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Analysis of *Quercus* long-term pollen season trends in the southwest of the Iberian Peninsula

Santiago Fernández Rodríguez [1]
Pablo Durán Barroso [1]
Rafael Tormo Molina [2]
José María Maya Manzano [2]
Miguel Candel Pérez [1]
Ángela Gonzalo Garijo [3]
Inmaculada Silva Palacios [4]

[1] Department of Construction, Polytechnic School, University of Extremadura. Cáceres, Spain
[2] Department of Plant Biology, Ecology and Earth Sciences, Faculty of Science, University of Extremadura. Badajoz, Spain
[3] Section of Allergology, Hospital Infanta Cristina. Badajoz, Spain
[4] Department of Applied Physics, Engineering Agricultural School, University of Extremadura. Badajoz. Spain

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Purpose

Possible impact of global warming on *Quercus* phenology is discussed taking into account:

- the great ecological and economical importance in the Mediterranean area

In Extremadura are the most important mediterranean forests, “dehesas” (Quercus, main tree genera)

Quercus genera are anemophilous species (wind pollinated)





Purpose

Traditionally, correlation and regression analyses statistical techniques has been employed to study pollen-season trends

Parametric model, been calibrated with the Shuffle Complex Evolution Metropolis Algorithm (SCEM-UA) using as optimization function the Root Mean Square Error (RMSE)

Main objective: to model *Quercus* pollen concentration (CQ) with five different meteorological variables for 21 years (t)

Design, Methodology or Approach

Daily concentration of airborne pollen concentration were obtained with Hirst type pollen trap at the roof of a building at the University of Extremadura in Badajoz (SW Spain)

Data were provided in daily pollen grains concentration for cubic meter. *Quercus* data from the period 1993-2013 were compared using time series analysis

Design, Methodology or Approach

Meteorological parameters:

- rainfall (R)
- relative humidity (RH)
- maximum (Tmax), mean (Tmean) and minimum temperature (Tmin)

To achieve the best fit it has been selected 5 years uniform correlative for 4 years period analyzing separately the data from the main pollen seson (PS, 5-95%):

- 1993-1998, 1999-2003, 2004-2008 and 2009-2013

Results/Findings

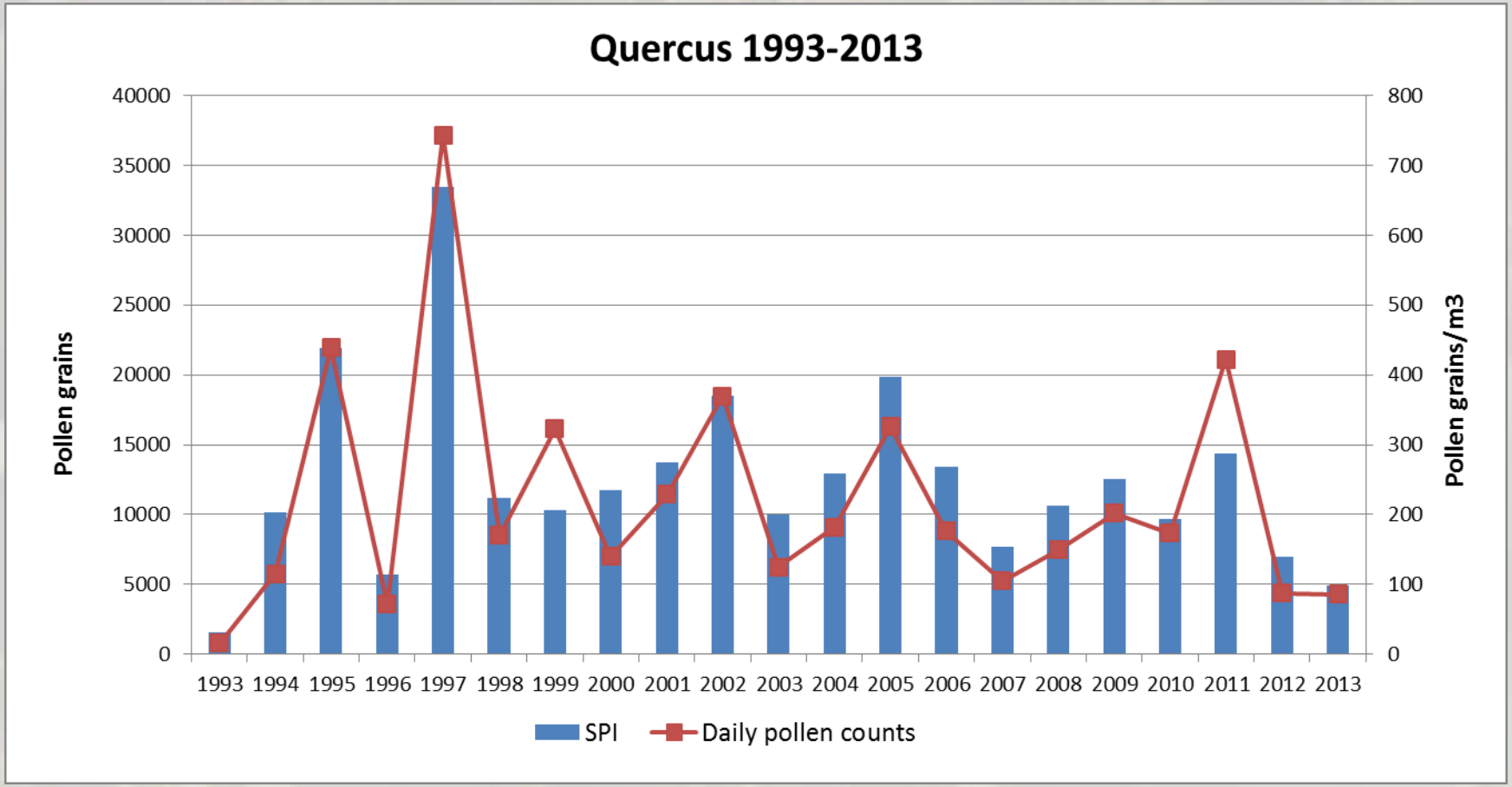
Quercus main pollen season lasted on average 60 days, ranging from 31 to 85 days, from 28th March to 27th May

