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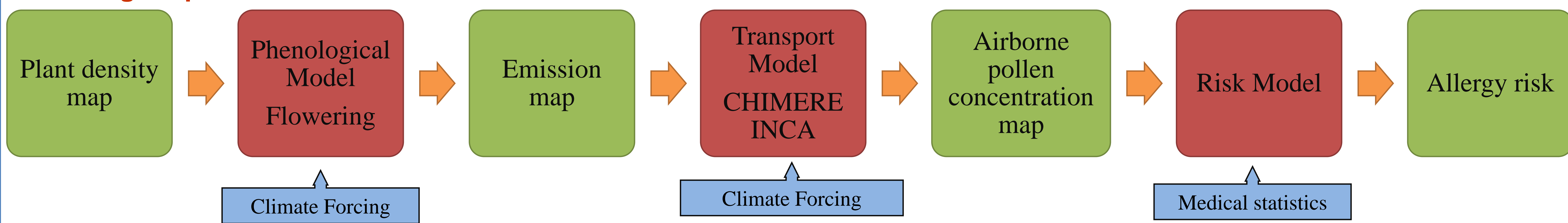
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Introduction

Pollen is a major source of allergy that has rapidly increased in that past decades. The project aims to develop an integrated modelling platform able to simulate allergenic risks from climate conditions. The objective is double: 1/ develop an early warning system to be integrated air quality forecast system (eg. Prev'air) 2/ Evaluate impact of climate change of allergy risk. The project will be achieved in three phases. First one will be to define a model to simulate the pollen source, second one will be to implement pollen transport and deposition in an atmospheric chemistry model (CHIMERE). Last step will be to rely simulated pollen concentration to medical risk

