

# Air pollution forecast in Portugal: a demand from the new air quality framework directive

A. Monteiro, C. Borrego, A. I. Miranda  
Universidade de Aveiro, Portugal

R. Vautard

Ecole Polytechnique, Palaiseau, France

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# Why air quality forecasting?

“ **COUNCIL DIRECTIVE 96/62/CE** ”

of 27 September 1996

**on ambiente air quality assessment and management**

**Article 1.º**

***Objectives***

The general aim of this Directive is to define the basic principles of a common strategy to:

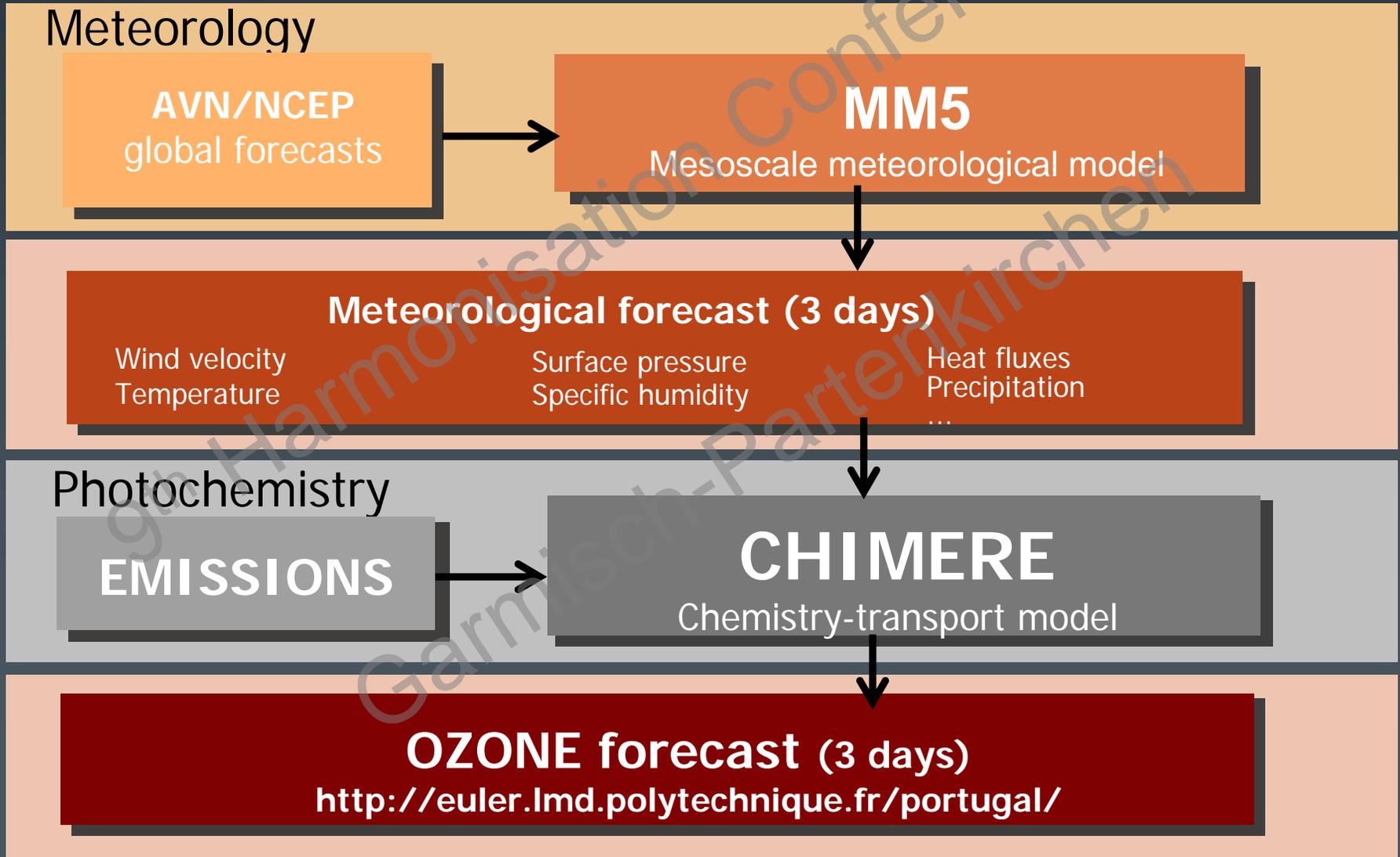
- define and establish objectives for ambient air quality in the Community designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole,
- assess the ambient air quality in Member States on the basis of common methods and criteria,
- **obtain adequate information on ambient air quality and ensure that it is made available to the public**, inter alia by means of alert thresholds,
- maintain ambient air quality where it is good and improve it in other cases.

# Why this work?

There is a **need to develop** an air quality forecasting programme for **Portugal**, like it exist in many European countries...

A **numerical system** was choosed to performed this task, and a **test application in real time** was performed last summer...