Model proposed to forecast the airborne pollen concentration is described by the eq. (1)

$$CQ^t = a \cdot \frac{\sum_{i=t-10}^{i=t} CQ^i}{10} + CQ^{t+1} \left(b \cdot {T_{max}}^t + c \cdot {T_{mean}}^t + d \cdot {T_{min}}^t + e \cdot \frac{\sum_{i=t-10}^{i=t} {T_{mean}}^t}{10} + f \cdot R^t + g \cdot \sum_{i=t-10}^{i=t} R^t + h \cdot RH^t \right) \quad (1)$$

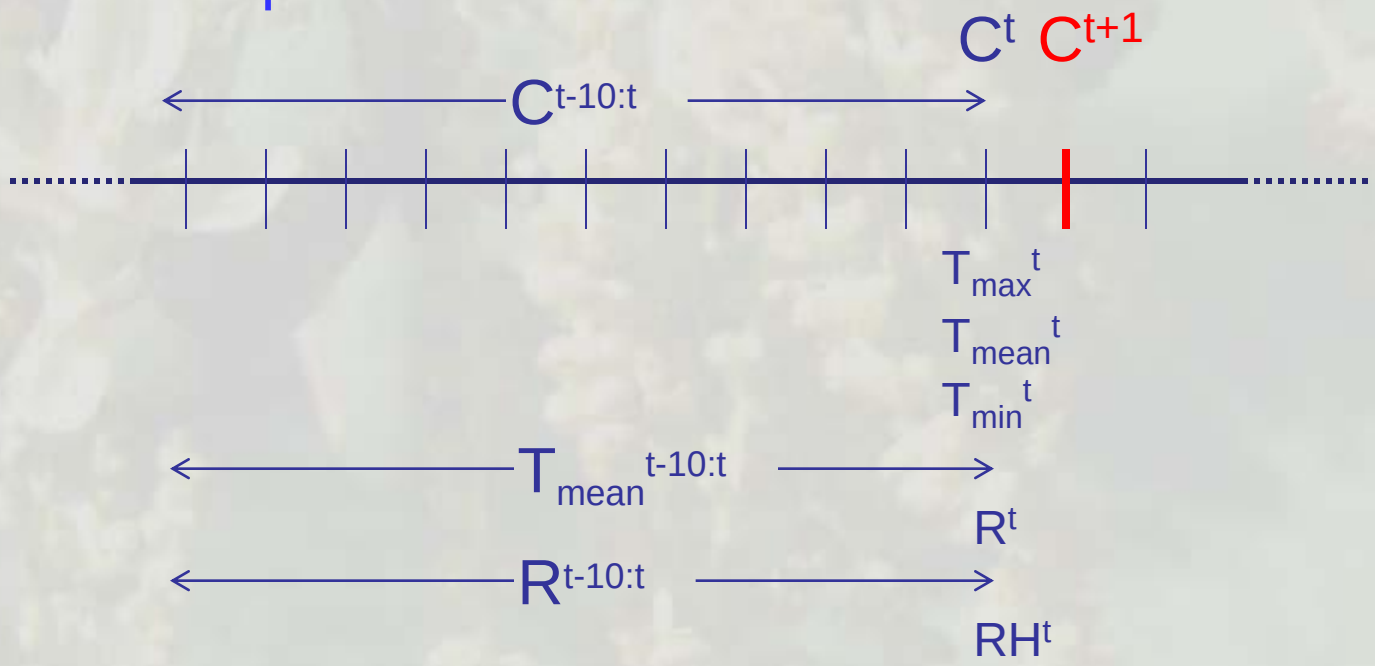
Where a, b, c, d, e, f, g and h: coefficients to be calibrated for our time series of meteorological and airborne pollen concentration

