Temporal and spatial distribution of atmospheric Poaceae pollen in Catalonia (Northeast Spain)

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Catalonian grasses

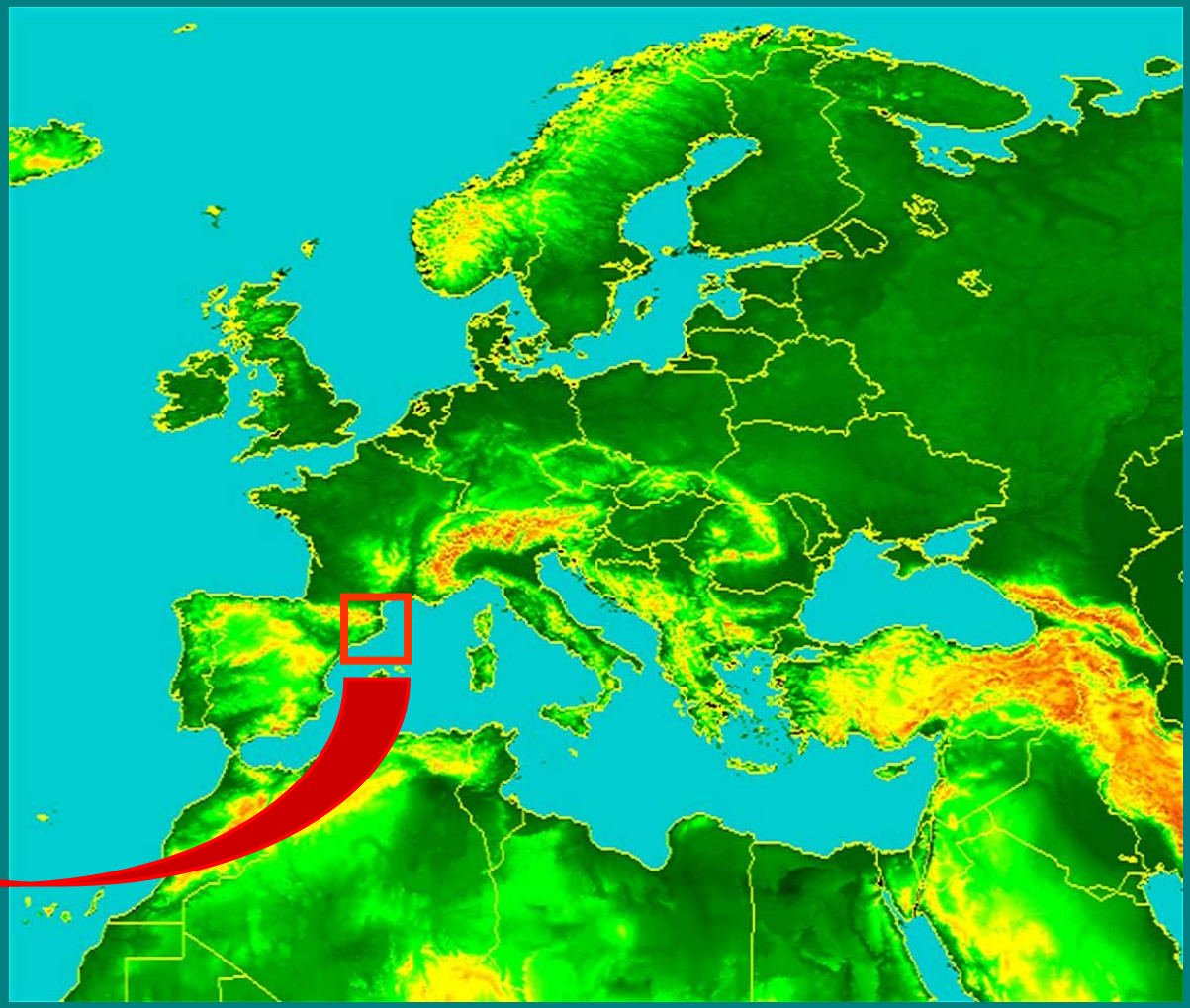
- 296 grass species are cited of Catalonia[1].
- They have an ubiquitous presence in the territory.
- One unique species is flowering all the year round: *Poa annua*[1].
- Grass pollen is one of the most important cause of rhinitis and/or seasonal asthma in Spain[2].
- In the Barcelona area Poaceae is the second taxa with allergenic significance, showing a pathogenic effect on the 35% of the patients[3].

1. Flora PPCC, 1985.
2. Subiza *et al*., 1989.
3. Belmonte *et al*., 1995

Objectives

- To compare Poaceae airborne pollen data of a 8 years-period at 6 localities in Catalonia.
- To evaluate possible differences in pollen concentrations.
- To determine if the differences found could be associated to particularities in climate, biogeography or human activity.

