

# FUNGAL SPORES SPECTRUM IN CATALONIA (NE SPAIN), 1995-2001

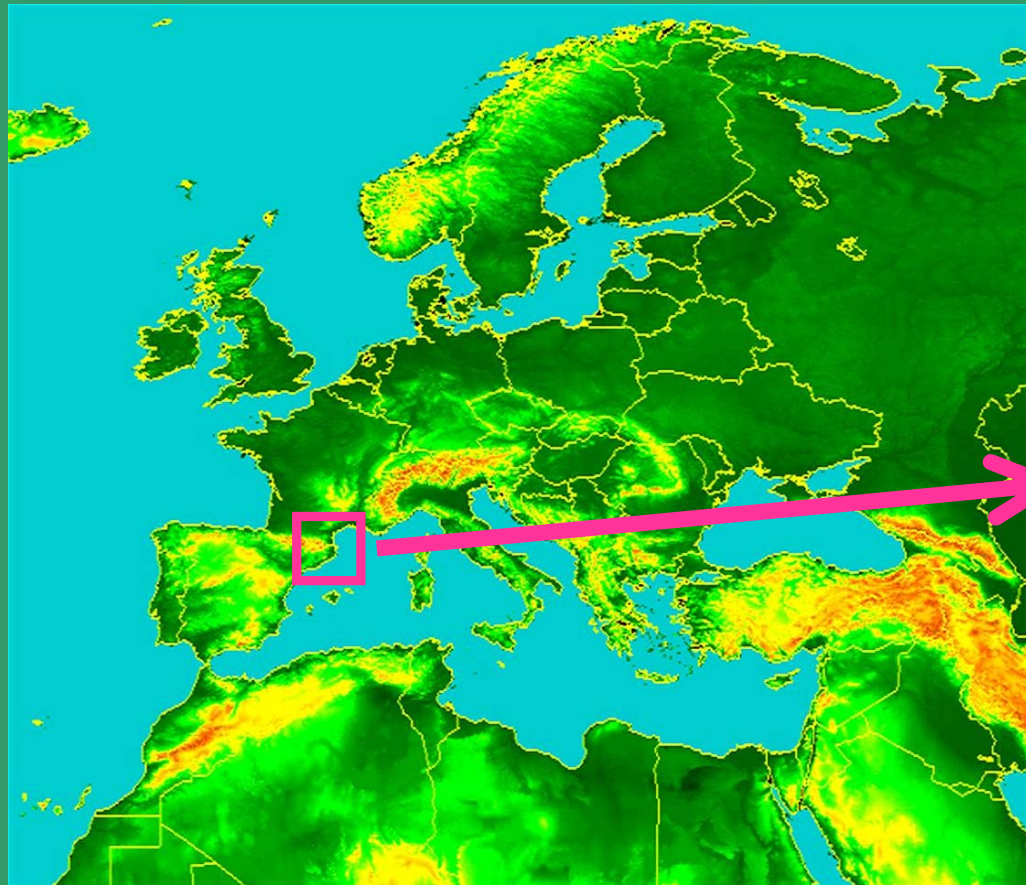
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# Objectives

- To actualise the XAC spore database, validating the raw data (daily counts) and the spore classification
- To calculate the classic aerobiological parameters (mean daily and weekly concentrations together with monthly and annual indexes and corresponding absolute maxima)
- To analyse these data, looking for differences and analogies between stations, specially in the allergenic spore spectra
- To point out the future working lines

# Sampling sites



## Catalonia



# Sampling sites



Aerobiological Sampling Stations	Geographical characteristics		Climatic characteristics		
	Altitude (m.a.s.l.)	Geographical Coordinates	Mean Annual Temperature (°C)	Annual Rainfall (mm)	Phytoclimates (Allue, 1990)
Barcelona	12	41°24' N, 02°11' E	16.4	593	Fresh-Tethyc-semiarid
Bellaterra	190	41°33' N, 02°07' E	15.2	594	Fresh-Continental Oriental-semihumid
Girona	70	41°59' N, 02°60' E	15.0	740	Fresh-Continental Oriental-semihumid
Lleida	221	41°37' N, 00°37' E	15.1	385	Fresh-Transitional-semiarid
Manresa	238	41°43' N, 01°50' E	13.6	619	Fresh-Continental Oriental-semihumid
Tarragona	20	41°07' N, 01°15' E	15.8	478	Fresh-Tethyc-semiarid

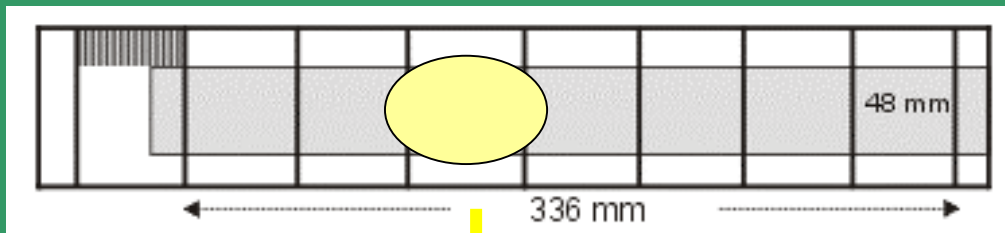
# Sampling Methods

Seven-day recording Hirst samplers



Daily counts

Pollen: REA standardized method  
4 longitudinal lines  
Spores: 1 longitudinal line



