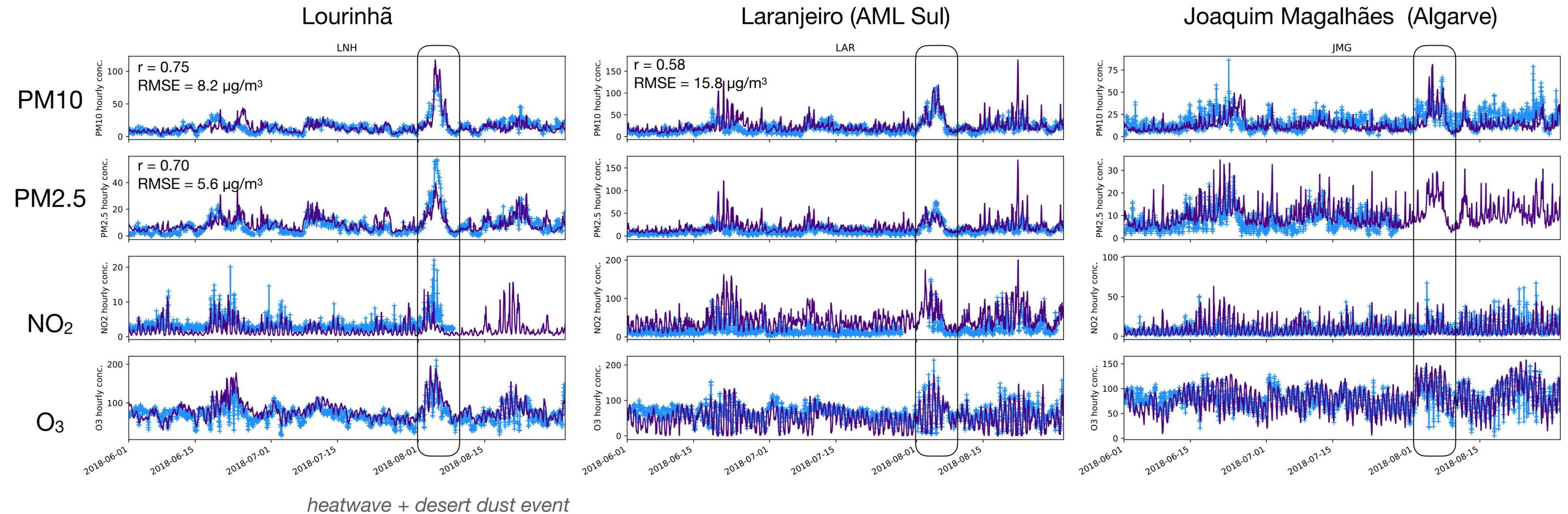
The new methodology for spatial disaggregation of anthropogenic emissions will be soon implemented in the operational air quality forecast system.

Future developments

- WIP: new website

- Consider forest fire emissions in the modelling system

- Add new domains with higher resolution (1 x 1 km^2) over the Lisboa and Porto urban areas

- Explore the online coupling possibilities between WRF and CHIMERE

PCIF/MPG/0147/2019

CIRCNA/CAC/0273/2019

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