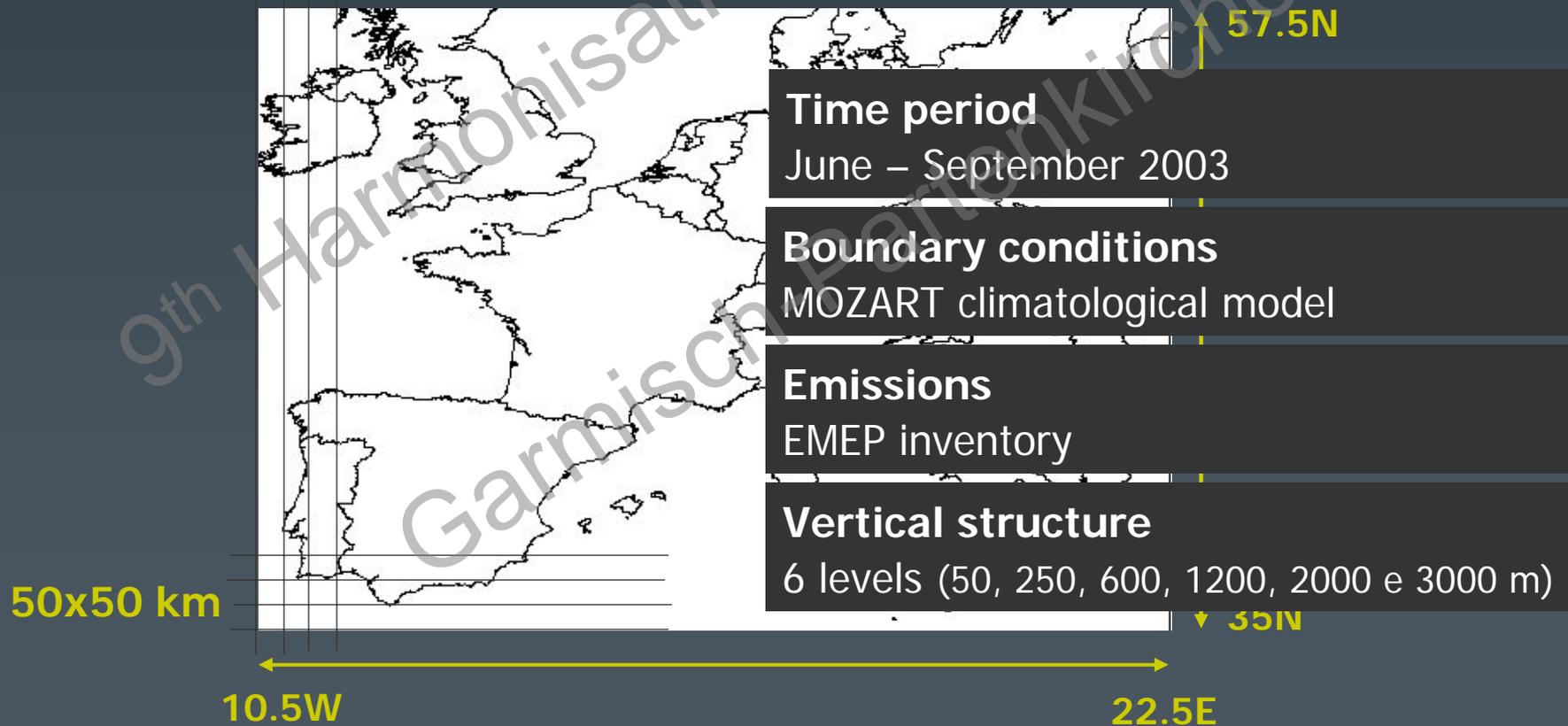
# The forecasting system



# The forecasting system application

## 1<sup>st</sup>

### continental scale run (coarse domain)



# The forecasting system application

## 2<sup>nd</sup>

nested run PORTUGAL domain

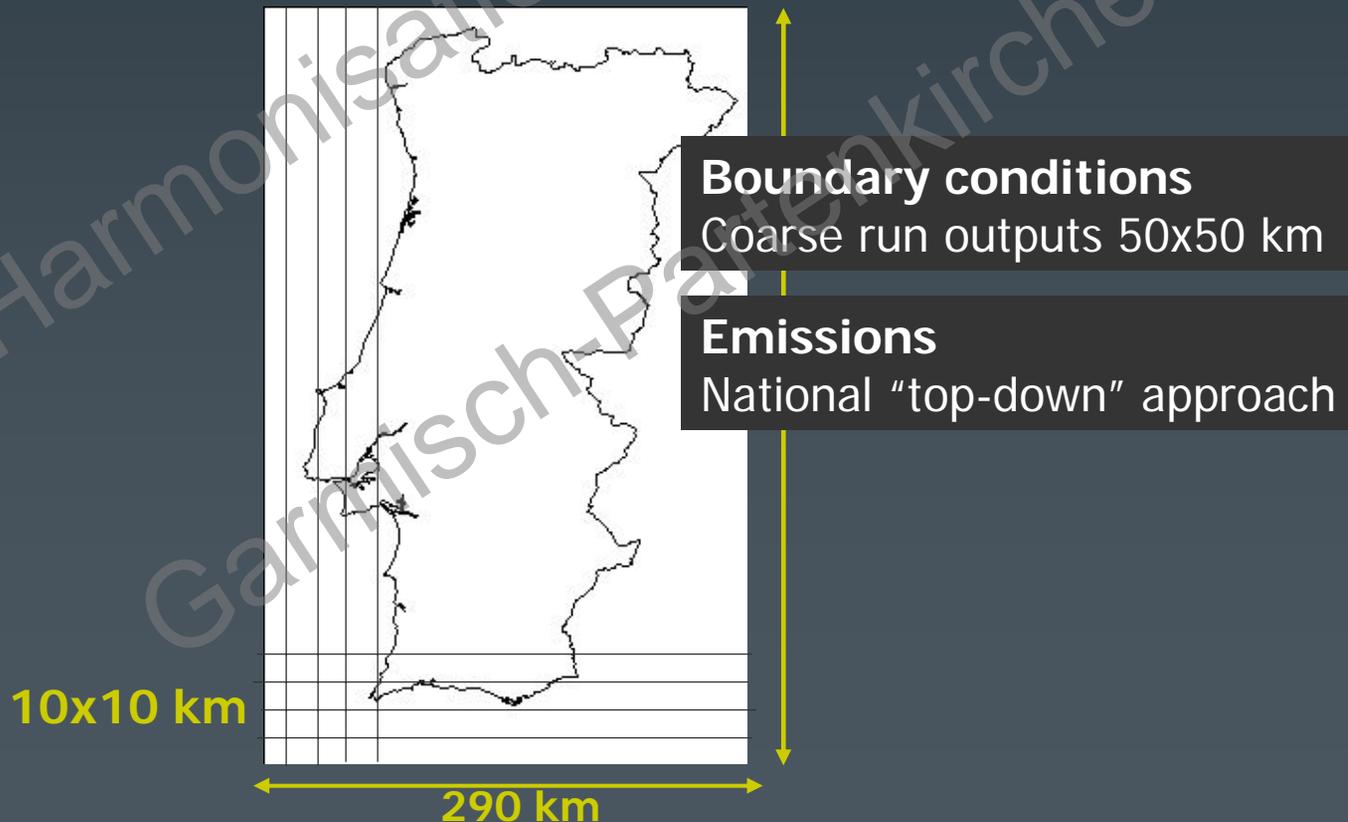


“simple one-way technique”