Daily sample



Dia	
1	
2	
3	
4	
5	
6	
7	
TOTAL	402

OBSERVACIONS REFERENTS A LA MOSTRA O AL PERÍODE D'EXPOSICIÓN

# Relation of fungal spores

Taxa	Systematic Group
<i>Agaricus</i>	<b>A</b> Basidiomycota
<i>Agrocybe</i>	Basidiomycota
<i>Altemaria</i>	<b>A</b> Deuteromycota (Ascomycota)
<i>Arthrrium</i>	<b>A</b> Deuteromycota (Ascomycota)
<i>Ascobolus</i>	Ascomycota
<i>Aspergillus-Penicillium</i>	<b>A</b> Deuteromycota (Ascomycota)
<i>Asterosporium</i>	Deuteromycota
<i>Chaetomium</i>	<b>A</b> Ascomycota
<i>Cladosporium</i>	<b>A</b> Deuteromycota (Ascomycota)
COPRINACEAE	<b>A</b> Basidiomycota
<i>Curvularia</i>	Deuteromycota (Ascomycota)
<i>Drechslera-Helminthosporium</i>	<b>A</b> Deuteromycota (Drechslera Ascomycota)
<i>Epicoccum</i>	<b>A</b> Deuteromycota
<i>Fusarium</i>	<b>A</b> Deuteromycota (Ascomycota)
<i>Ganoderma</i>	<b>A</b> Basidiomycota
<i>Humicola</i>	Deuteromycota
<i>Inocybe</i>	Basidiomycota
<i>Leptosphaeria</i>	<b>A</b> Ascomycota
MYXOMYCOTA	Mixomycota
<i>Nigrospora</i>	<b>A</b> Deuteromycota (Ascomycota)

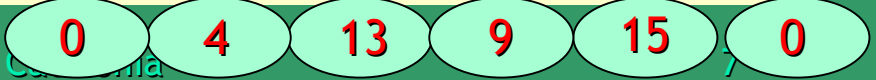
Taxa	Systematic Group
<i>Odium</i>	Deuteromycota (Ascomycota)
Other ASCOMYCOTA 1-cel	Ascomycota
Other ASCOMYCOTA 2-cel	Ascomycota
Other ASCOMYCOTA n-cel	Ascomycota
Other BASIDIOMYCOTA	Basidiomycota
Other DEUTEROMYCOTA	Deuteromycota
<i>Periconia</i>	<b>A</b> Deuteromycota
<i>Phomopsis</i>	Deuteromycota (Ascomycota)
<i>Pleospora</i>	Ascomycota
<i>Polythrincium</i>	<b>A</b> Deuteromycota (Ascomycota)
<i>Puccinia</i>	<b>A</b> Basidiomycota
<i>Sphacelotheca</i>	Basidiomycota
<i>Stemphylium</i>	<b>A</b> Deuteromycota (Ascomycota)
<i>Tetraploa</i>	Deuteromycota (Ascomycota)
THELEPHORACEAE	Basidiomycota
<i>Tilletia</i>	<b>A</b> Basidiomycota
<i>Torula</i>	<b>A</b> Deuteromycota
<i>Ustilago</i>	<b>A</b> Basidiomycota
VENTURACEAE	Ascomycota
XYLARIACEAE	<b>A</b> Ascomycota

Unknown Spores

# Compared spores spectra



Taxa	ANNUAL SUM of the MEAN DAILY CONCENTRATIONS					
	Barcelona 1995-2001	Bellaterra 1995-2001	Girona 1996, 2000	Lleida 1996, 2000	Manresa 1996, 2000	Tarragona 1996, 2000
SPORES TOTAL	299580	521301	642523	585942	<b>845567</b>	345487
<i>Agaricus</i>	2852	<b>5444</b>	1012	339	3266	946
<i>Agrocybe</i>	1496	3232	1033	2202	<b>5419</b>	1261
<i>Alemarà</i>	7313	10258	12649	<b>31098</b>	12061	6806
<i>Arthrrium</i>	1090	1580	<b>10566</b>	5983	2174	919
<i>Ascobolus</i>	69	67	4	25	<b>129</b>	39
<i>Aspergillus-Penicillium</i>	2785	1873	5051	1235	<b>6411</b>	3300
<i>Asterosporium</i>	2	51	<b>232</b>	20	44	16
<i>Chaetomium</i>	203	250	<b>360</b>	<b>366</b>	289	153
<i>Cladosporium</i>	120952	198749	235284	236129	<b>301550</b>	146558
COPRINACEAE	6872	<b>21068</b>	19890	7766	15252	7301
<i>Curvularia</i>	73	113	3868	<b>5149</b>	327	201
<i>Drechslera-Helminthosporium</i>	1047	1434	1514	1959	<b>4505</b>	2579
<i>Epicoccum</i>	879	983	2970	<b>4152</b>	1379	501
<i>Fusarium</i>	15	63	<b>143</b>	41	11	46
<i>Ganoderma</i>	997	1689	<b>2549</b>	459	731	488
<i>Humicola</i>	2	58	10	<b>132</b>	13	2
<i>Inocybe</i>	24	51	21	0	<b>55</b>	18
<i>Leptosphaeria</i>	1781	3769	<b>13601</b>	4096	4776	2517
MYXOMYCOTA	781	1140	1999	812	<b>3557</b>	2144
<i>Nigrospora</i>	107	148	44	169	<b>338</b>	119
Oidium	1416	1225	<b>1574</b>	1132	1457	254
Other ASCOMYCOTA 1-cel	87347	158746	224283	202838	<b>320380</b>	107639
Other ASCOMYCOTA 2-cel	7153	15526	26868	22192	<b>53435</b>	25185
Other ASCOMYCOTA n-cel	26709	<b>56353</b>	46097	28705	<b>56629</b>	22974
Other BASIDIOMYCOTA	7862	<b>10826</b>	3957	1233	10085	1066
Other DEUTEROMYCOTA	9027	14674	11	1	<b>18492</b>	119
<i>Periconia</i>	831	827	<b>2208</b>	1136	630	635
<i>Phomycetes</i>	186	141	<b>548</b>	56	162	259
<i>Phospora</i>	1304	2089	2003	3823	<b>4758</b>	2197
<i>Polythrincium</i>	87	75	<b>170</b>	136	63	24
<i>Puccinia</i>	272	<b>336</b>	252	99	244	247
<i>Sphacelotheca</i>	23	32	4	<b>860</b>	157	66
<i>Stemphylium</i>	698	901	<b>1112</b>	810	1075	521
<i>Tetrapba</i>	10	6	289	<b>705</b>	12	8
THELEPHORACEAE	851	1460	1114	182	<b>2564</b>	721
<i>Tilletia</i>	23	52	<b>245</b>	5	71	47
<i>Torula</i>	533	614	957	<b>1433</b>	951	696
<i>Ustilago</i>	4291	3760	<b>8156</b>	7337	6156	3354
VENTURACEAE	211	328	7	8	<b>466</b>	29
XYLARACEAE	237	328	<b>1704</b>	805	1329	496
Unknown spores	1168	985	8163	<b>10313</b>	4163	3033



