Study of the correlation between precipitation indices and airborne pollen in the NE of the Iberian Peninsula

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As well as, among the meteorological variables, temperature is the one that shows the most positive correlation with airborne pollen concentration, for precipitation this relationship is not so clear due to its twofold impact: on the one hand rainfall preceding pollination has a positive influence in pollen production; on the other hand rainfall during pollination contributes to the pollen removal from the air by a wash-out effect [1]. In order to explore this impact more accurately, correlations between pollen parameters registered in six aerobiological stations in the NE of the Iberian Peninsula and several precipitation indices have been calculated. These indices are part of a set of descriptive indicators proposed by the Expert Team on Climate Change Detection and Indices (ETCCDI) of the World Meteorological Organization to characterize weather and climate extremes.

Fig. 1: Location of the aerobiological stations
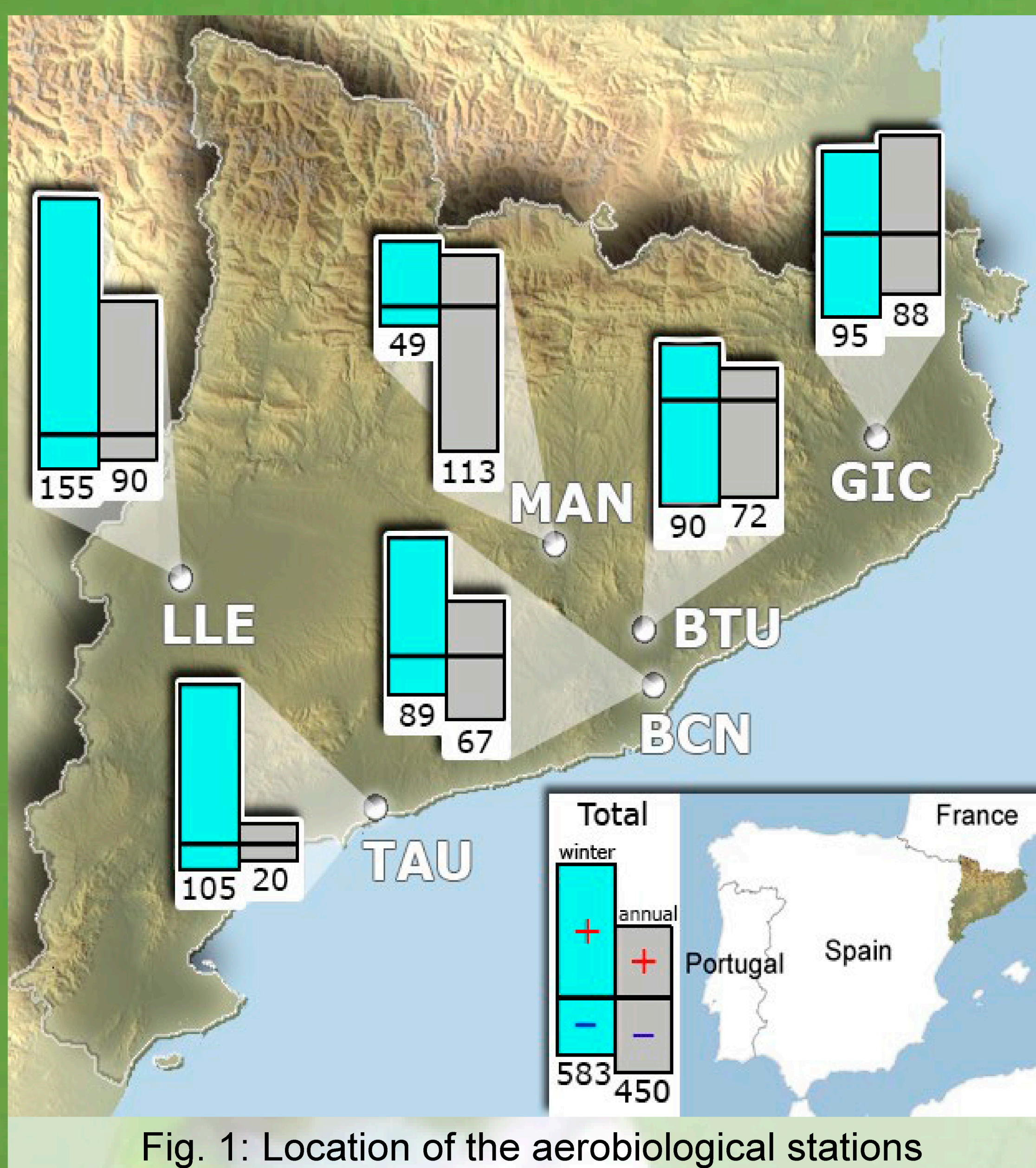
Methodology