Modeling Steps

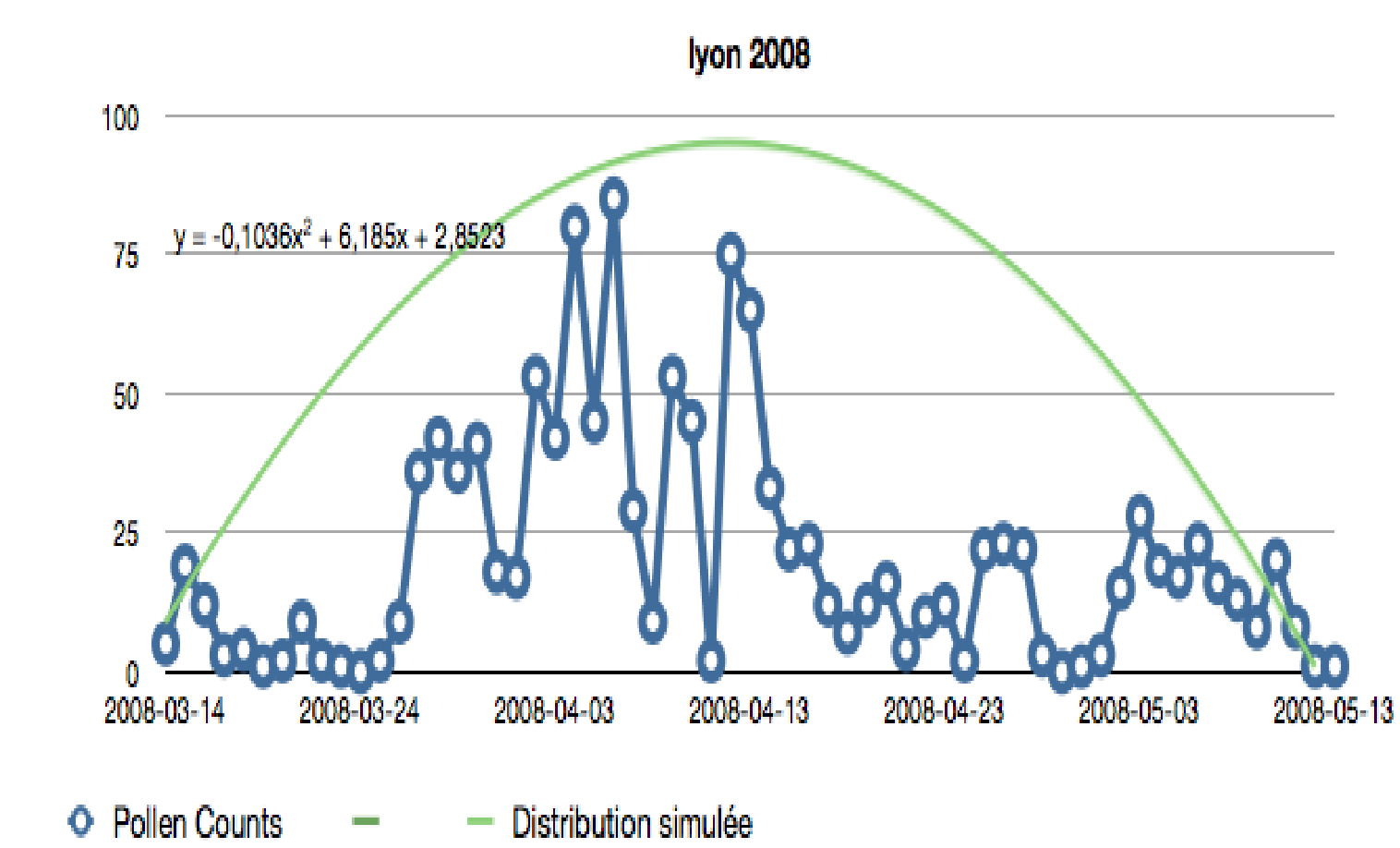


1- phenological model : Birch

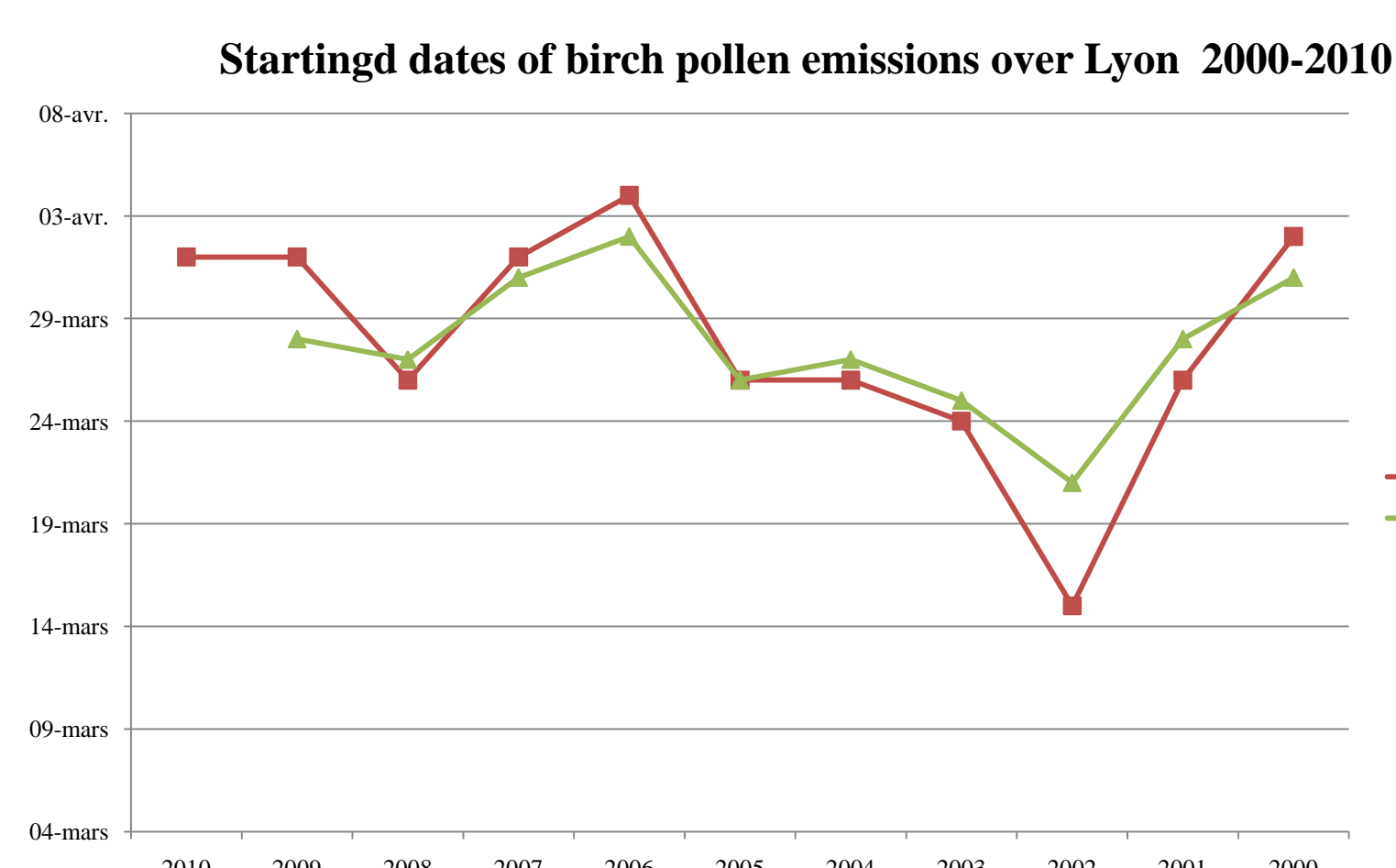
For period of flowering we used the phenological model defined by Chuine et al. 99 This model is able to define beginning, max and end of flowering as function of cumulative temperature. 3 calibration attempts were carried with 3 different approaches