# Compared allergenic spores spectra

Taxa	ANNUAL SUM of the		MEAN DAILY CONCENTRATIONS			
	Barcelona 1995-2001	Bellaterra 1995-2001	Girona 1996, 2000	Lleida 1996, 2000	Manresa 1996, 2000	Tarragona 1996, 2000
ALLERGENIC SPORES	153864	254199	320438	305553	<b>363262</b>	178254
Agaricus	2852	<b>5444</b>	1012	339	3266	946
Alternaria	7313	10258	12649	<b>31098</b>	12061	6806
Arthrinium	1090	1580				919
<b>!!!!</b> Aspergillus-Penicillium	2785	1873				<b>3300</b>
Chaetomium	203	250				153
Cladosporium	120952	198749				146558
COPRINACEAE	6872	<b>21068</b>				7301
Drechslera-Hemithosporium	1047	1434				2579
Epitocum	879	983				501
<b>!!!!</b> Fusarium	15	63				<b>46</b>
Ganoderma	997	1689				488
Leptosphaeria	1781	3769				2517
Nigrospora	107	148				119
Periconia	831	827				635
Polythrincium	87	75				24
Puccinia	272	<b>336</b>				247
Stemphylium	698	901				521
Tilletia	23	52				47
Torula	533	614				696
Ustilago	4291	3760				3354
XYLARACEAE	237	328				496
Other spores	145715	267102	1704	805	1329	496
	<b>0</b>	<b>2</b>	<b>10</b>	<b>4</b>	<b>4</b>	<b>0</b>