CATALONIA



Geographical and Climatic characteristics

Locality	Altitude masl	Mean Annual Temperature ºC	Annual Rainfall mm	Phytoclimate (Allue, 1990)
Barcelona	12	16.4	683	Fresh - Tethyc Semiarid
Bellaterra	190	15.2	594	Fresh - Continental Semihumid
Girona	70	15.0	740	Fresh - Continental Semihumid
Lleida	221	15.1	385	Fresh - Transicional Semiarid
Manresa	238	13.6	619	Fresh - Continental Semihumid
Tarragona	20	15.8	478	Fresh - Tethyc Semiarid

Material and methods

- Study period: 1994-2001.
- Hirst volumetric sampling traps.
- Pollen counted following the Spanish Aerobiological Network methodology (REA). [4]
- Base pollen data expressed as **mean daily pollen concentrations** (p/m^3).
- Other pollen parameters:
  - **mean weekly** pollen concentrations: average of the 7 mean daily pollen concentration corresponding to a given week.
  - **annual index** or annual totals: summation of the mean daily pollen concentration corresponding to 1 year.
  - Daily, weekly and annual **means for the study period**.
- Meteorological data was supplied by both the National Institute of Meteorology and the Catalonian Meteorological Services.
- Basic statistics, Correlation and Regression Analysis.

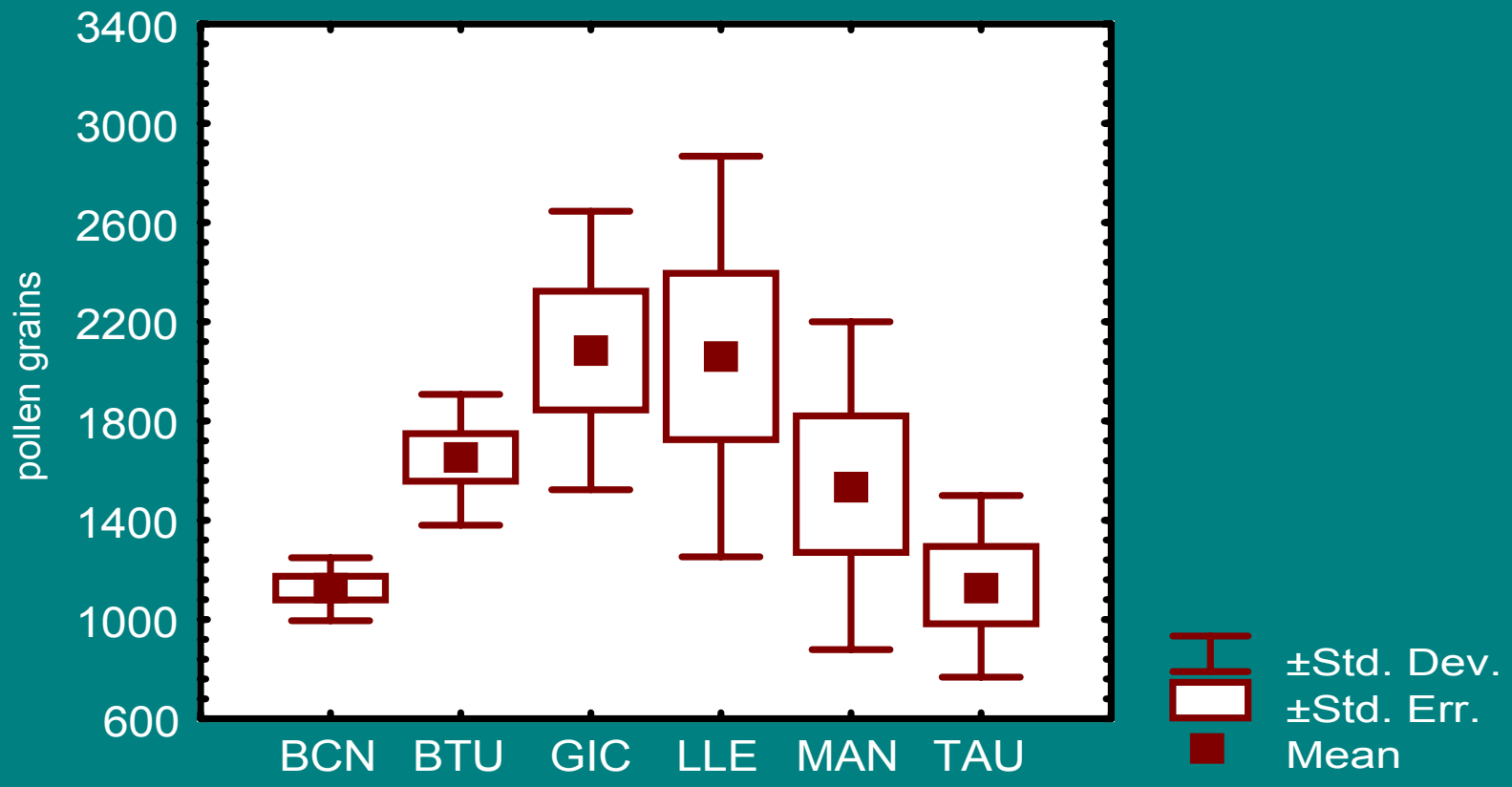
4. Dominguez *et al.*, 1991.