# The forecasting system application

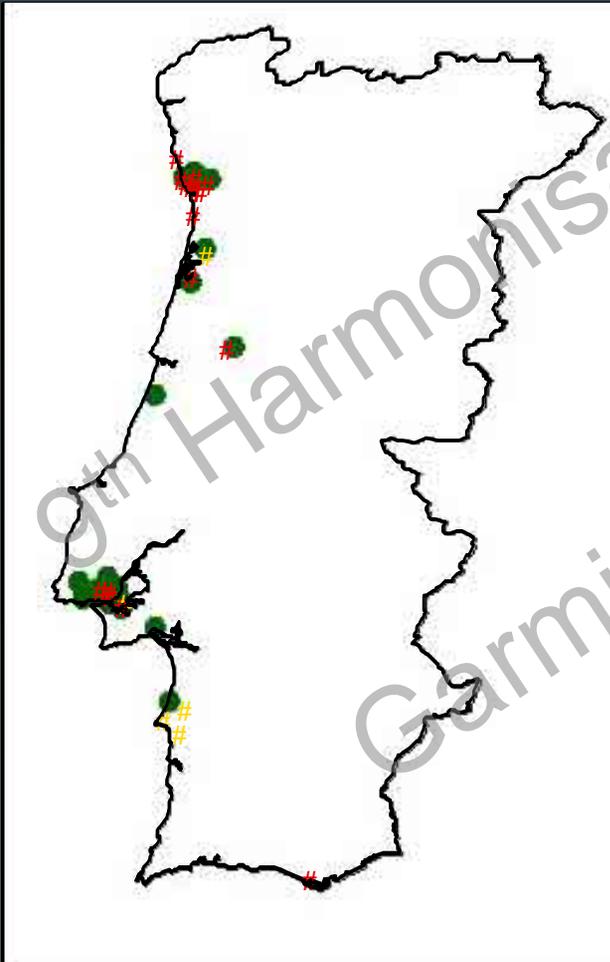
## 2<sup>nd</sup>

nested run PORTUGAL domain



# The forecasting system validation

Air Quality National network



● background stations	23
● industrial stations	5
● traffic stations	17

$\Sigma$  45

# The forecasting system validation

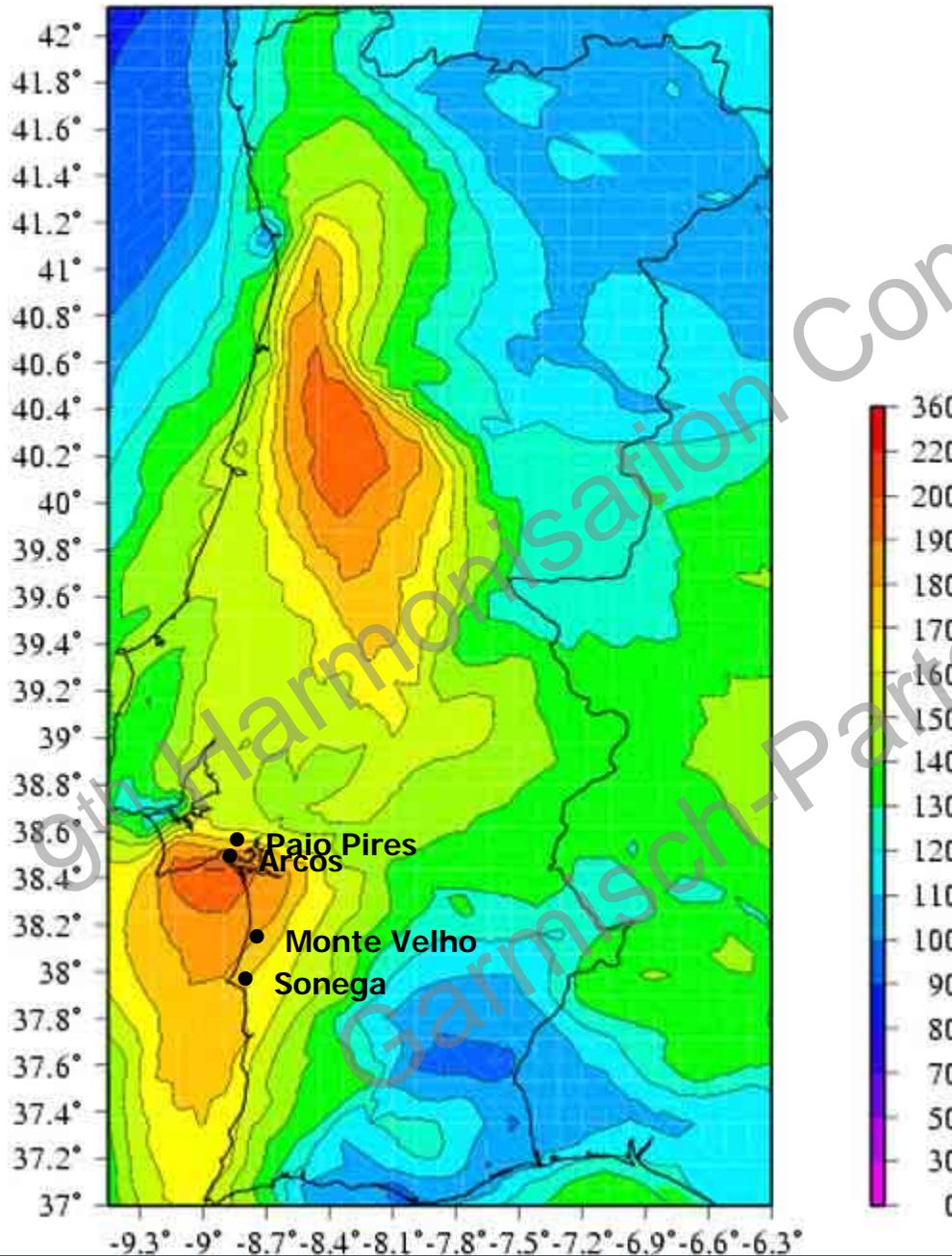
O<sub>3</sub> exceedances in 2003

	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total		
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Abr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Mai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5	0	0	7	
Jun	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	11	1	1	0	0	0	0	0	0	0	0	0	0	0	16	
Jul	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	12	39	71		
Agô	58	0	4	3	0	16	28	28	7	11	14	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	172		
Set	0	0	0	0	0	0	0	0	0	0	1	0	4	6	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	
Out	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Nov																																	0	
Dez																																		0