- Using the same equation applied on all the selected stations within the 2003-2006 period and validation using the 2007 data
- Using Different equations according to the local climat within the the 2003-2006 period and validation using the 2007 data
- Using different equations applied to the 2003_2007 period but leaving some stations out for cross validation

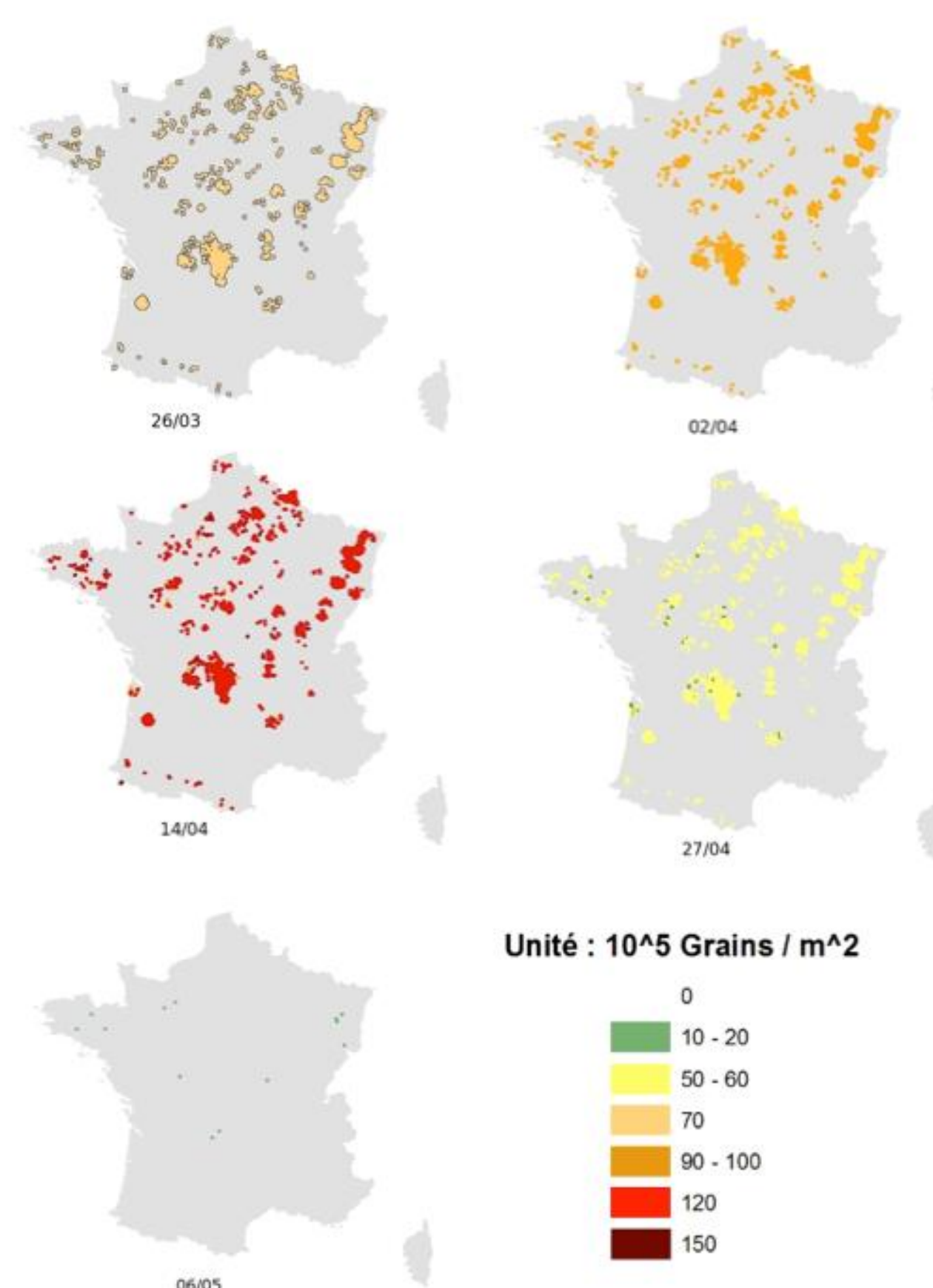
The best response in the phenological model defined by Chuine et al, 1999 was obtained from 1 phase model, this kind of model consider what happens during the quiescence phase only (after dormancy break). GDD model (sum of degrees days) and Normal response to temperature are the best fit to the data we used.



Comparison to Lyon Station



Inter-annual variability



Emission maps

As shown in this figure our calibration tend to over-estimate flowering start of birch pollen but the inter-annual variability was well described. Using Birch density map, phenological simulation and an empirical estimation of pollen flux, a series of « first guess » emission maps were produced.

Conclusion et perspectives :

Next steps :

- Pollen concentration mapping by merging fluxes maps and CHIMERE transport.
- Comparison with RNA stations
- Re-calibration of pollen fluxes using transport « inversion »

Perspectives:

- Other allergenic species :
- May be done without difficulties for trees
 - more complex for herbaceous
 - Dynamic yearly change of extent
 - Phenology is dependant of the landuse