Absolute and relative annual index

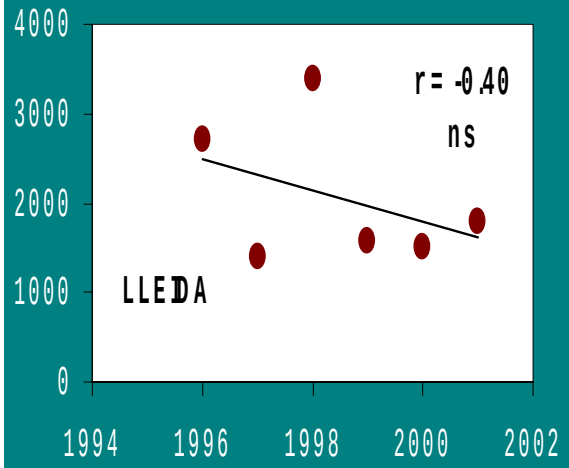
Locality	Minimum		Mean	Maximum		% of the total pollen	% of the non arboreal pollen
	Annual index	Year		Annual index	Year		
BCN	894	1994	1122	1311	2001	2.4	17.1
BTU	1193	1999	1644	1952	1996	4.7	24.4
GIC	1474	2001	2084	3000	1996	3.9	30.3
LLE	1394*	1997	2060	3391	1998	8.1	30.3
MAN	927 *	2000	1540	2594	1997	4.7	21.1
TAU	649	2000	1134	1673	1996	4.0	16.1

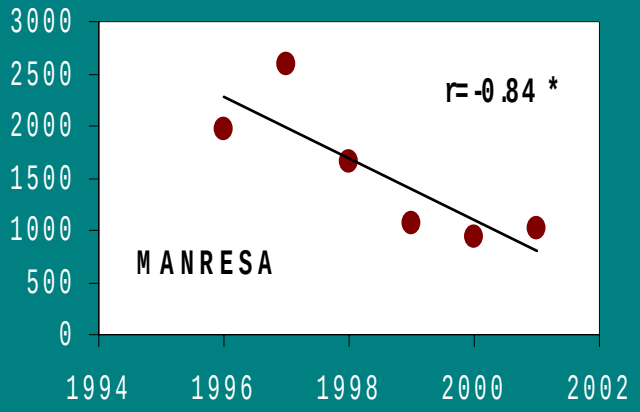
* within the medium range (mean ± 1 st dv).