Source: Instituto do Ambiente 2003

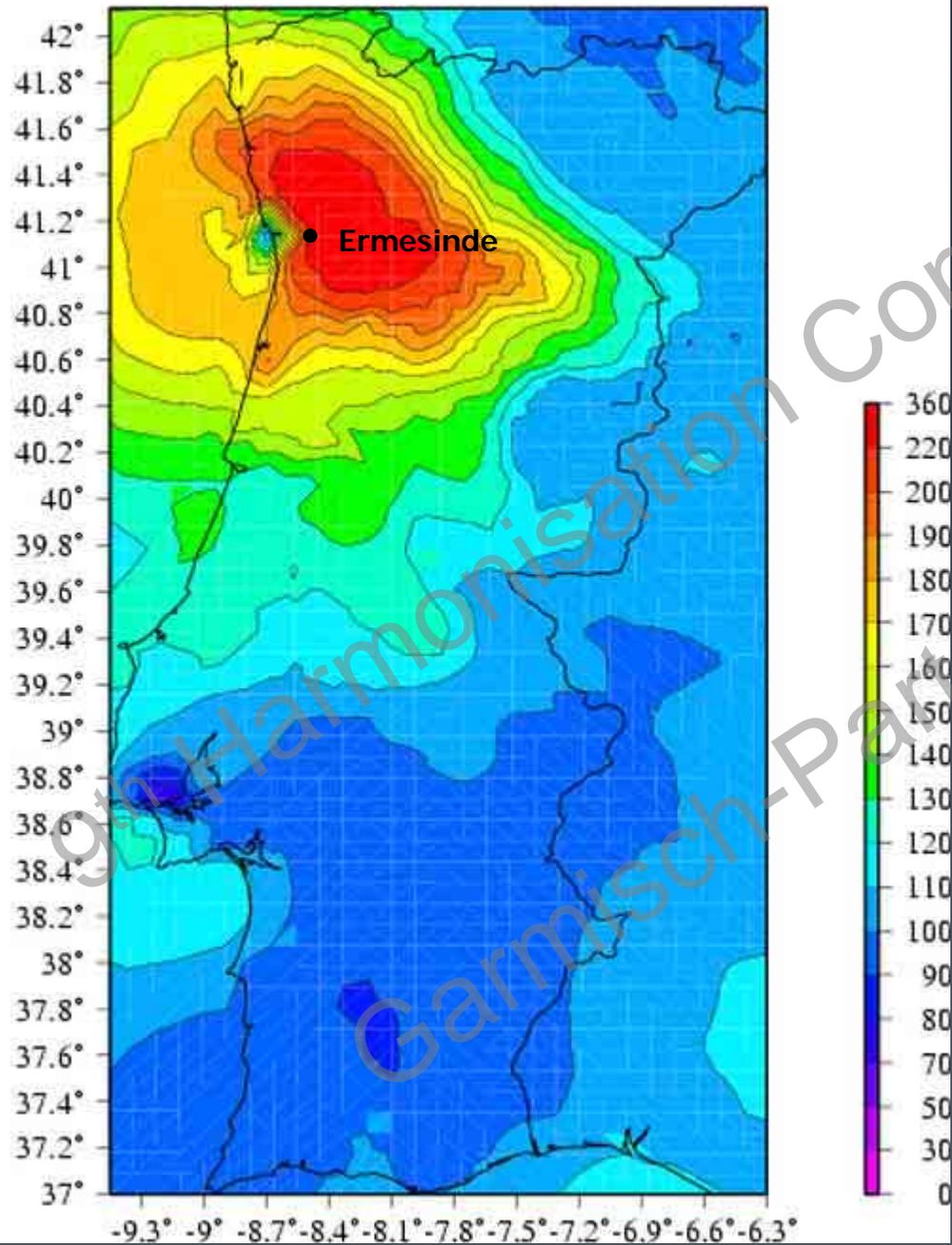
Forest fires

# Ozone Peak Surface D+0 Fcst Issued 20030730



STATION	O <sub>3</sub> µg.m <sup>-3</sup>
Paio Pires	187,0
Paio Pires	183,5
Arcos	195,0
Arcos	207,5
Arcos	194,5
Chamusca	203,8
Chamusca	225,4
Chamusca	205,7
Monte Velho	182,5
Monte Velho	180,5
Sonega	192,3

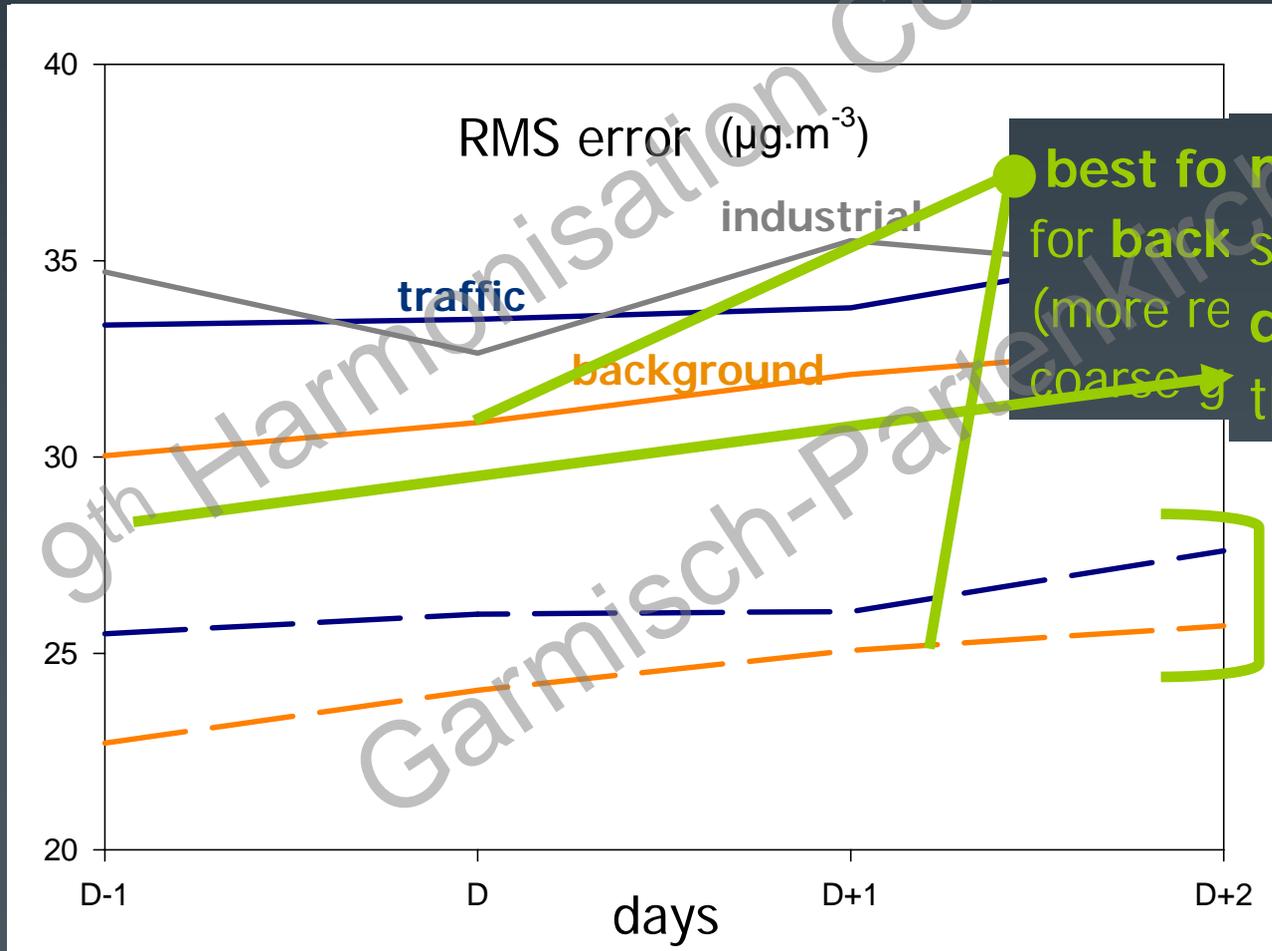
# Ozone Peak Surface D+0 Fcst Issued 20030621