# Allergenic spores

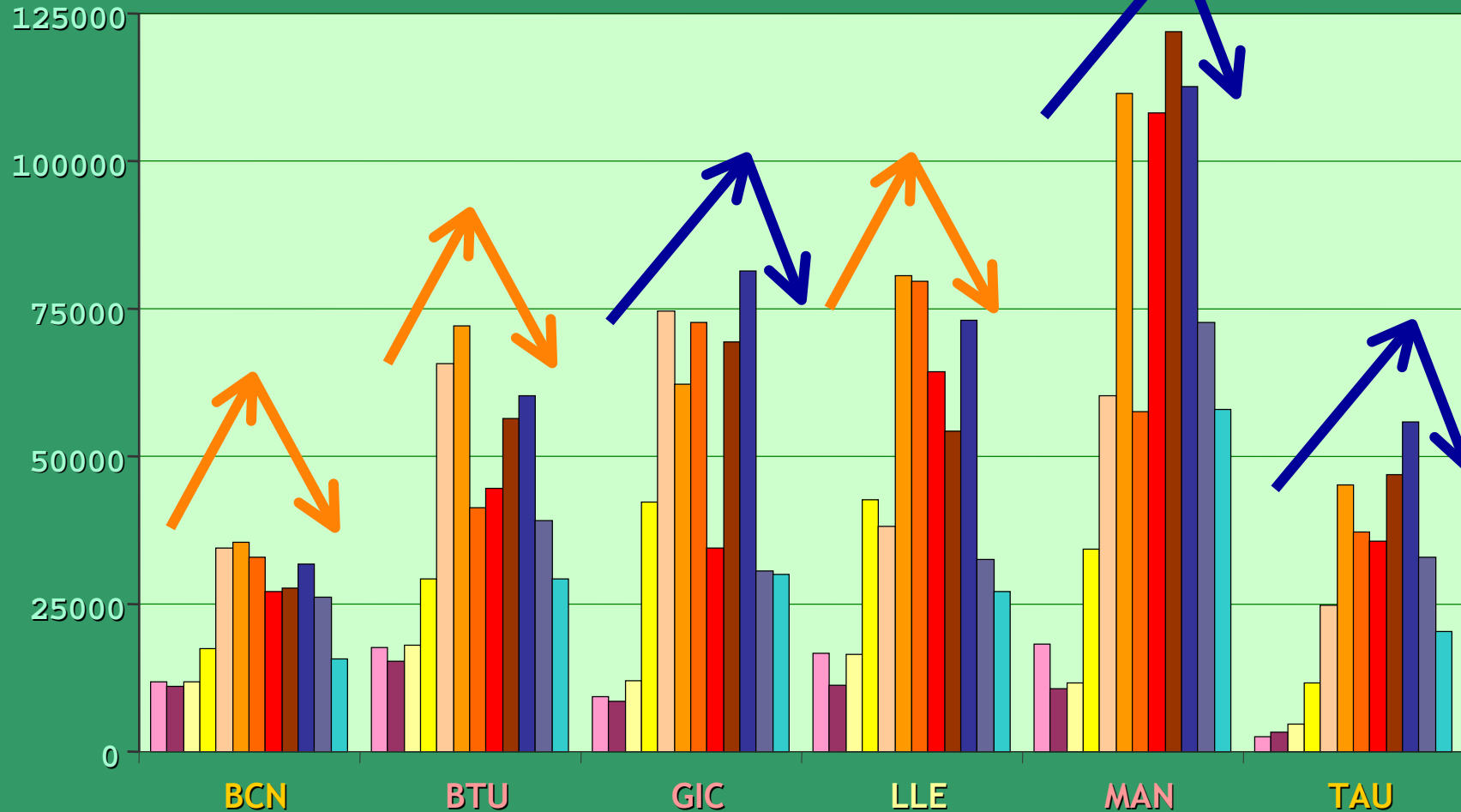
# spectra



LLEIDA	TARRAGONA	BARCELONA	BELLATERRA	MANRESA	GIRONA
<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>	<i>Cladosporium</i>
<i>Alternaria</i>	COPRINACEAE	<i>Alternaria</i>	COPRINACEAE	COPRINACEAE	COPRINACEAE
COPRINACEAE	<i>Alternaria</i>	COPRINACEAE	<i>Alternaria</i>	<i>Alternaria</i>	<i>Leptosphaeria</i>
<i>Ustilago</i>	<i>Ustilago</i>	<i>Ustilago</i>	<i>Agaricus</i>	<b>Asp.-Penicillium</b>	<i>Alternaria</i>
<i>Arthrinium</i>	<b>Asp.-Penicillium</b>	<i>Agaricus</i>	<i>Leptosphaeria</i>	<i>Ustilago</i>	<i>Arthrinium</i>
<i>Epicoccum</i>	<i>Drechs.Helminthos.</i>	<b>Asp.-Penicillium</b>	<i>Ustilago</i>	<i>Leptosphaeria</i>	<i>Ustilago</i>
<i>Leptosphaeria</i>	<i>Leptosphaeria</i>	<i>Leptosphaeria</i>	<b>Asp.-Penicillium</b>	<i>Drechs.Helminthos.</i>	<b>Asp.-Penicillium</b>
<i>Drechs.Helminthos.</i>	<i>Agaricus</i>	<i>Arthrinium</i>	<i>Ganoderma</i>	<i>Agaricus</i>	<i>Epicoccum</i>
<i>Torula</i>	<i>Arthrinium</i>	<i>Drechs.Helminthos.</i>	<i>Arthrinium</i>	<i>Arthrinium</i>	<i>Ganoderma</i>
<b>Asp.-Penicillium</b>	<i>Torula</i>	<i>Ganoderma</i>	<i>Drechs.Helminthos.</i>	<i>Epicoccum</i>	<i>Periconia</i>
<i>Periconia</i>	<i>Periconia</i>	<i>Epicoccum</i>	<i>Epicoccum</i>	XYLARIACEAE	XYLARIACEAE
<i>Stemphylium</i>	<i>Stemphylium</i>	<i>Periconia</i>	<i>Stemphylium</i>	<i>Stemphylium</i>	<i>Drechs.Helminthos.</i>
XYLARIACEAE	<i>Epicoccum</i>	<i>Stemphylium</i>	<i>Periconia</i>	<i>Torula</i>	<i>Stemphylium</i>
<i>Ganoderma</i>	XYLARIACEAE	<i>Torula</i>	<i>Torula</i>	<i>Ganoderma</i>	<i>Agaricus</i>
<i>Chaetomium</i>	<i>Ganoderma</i>	<i>Puccinia</i>	<i>Puccinia</i>	<i>Periconia</i>	<i>Torula</i>
<i>Agaricus</i>	<i>Puccinia</i>	XYLARIACEAE	XYLARIACEAE	<i>Nigrospora</i>	<i>Chaetomium</i>
<i>Nigrospora</i>	<i>Chaetomium</i>	<i>Chaetomium</i>	<i>Chaetomium</i>	<i>Chaetomium</i>	<i>Puccinia</i>
<i>Polythrincium</i>	<i>Nigrospora</i>	<i>Nigrospora</i>	<i>Nigrospora</i>	<i>Puccinia</i>	<i>Tilletia</i>
<i>Puccinia</i>	<i>Tilletia</i>	<i>Polythrincium</i>	<i>Polythrincium</i>	<i>Tilletia</i>	<i>Polythrincium</i>
<b>Fusarium</b>	<b>Fusarium</b>	<i>Tilletia</i>	<b>Fusarium</b>	<i>Polythrincium</i>	<b>Fusarium</b>
<i>Tilletia</i>	<i>Polythrincium</i>	<b>Fusarium</b>	<i>Tilletia</i>	<b>Fusarium</b>	<i>Nigrospora</i>