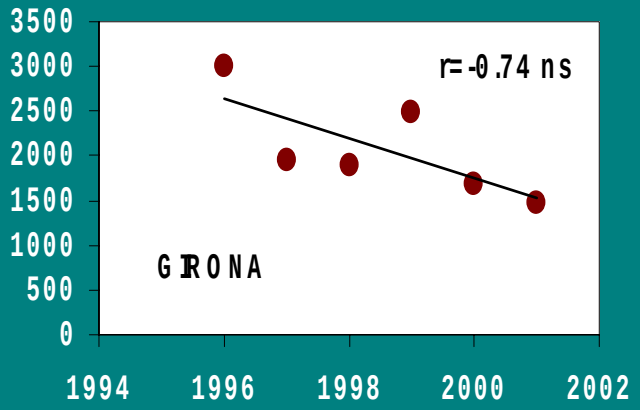
Annual index

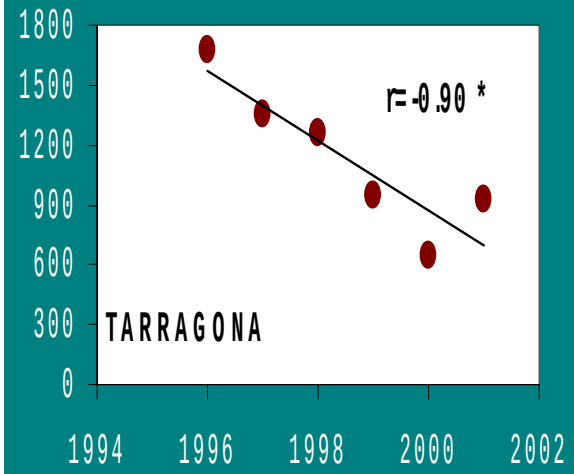


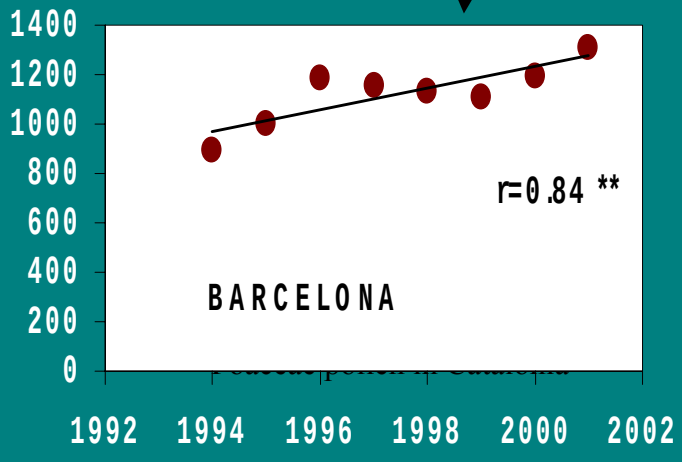
Poaceae annual index tendencies

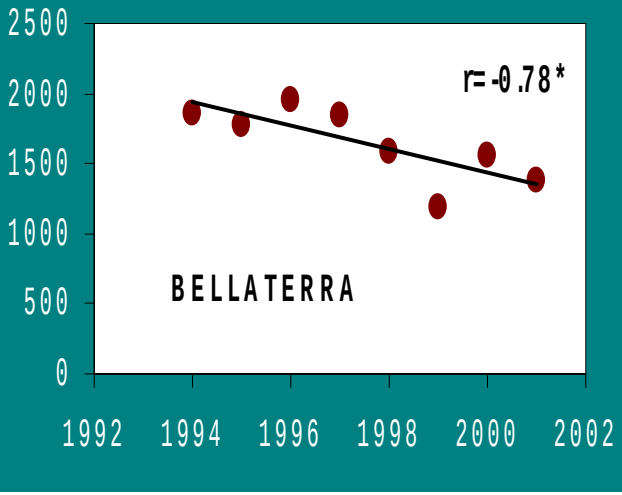