Station	O <sub>3</sub> µg/m <sup>3</sup>
Ermesinde	188,1

# The forecasting system validation

## Daily peak ozone forecast



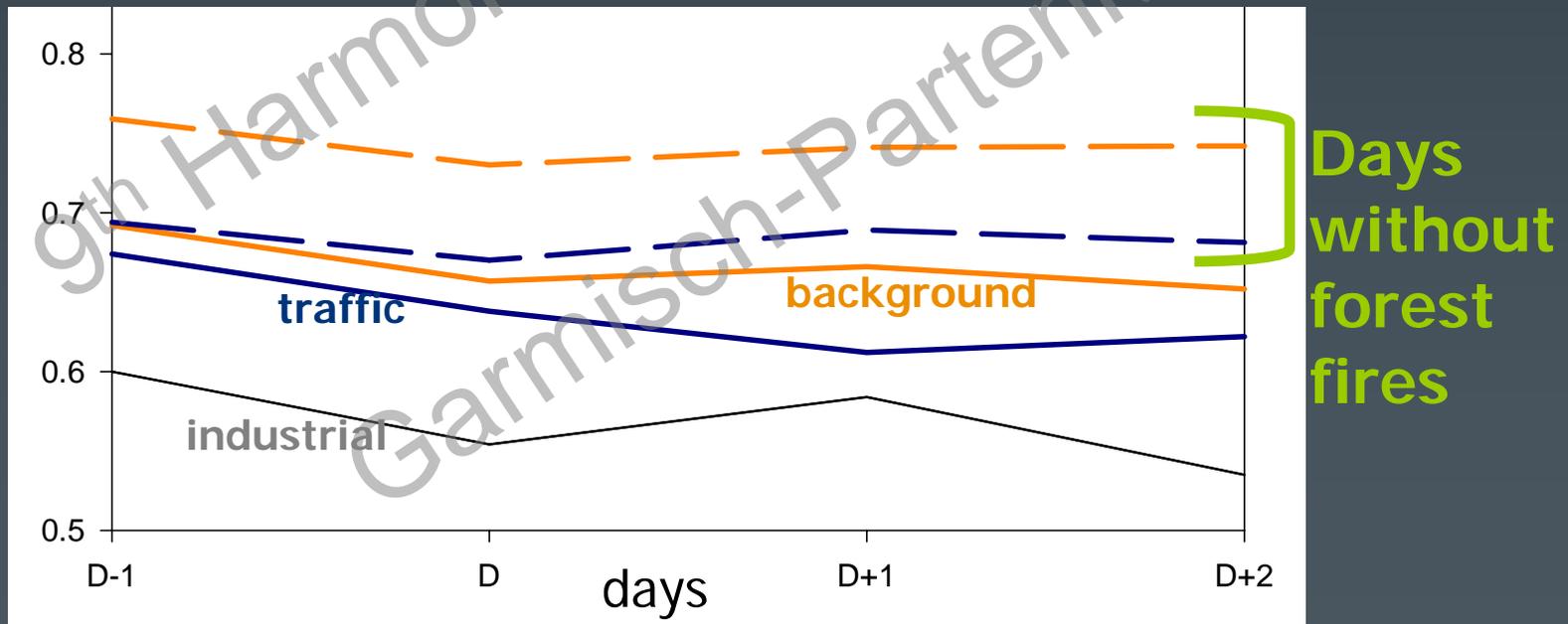
best fo model skill  
for back slightly  
(more re decreases with  
coarse → the lead time