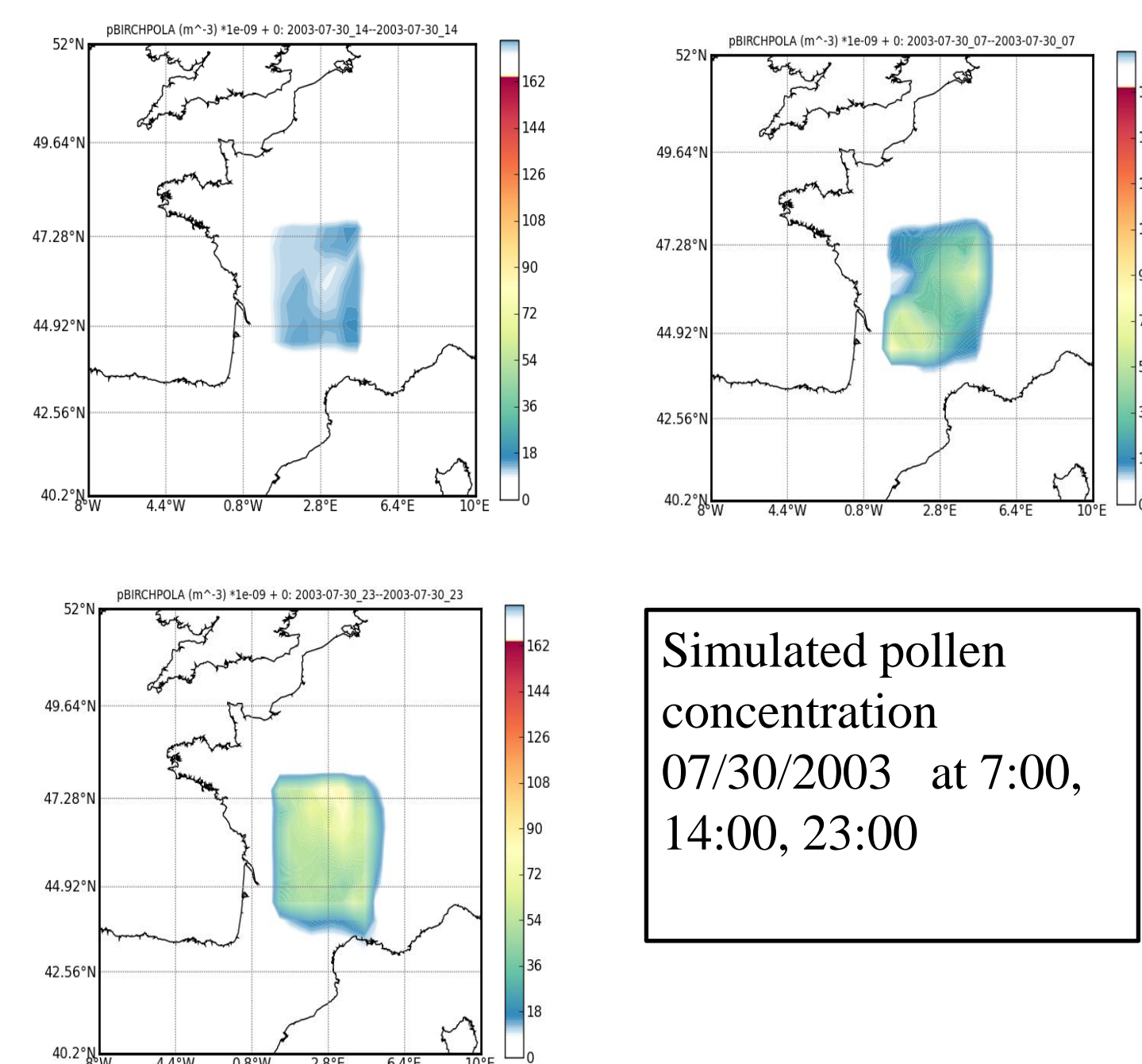
For the medical part the last part of the project will focus more on comparison of concentrations maps with large sample medical available over France.