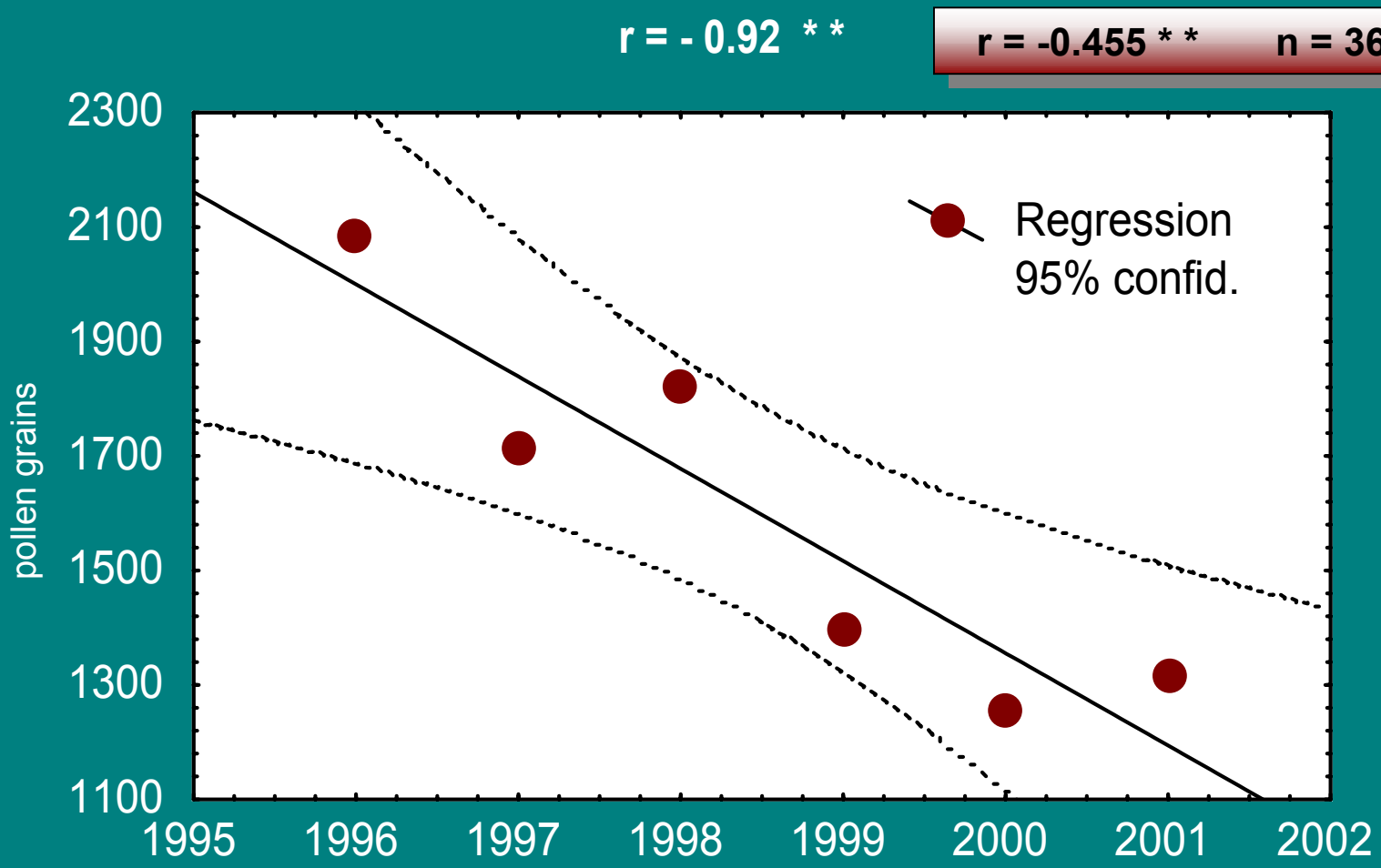






General pattern of annual index

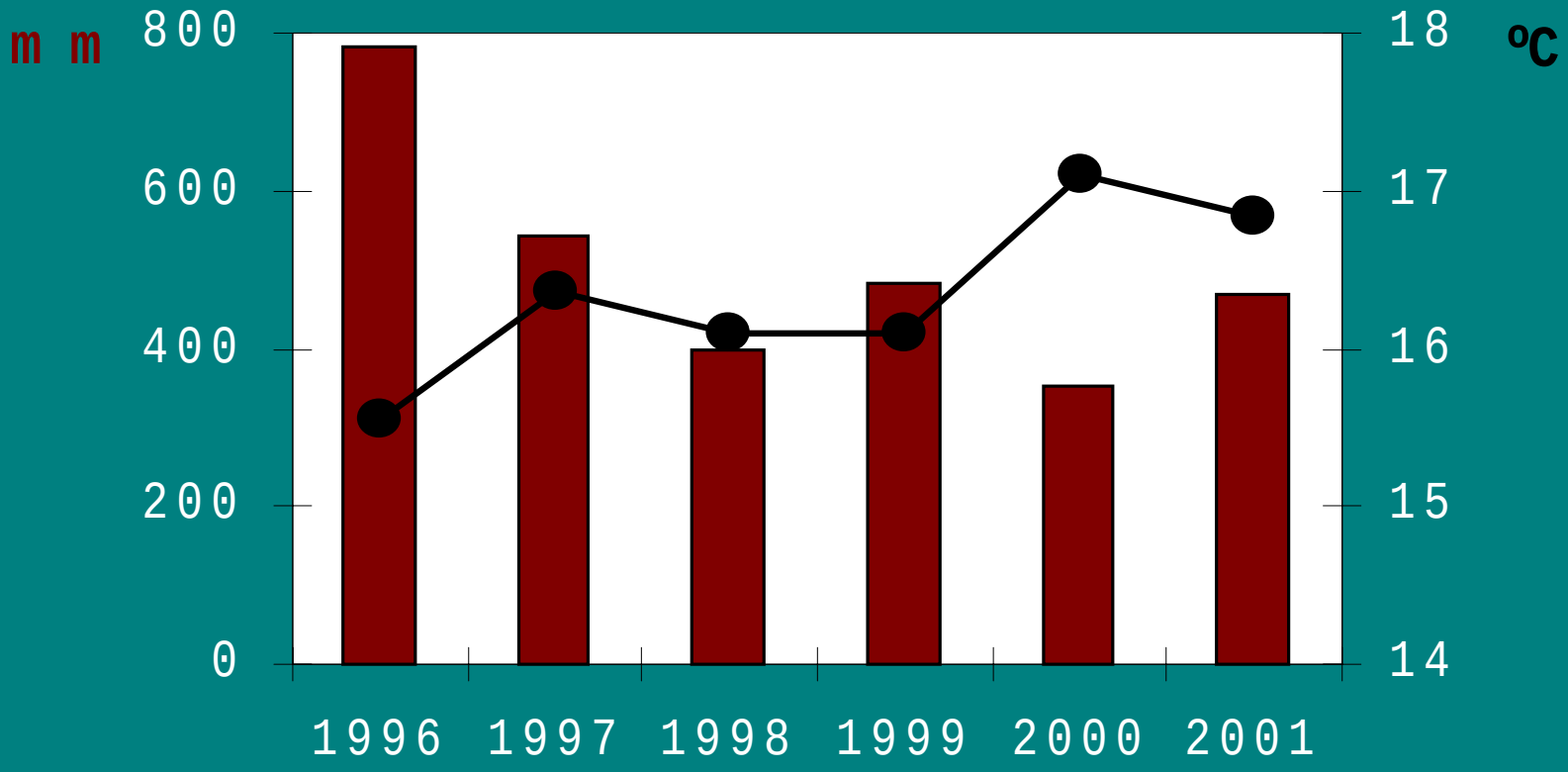
(for each year, mean annual pollen index of all localities)



Catalonian climate tendency (1996-2001)