Results/Findings



Results/Findings

Beside the value of each variable is evaluated for each time step, it has been added the aggregated variables of the mean temperature for 10 previous days as well as the cumulative rainfall of the 10 previous days to analysis the influence of the temporal variation of these variables over the airborne pollen concentration



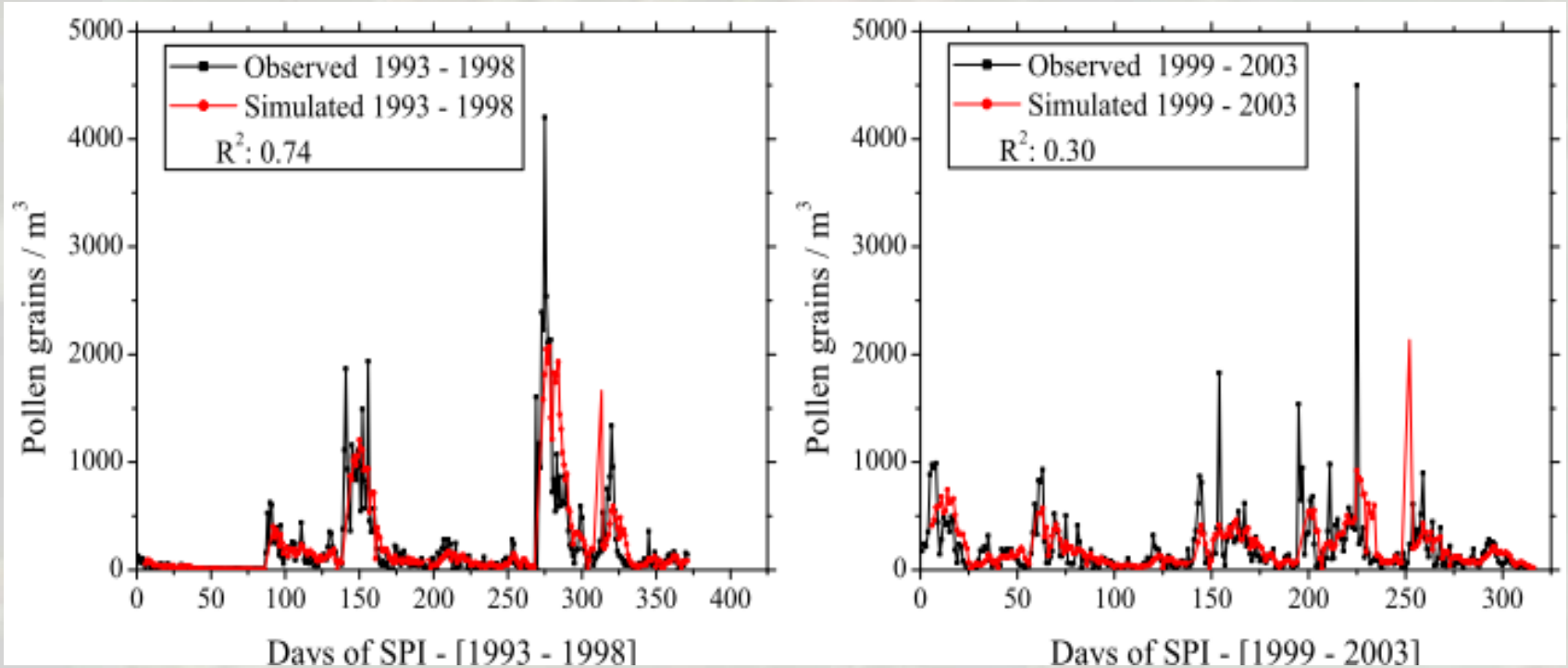
Results/Findings

Beside the value of each variable is evaluated for each time step, it has been added the aggregated variables of the mean temperature for 10 previous days as well as the cumulative rainfall of the 10 previous days to analysis the influence of the temporal variation of these variables over the airborne pollen concentration