days  
without  
forest  
fires

# The forecasting system validation

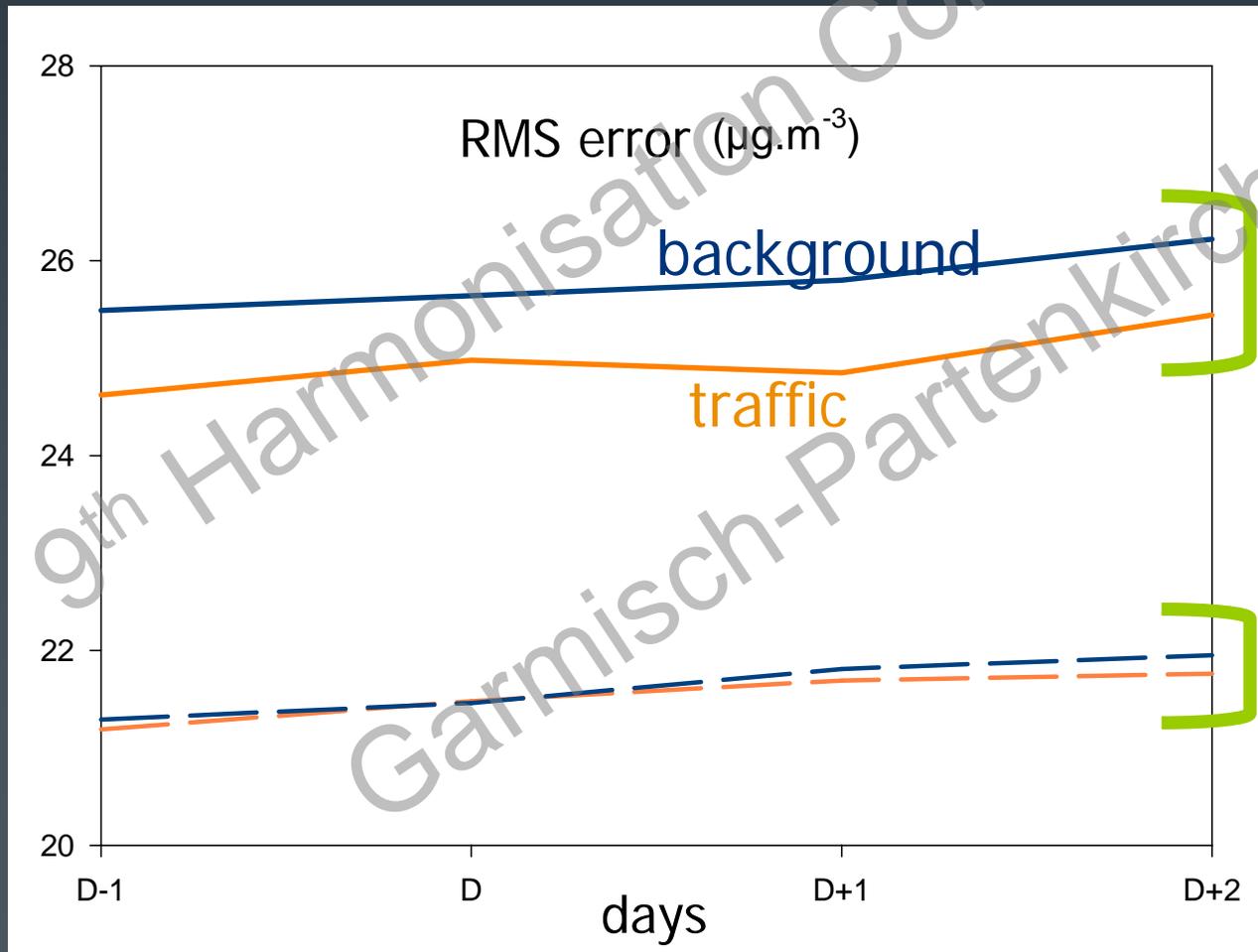
## Daily peak ozone forecast

Skill scores clearly **improve** when the **forest fire days** are excluded of the statistical analysis, indicating that **unaccounted sources** due to these fires may be responsible for unskilful forecasts.



# The forecasting system validation

1-h and 8-h averages forecast



1h averages

8h averages

# The forecasting system validation

## Thresholds exceedance forecast

8h average target