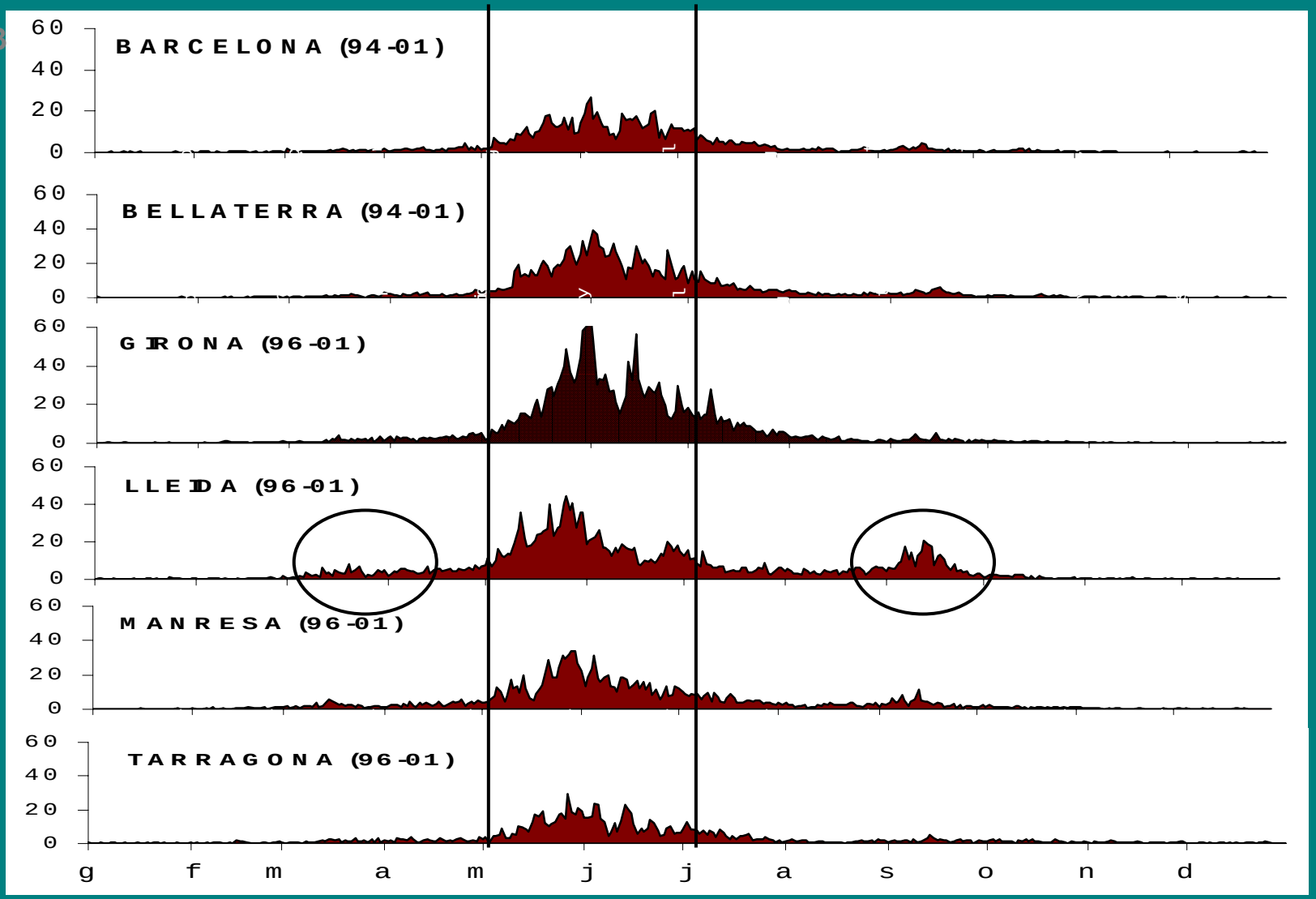
(for each year, mean values of all localities)

$r_{^oC - year} = 0.826$ * $r_{mm - year} = -0.728$ n.s.



$r_{pollen - ^oC} = -0.86$ * $r_{pollen - mm} = 0.737$ n.s.

Daily means during the study period



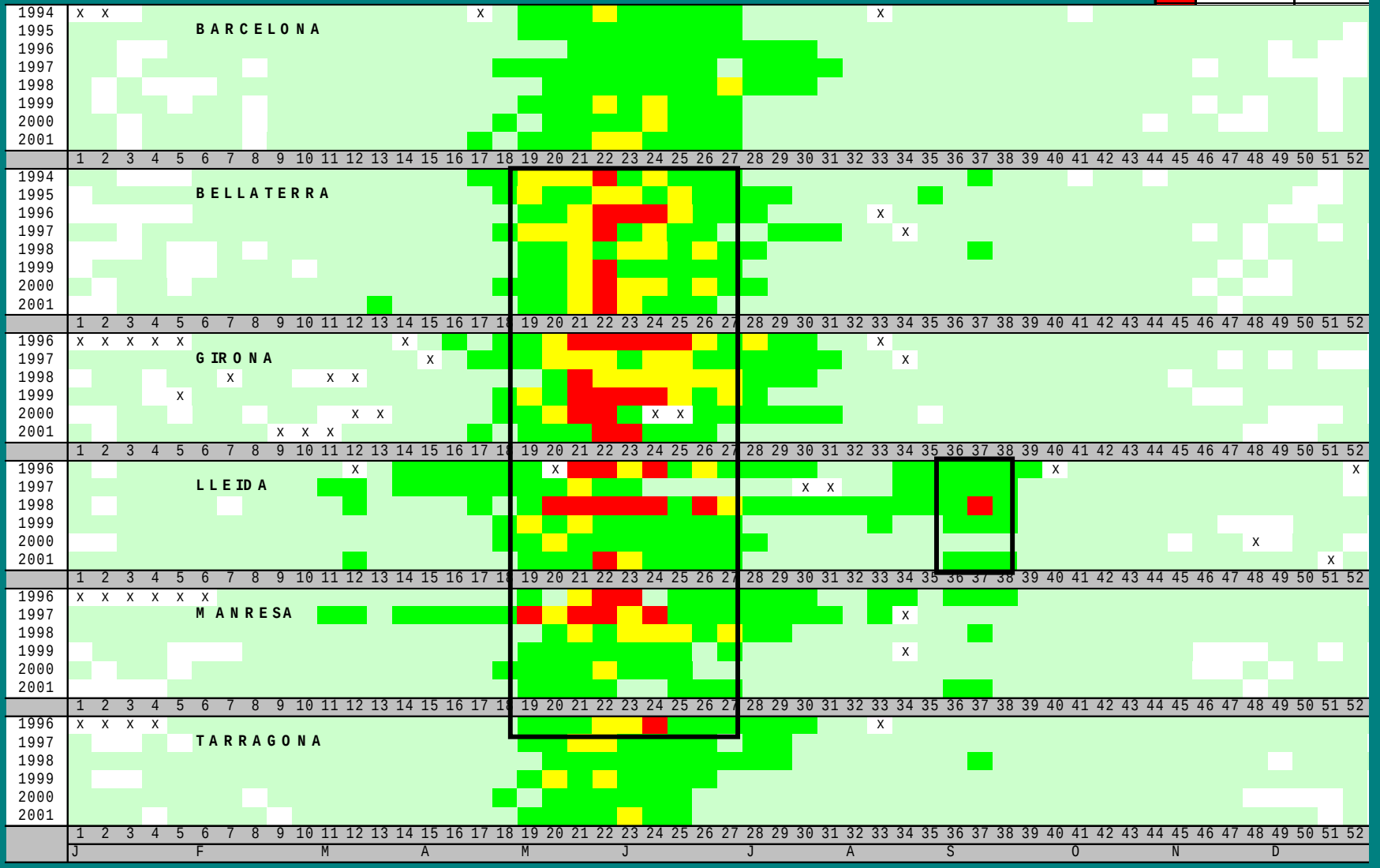
Pollen and meteorological daily mean data