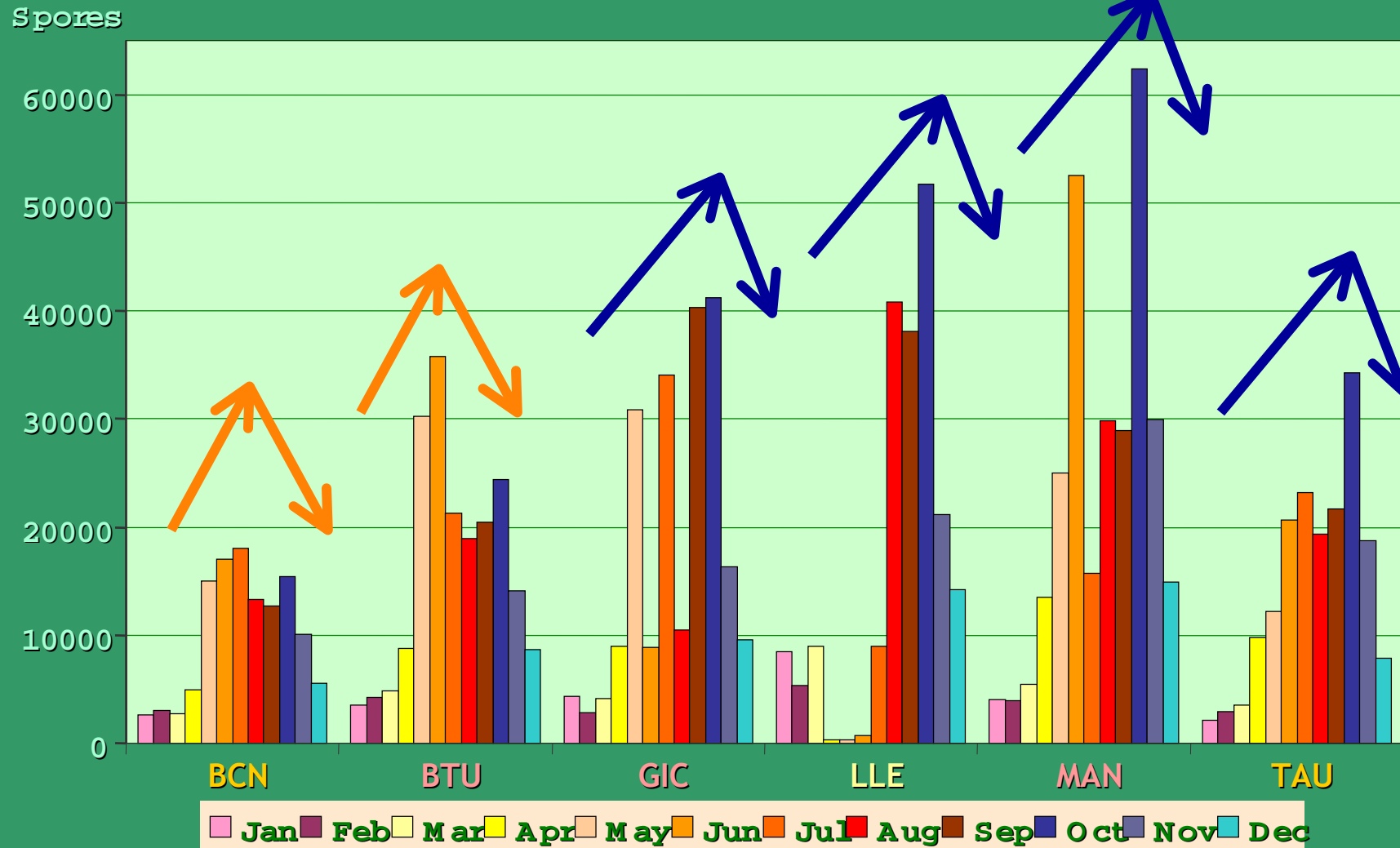
# Total spores - Compared monthly dynamics

Spores



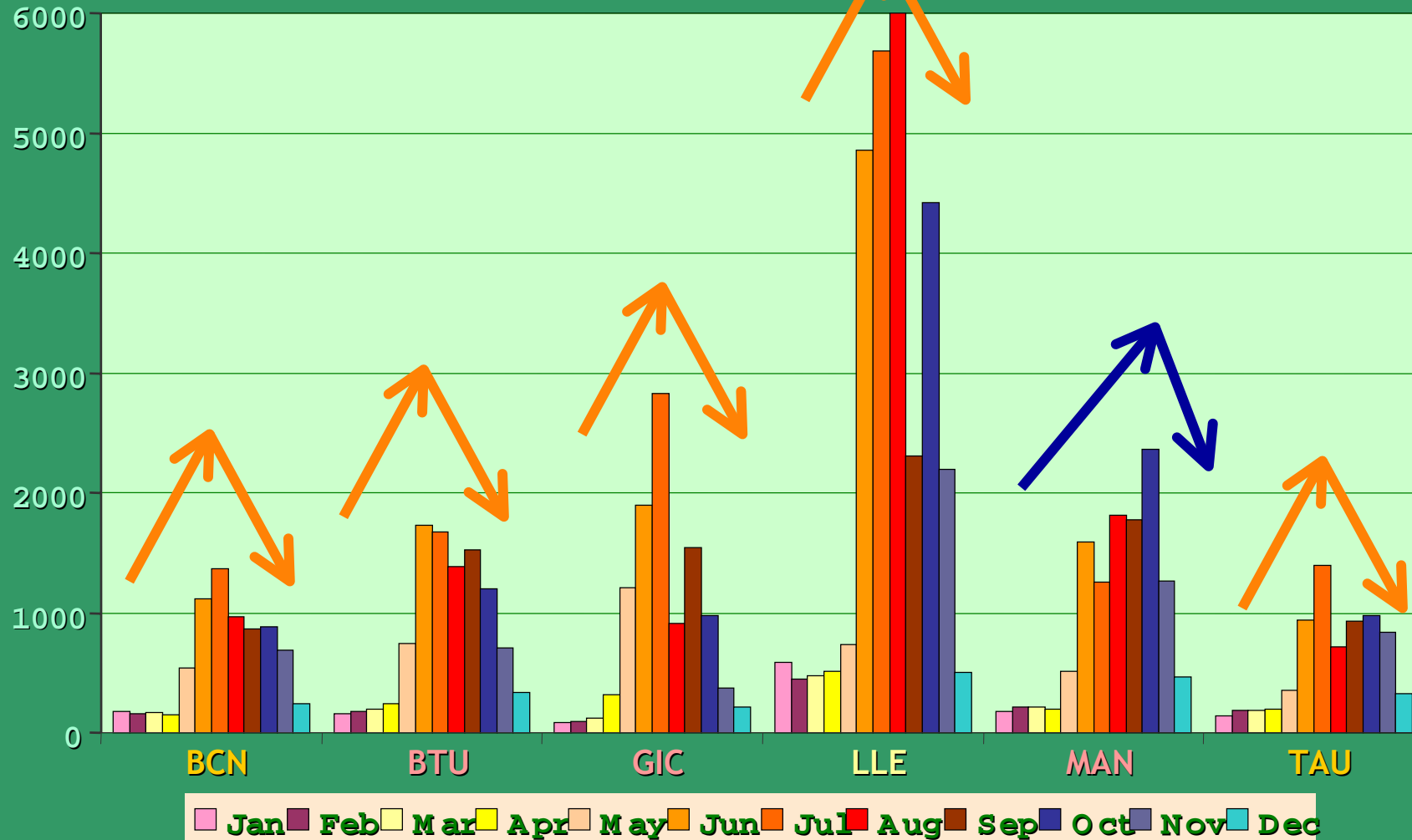
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