as measured by correct forecast

more correctly forecast

forecasted

	180 $\mu\text{g}\cdot\text{m}^{-3}$ (1h)				240 $\mu\text{g}\cdot\text{m}^{-3}$ (1h)				120 $\mu\text{g}\cdot\text{m}^{-3}$ (8h)			
	D-1	D+0	D+1	D+2	D-1	D+0	D+1	D+2	D-1	D+0	D+1	D+2
Successful forecast exceedances	24	19	10	7	0	0	0	0	604	576	455	449
False alarms	17	39	36	33	0	0	2	2	120	145	188	174
Non predicted events	21	35	45	48	1	1	1	1	414	442	563	569

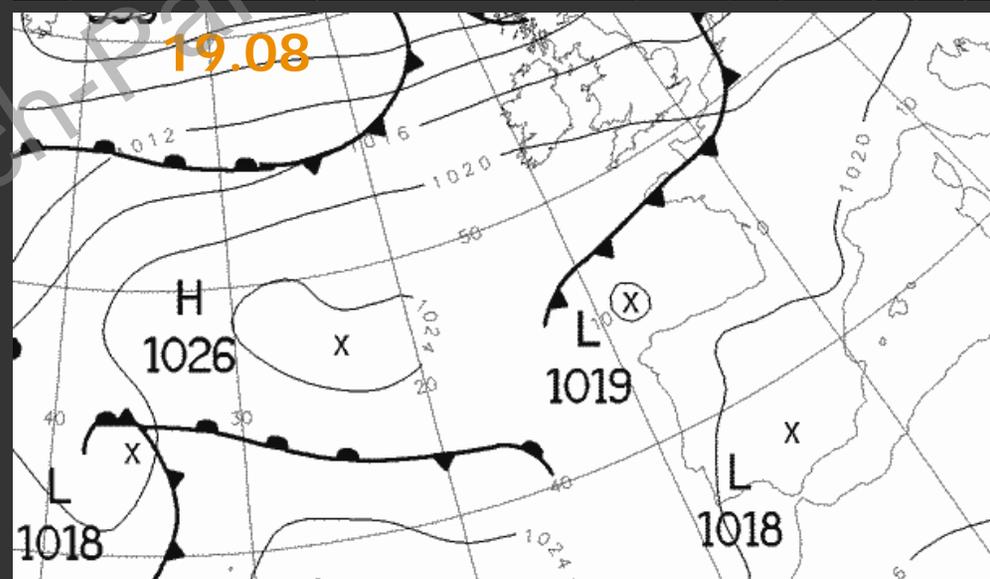
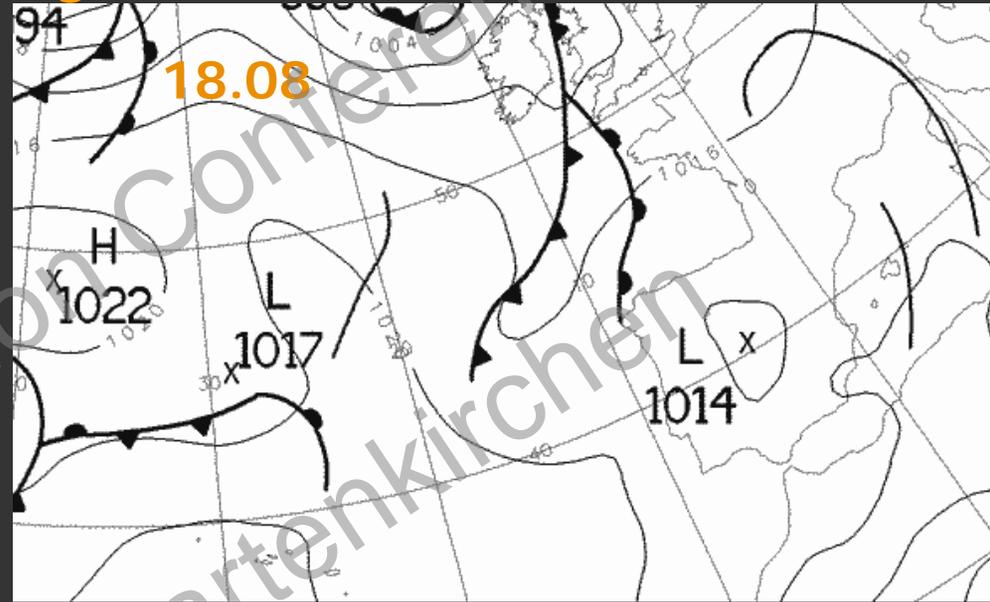
(days with forest fires were omitted)