BCN	1994	1995	1996	1997	1998	1999	2000	2001
daily maximum	50,4	61,6	55,3	32,9	34,3	49,7	53,2	83,3
daily mean	2,9	2,7	3,3	3,3	3,1	3,1	3,3	3,6
stdv	5,7	5,5	6,4	5,5	5,6	6,4	7,4	7,8
cv	2,0	2,0	2,0	1,7	1,8	2,1	2,2	2,2
rainfall mm	1,3	0,8	2,3	1,3	1,0	1,0	1,0	1,1
T ºC	16,4	15,8	15,7	17,1	16,9	16,8	17,4	17,9
BTU	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
daily maximum	91,7	93,1	84,0	90,3	46,9	68,6	81,2	53,9
daily mean	5,2	5,1	5,7	5,1	4,4	3,4	4,4	3,8
stdv	10,7	9,4	11,6	9,6	7,4	7,0	10,2	7,9
cv	1,6	2,0	1,9	2,0	1,9	1,7	2,1	2,3
rainfall mm	1,2	1,2	2,8	1,6	1,2	1,2	0,9	1,2
T ºC	17,0	16,6	16,4	16,8	17,0	16,8	16,8	17,2
GIC	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
daily maximum			75,6	49,0	119,0	76,3	123,9	123,9
daily mean			5,8	6,0	7,1	5,1	4,5	4,4
stdv			9,7	10,6	15,6	11,6	13,3	13,3
cv			1,7	1,8	2,2	2,3	3,0	3,0
rainfall mm			2,4	1,5	1,6	2,0	1,5	1,7
T ºC			15,4	16,1	15,6	15,8	15,9	16,5
LLE	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
daily maximum			34,3	93,1	40,6	47,6	64,4	64,4
daily mean			4,1	9,5	4,4	4,3	5,1	5,0
stdv			6,0	15,3	6,7	6,7	9,7	9,7
cv			1,5	1,6	1,5	1,6	1,9	1,9
rainfall mm			1,3	1,4	0,6	1,0	1,1	1,0
T ºC			15,0	15,6	15,1	15,2	15,5	16,6
MAN	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
daily maximum			76,3	58,1	34,3	35,7	32,9	32,9
daily mean			7,4	4,6	3,0	2,6	2,8	2,8
stdv			11,9	8,5	5,2	5,1	4,8	4,8
cv			1,6	1,8	1,7	2,0	1,7	1,7
rainfall mm			2,6	1,9	1,1	1,5	1,6	1,2
T ºC			14,4	15,3	14,6	14,6	14,8	15,0
TAU	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
daily maximum			45,5	46,2	39,9	28,7	44,1	44,1
daily mean			3,8	3,5	2,6	1,8	2,6	2,6
stdv			6,2	6,1	5,5	4,0	6,0	5,9
cv			1,6	1,7	2,1	2,2	2,3	2,3
rainfall mm			1,4	1,3	1,1	1,2	1,0	1,5
T ºC			16,4	17,2	17,4	17,4	17,6	17,7

ALLERGENICITY SCALE [5]

(weekly mean pollen data)