2- Parametrisation in CHIMERE:

- Pollen deposition:
 - Increase of the dimension spectrum
 - Change in density
- Resuspension: as a function of wind speed and relative humidity (Helbig et al. 2004).
- Viability of pollen function of age and radiation

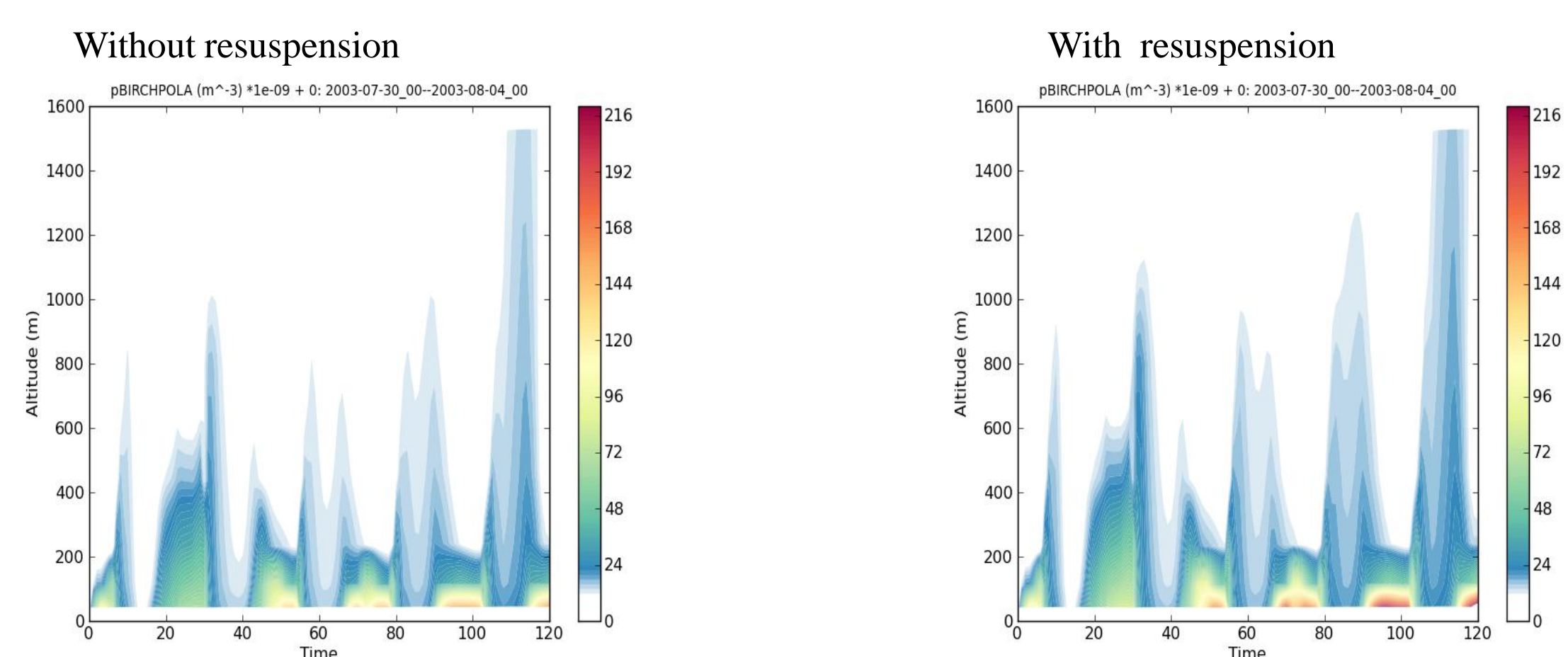
example on an idealized case :

- Constant emission of 10^5 grains cm^{-2}
- 2 contrasted climate condition
 - July 2009: very wet
 - August 2003: heatwave