Spearman correlations between the pollen parameters of 27 pollen taxa from six aerobiological stations located in the littoral, pre-littoral and central areas of Catalonia (figure 1) and the annual and winter precipitation ETCCDI

ETCCDI	
RX1day	Maximum daily rainfall amount
RX5day	Maximum rainfall amount in five consecutive days
SDII	Ratio of total rainfall to the number of wet days (≥1 mm)
R10mm	Number of days with rainfall greater than 10 mm
R20mm	Number of days with rainfall greater than 20 mm
R50mm	Number of days with rainfall greater than 50 mm
CDD	Maximum number of consecutive dry days (<1 mm)
CWD	Maximum number of consecutive wet days (≥1 mm)
R95p	Total rainfall from days exceeding the 95th percentile
R99p	Total rainfall from days exceeding the 99th percentile
PRCPTOT	Total wet-day precipitation

Pollen parameters:

Annual Pollen Integral (**APIn**)
Seasonal Pollen Integral (**SPIn**)

Days with pollen
Maximum daily concentration (**Max**)
Date of the Max (**Peak**)
Start date of the Main Pollen Season
**End** date of the Main Pollen Season
Main Pollen Season **Length**

Main Pollen Season (MPS): temporal interval between 2.5% and 97.5% of the APIn

Results

❖ For **winter** rainfall a **5.6%** of the possible correlations are significant (9.2% at Lleida), while there is only a 3.6% for **annual** rainfall.
❖ The number of **winter** significant correlations at Tarragona is six times the number of annual ones, being twice at Lleida and Bellaterra.
❖ For **winter** rainfall positive correlations are approximately twice than negative ones while this ratio is near to 1 for annual rainfall.
At the coastal and central areas (Barcelona, Tarragona, Lleida and Manresa) this proportion is 70% / 30%,
while remains 50% / 50% for the pre-littoral area (Bellaterra and Girona).
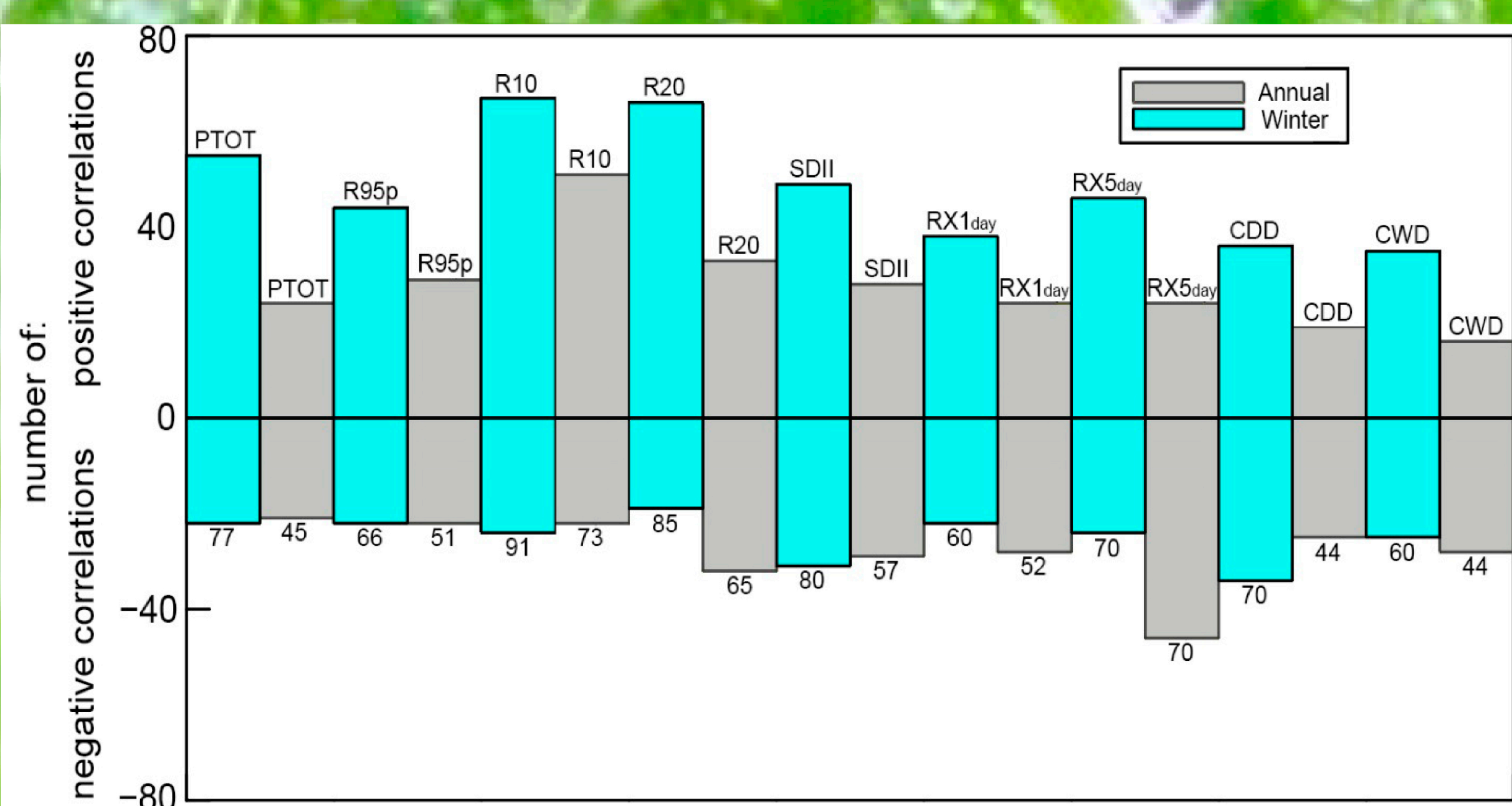
R10mm and **R20**mm are the precipitation indices with a higher percentage of significant correlations and with the largest positive/negative ratio.

When **CDD** increases **APIn**, **SPIn**, and **Max** decrease and pollination begins later.