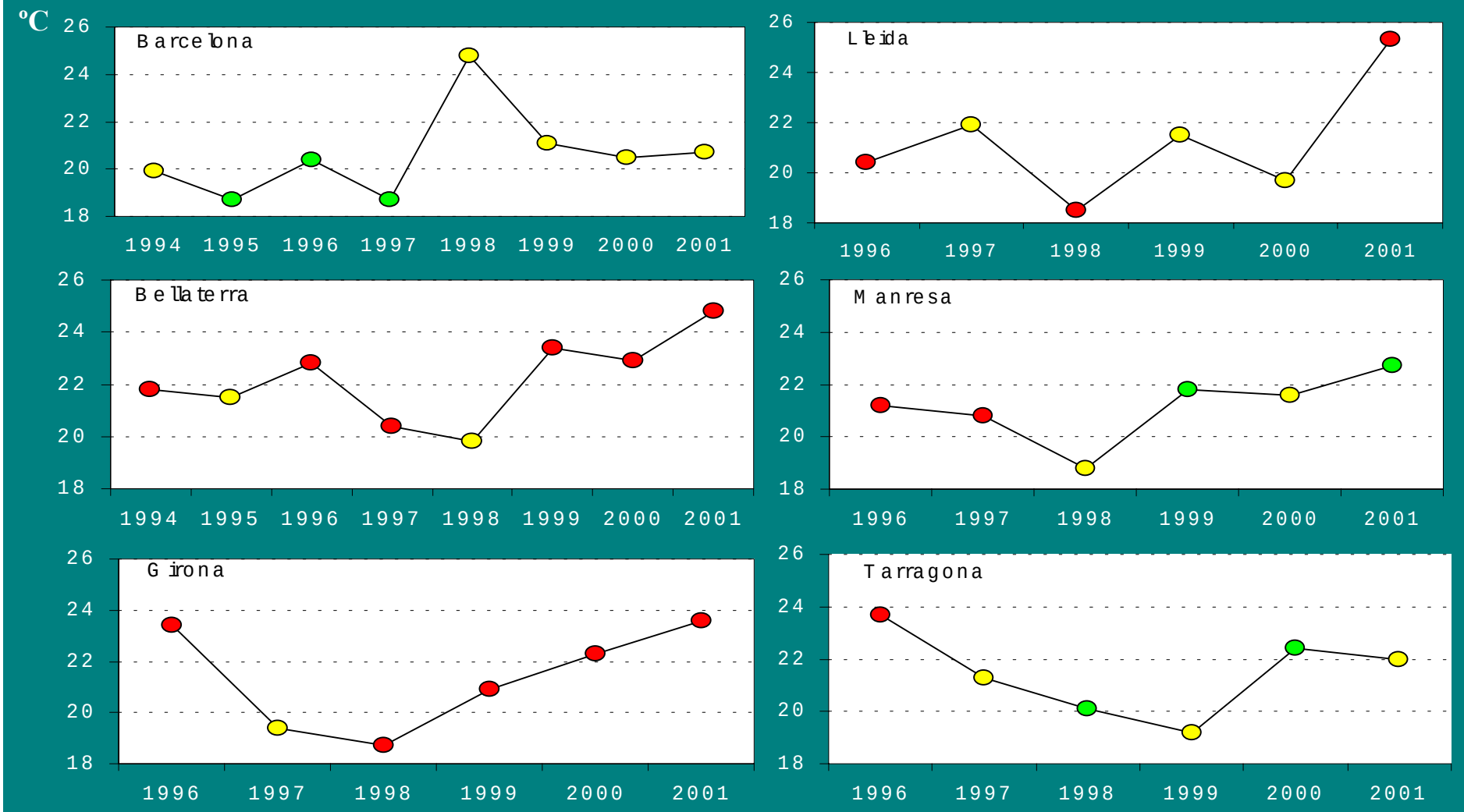
x	no data	
0	null	0
1	low	0-4.9
2	medium	5-19.9
3	high	20-29.9
4	very high	>30



5. Belmonte *et al.*, 2000

Mean weekly temperatures corresponding to the yearly **maximum weekly pollen concentration**

0	null	0
1	low	0-4.9
2	medium	5-19.9
3	high	20-29.9
4	very high	>30



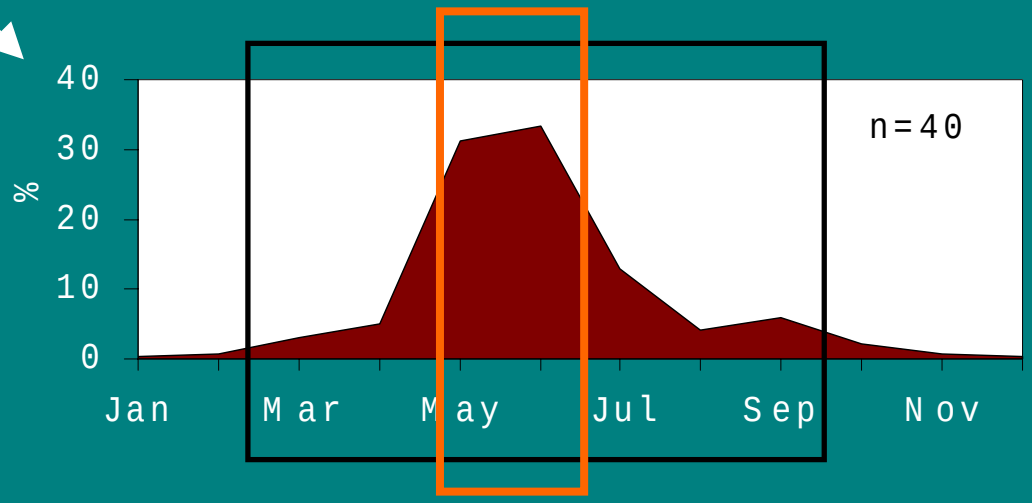
5. Belmonte *et al.*, 2000.

Conclusions

Spatial and Temporal distribution of Poaceae pollen

Decreasing annual index ranking

Girona
Lleida
Bellaterra
Manresa
Tarragona
Barcelona



Pollen all the year round

Highest interannual variability in Lleida

Annual index decreasing tendency during the study period except in Barcelona

Diversity of species but similar behaviours

Further researches

- To cross meteorological data and formalise grasses pollen dynamics.
- To cross clinical data and improve the allergenicity scale.
- To compare Poaceae pollen dynamics among Catalonia (Spain) and Buenos Aires Province (Argentina).

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