Regardless the degree of influence of some meteorological variables could be previously neglected by its apparently low relevance, it has been therefore considered appropriate to maintain them due the range of variations of are different among them as well as its mean value

Results/Findings

Comparison between observed and simulated pollen grains/m^3 of the SPI for the period 1993-2013 join to the coefficient of determination R^2



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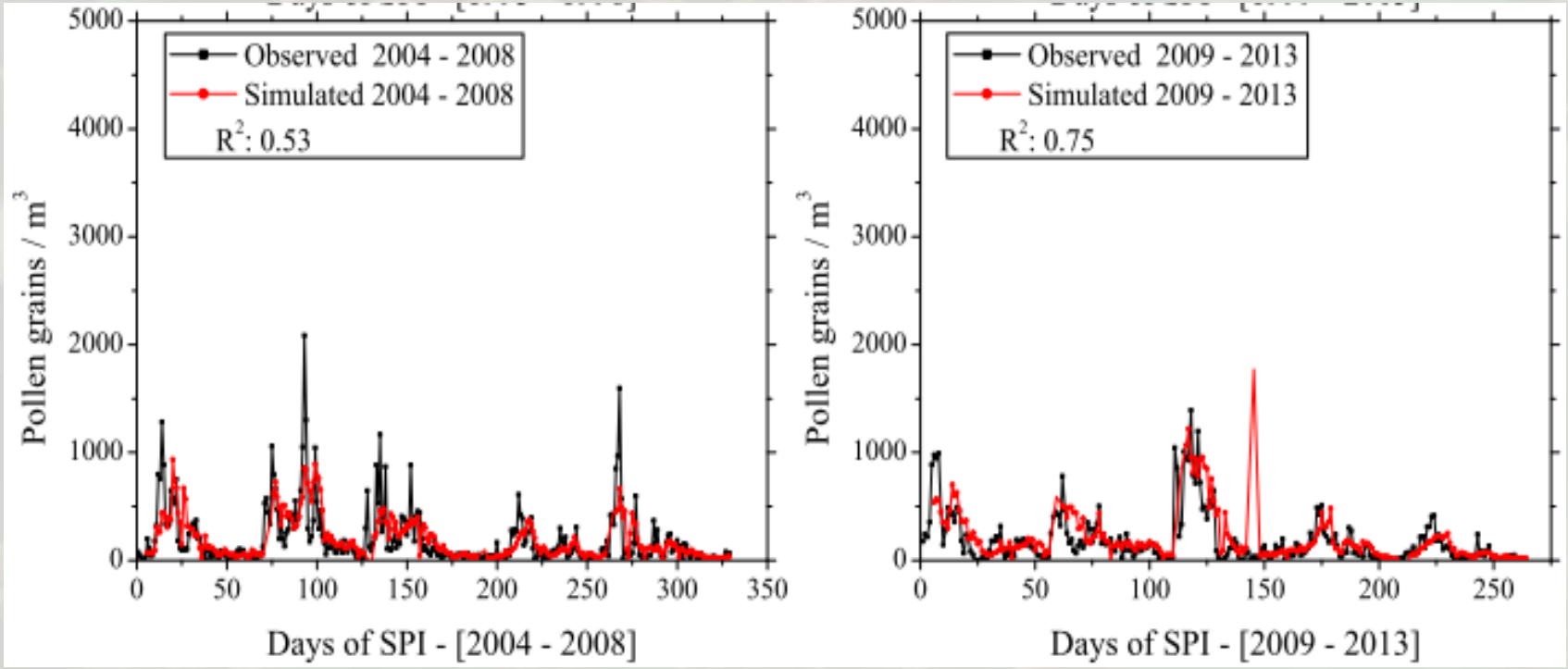

Conclusions

The temporal distribution of the *Quercus* pollen season lasted two months, with higher variations among years

Using long-term pollen trends, it has been developed an autoregressive parametric model to analyze the fitting degree for different 5-year partial time series

It could be appreciated that despite the global fit of the model is quite accurate (R^2=0,58), this value is not constant for different partial time series due likely to the influence of meteorological variables

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Thank you very much for your attention

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