# The forecasting system validation

Days with higher errors  
18-20 august

~~Transboundary  
pollution effects?~~

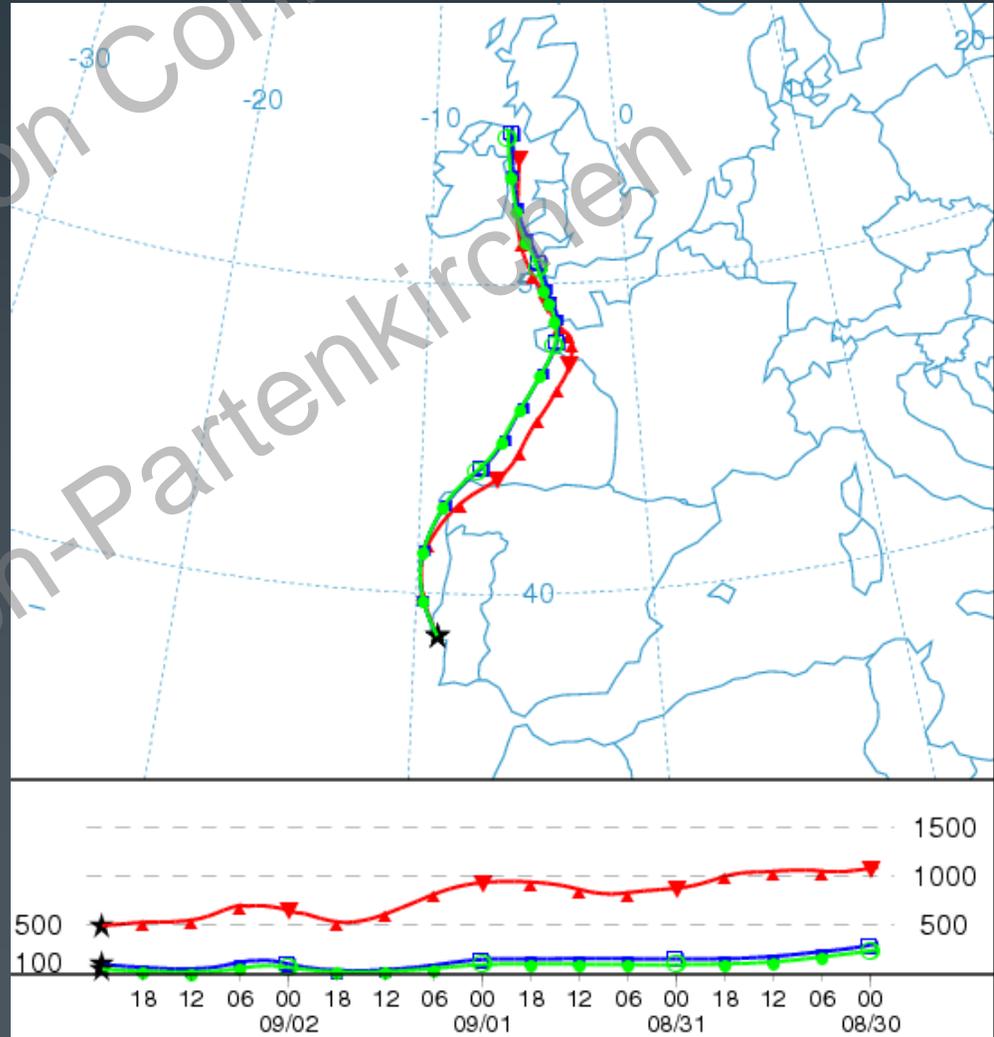
Meteorological effects?  
Thermal depression could  
not be correctly simulated  
by the model



# The forecasting system validation

Days with higher errors  
01-02 september

Transboundary  
pollution effects?



# Final remarks

Besides the model properly represents the physical, meteorological and chemical processes, which makes this **reliable tool for helping operational forecasters...**

the results of this validation exercise calls for **improving the forecasting system** in several aspects such as the **model grid resolution, industrial area emissions** estimation, **background ozone** prediction...