# Cladosporium - Compared monthly dynamics

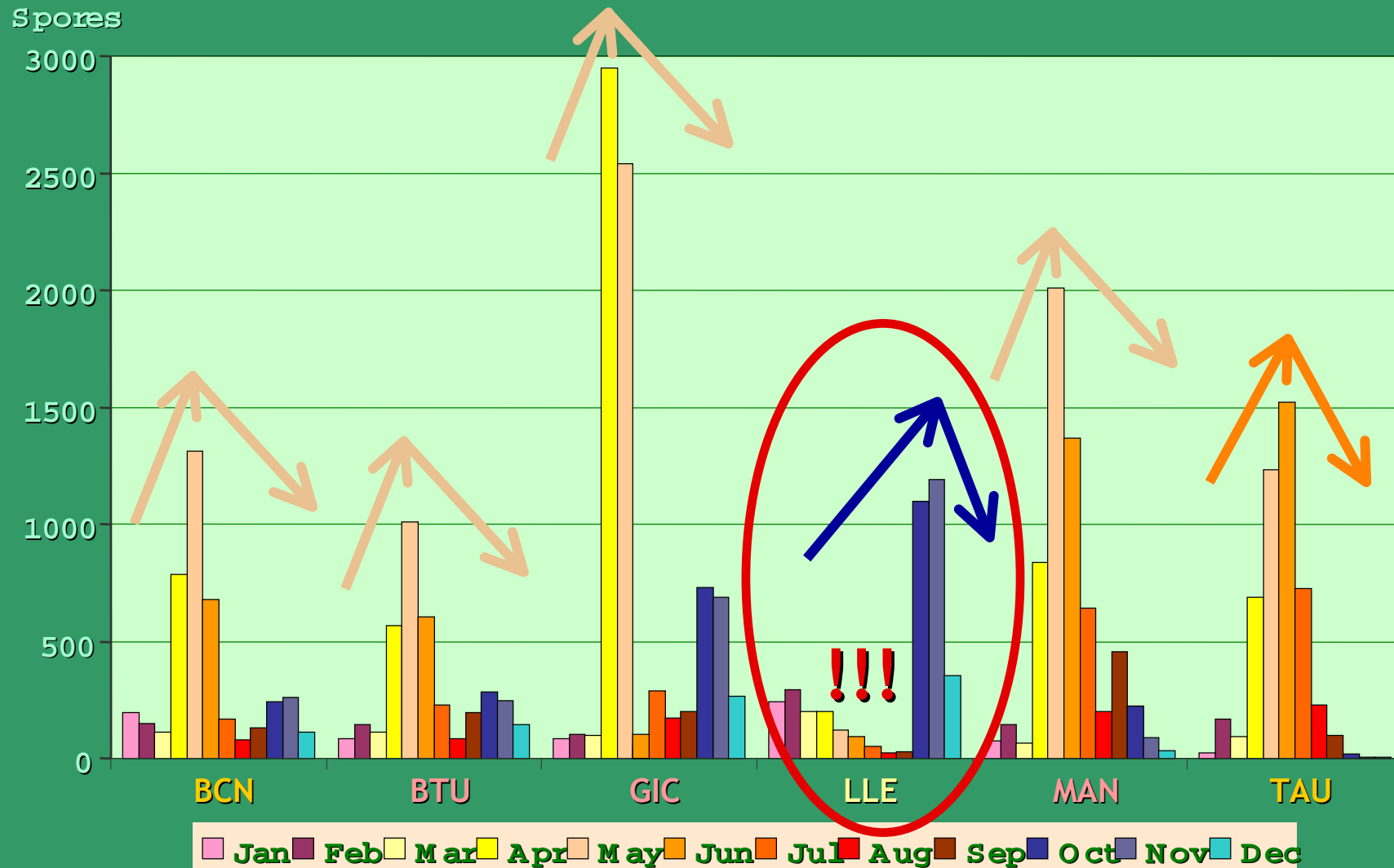


# Alternaria - Compared monthly dynamics

Spores



# Ustilago - Compared monthly dynamics



# Collaboration XAC - SCAIC\*

Study on the prevalence of fungal spores sensitization in population with rhinitis and/or allergic asthma in Catalonia

15 medical centres

January to December 2002

Prick test with:

*Alternaria alternata* → 19 %

*Aspergillus fumigatus* → 9 %

*Cladosporium herbarum* → 4 %

*Penicillium nottatum* → 6 %

*Ustilago* → 3 %

300 patients

Jan to Apr 2002

Sensibilization:

19 %

9 %

4 %

6 %

3 %

Per localities:

Barcelona 30 %

Barcelona 25 %

Terrassa 52 %

Manresa 45 %

Girona 31 %

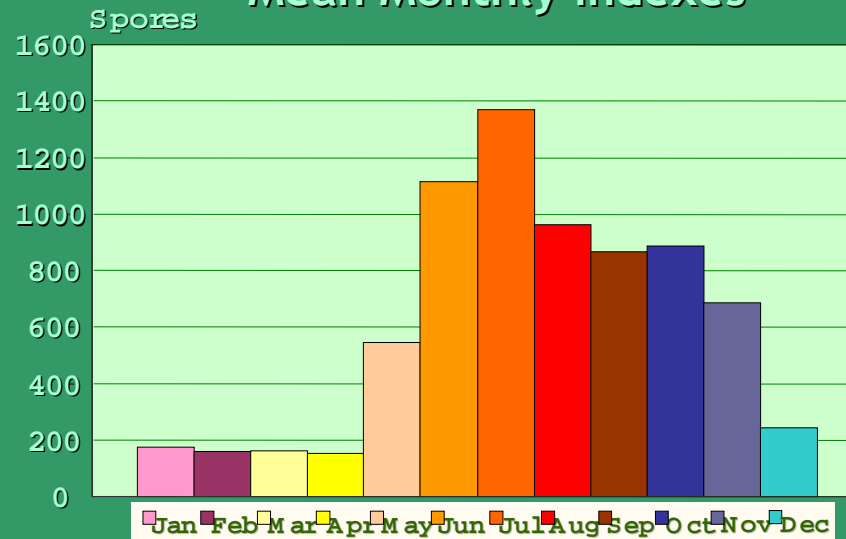
Lleida 14 %

Tarragona 30 %

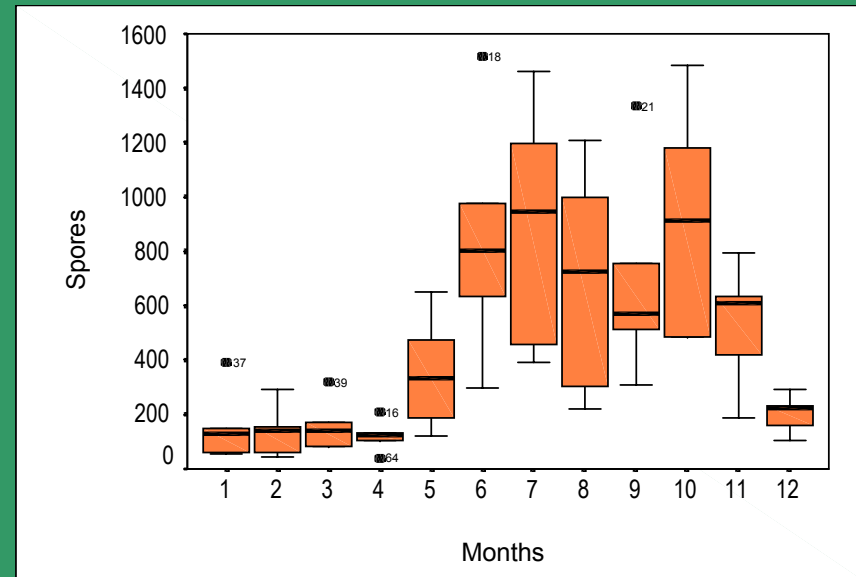
\* Aerobiological Network of Catalonia - Catalan Society of Allergy and Clinical Immunology