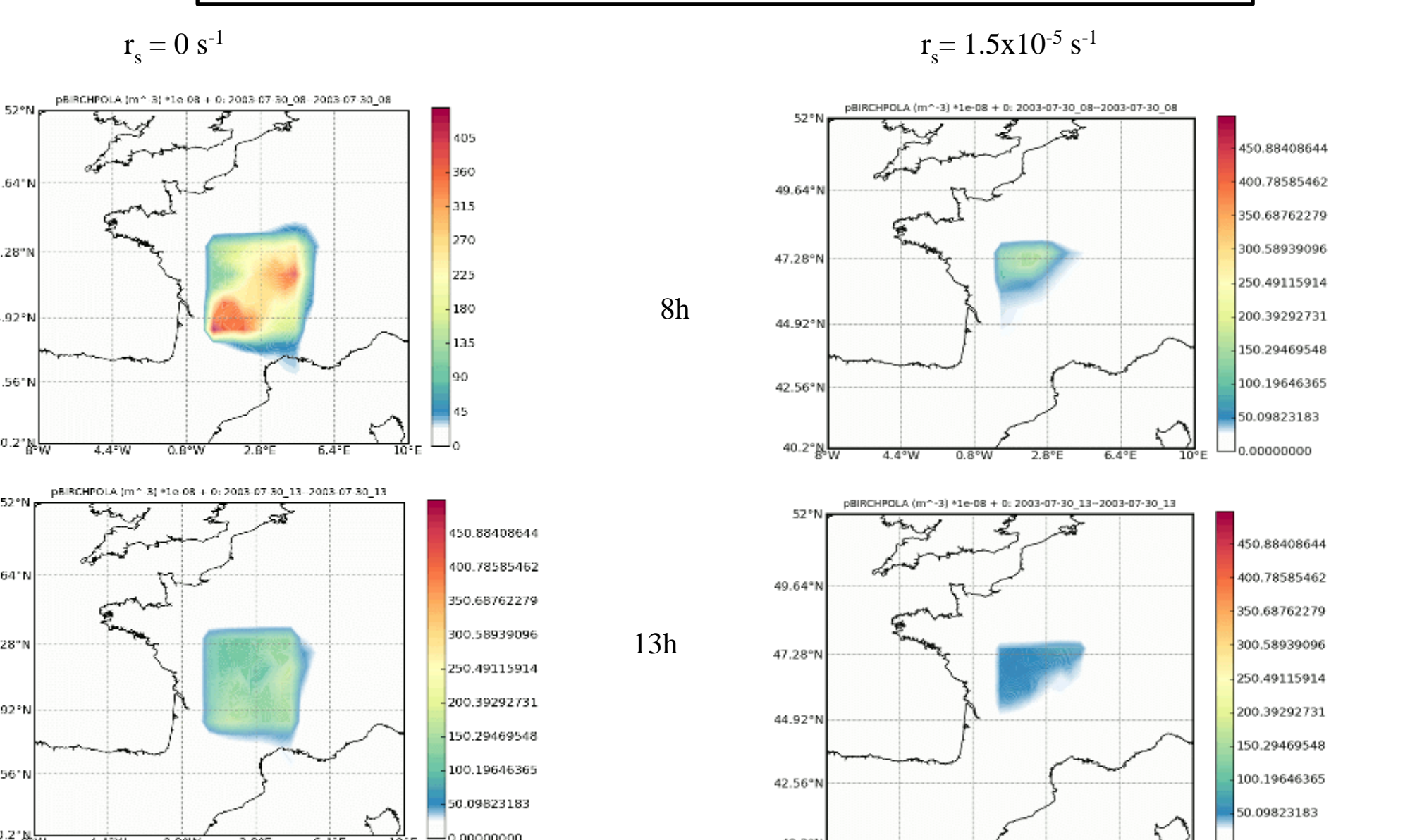
Simulated pollen concentration 07/30/2003 at 7:00, 14:00, 23:00

Vertical profile of pollen concentration in 3°E 46°N



→ Resuspension tend to increase pollen concentrations

Viability: r_s effect (summer 2003)



References :

Phenology Modelling Platform PMP 3.3.1 by Chuine Isabelle CEFE-CNRS
Helbig, N., B. Vogel, H. Vogel, F. Fiedler (2004) Numerical Modelling of Pollen Dispersion on the Regional Scale Aerobiologia 3, 3-19,

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