As winter rainfall increases:
❖ **APIN**, **SPIn** and **Days with Pollen** increase (for 5 of the 6 stations)
❖ the **MPS** starts earlier (for 4 of the 6 stations)
❖ the **Peak day** occurs also earlier (for 3 of the 6 stations)
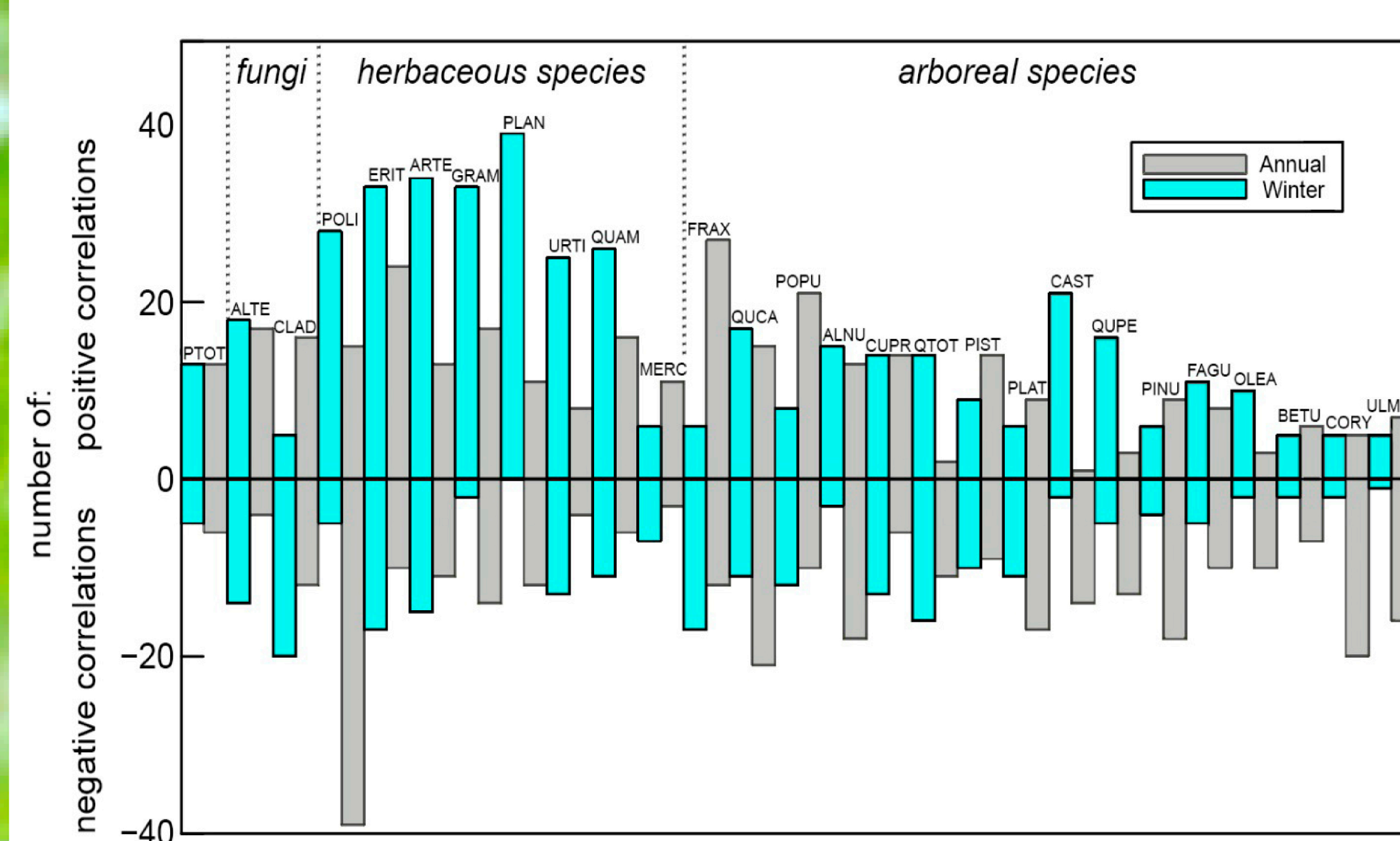
The seven taxa with the highest number of significant correlations with winter rainfall are **herbaceous** (ERIT and ARTE >10%). Most of the taxa with more negative than positive correlations are **arboreal**: QTOT, FRAX, POPU, PIST and PLAT. The Quercus family (QUCA, QTOT, QUPE) presents the highest number of correlations.

Conclusions

To elude the wash-out effect of precipitation on pollination, it has been useful to address the correlation study using the ECCDTI obtained from **winter** rainfall. As expected, a positive influence of this variable in the resulting subsequent pollen production has been found.

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