# Alternaria dynamics, Barcelona 1995-2001

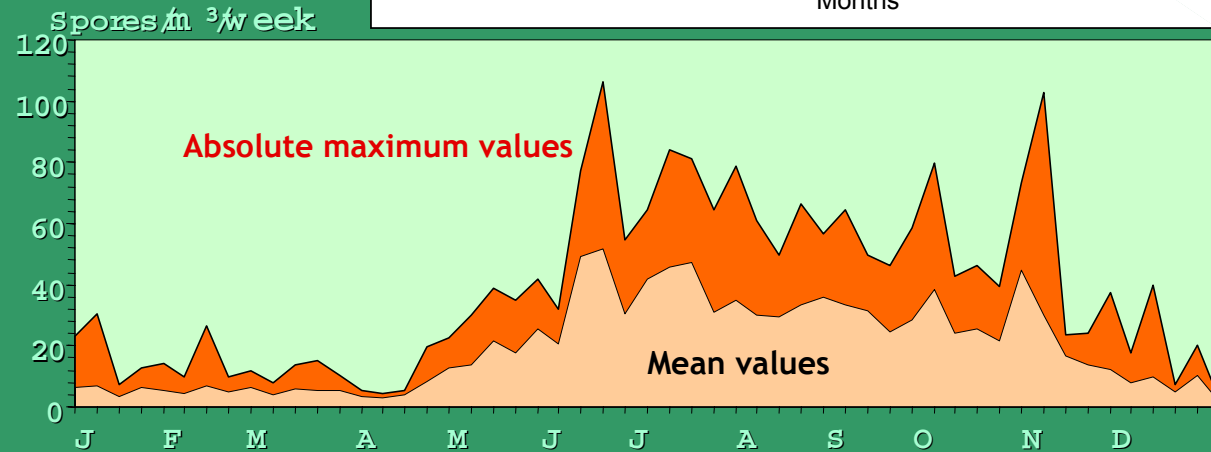
Mean Monthly indexes



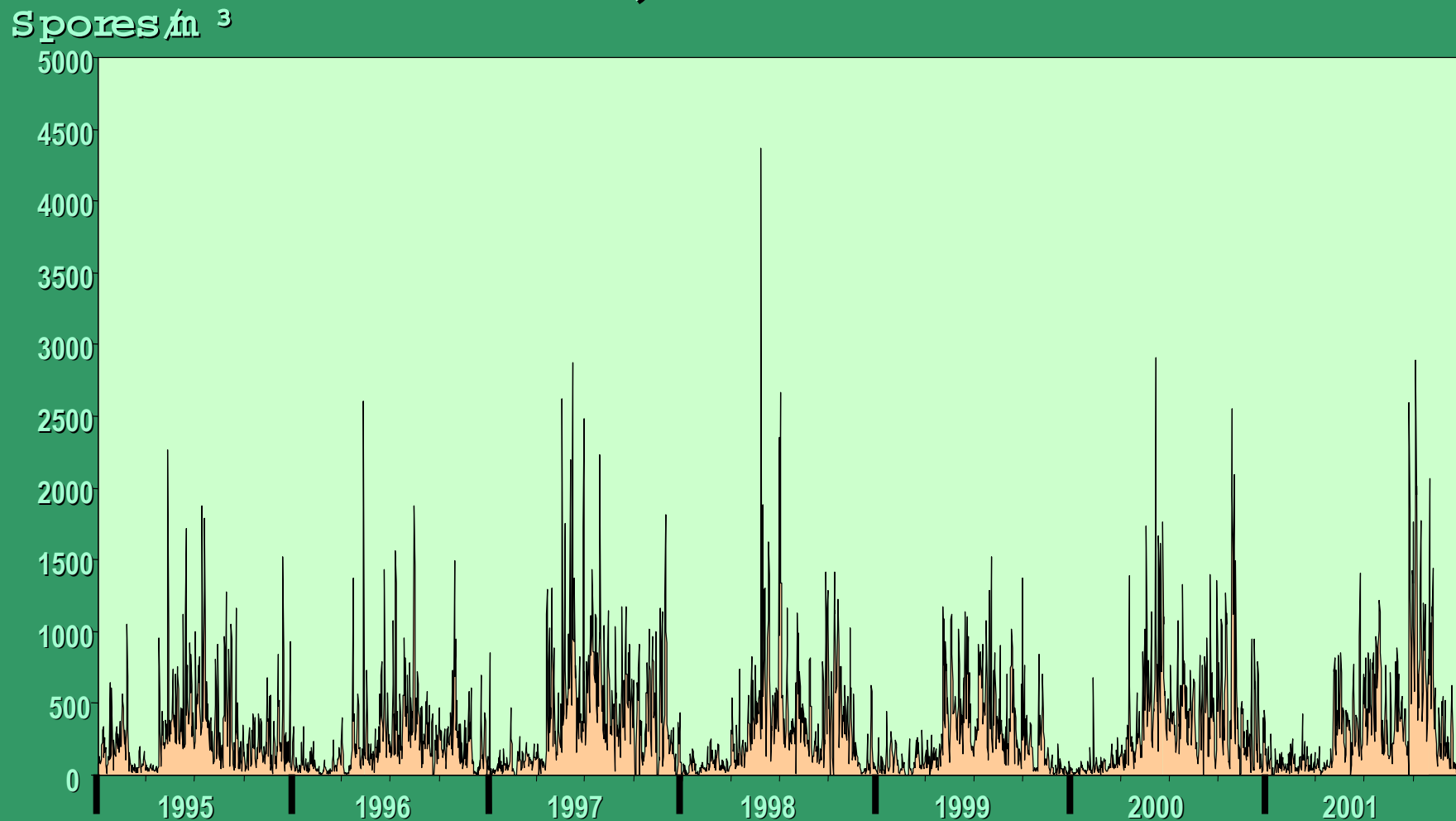
Monthly indexes variation



Mean weekly concentrations variation



# *Cladosporium* mean daily spores concentrations, Barcelona 1995-2001



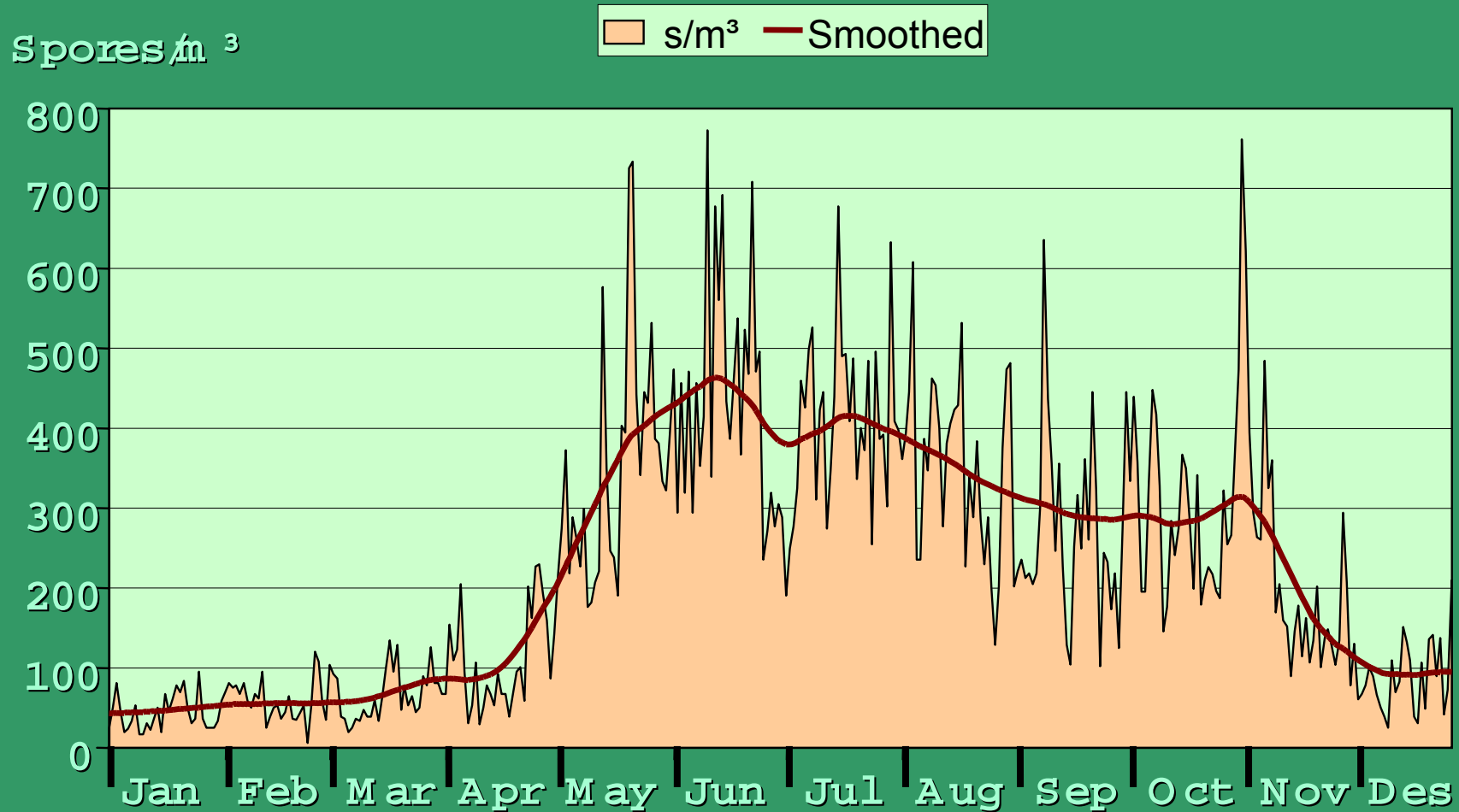


# *Cladosporium* Compared statistics

## Barcelona and Bellaterra, 1995-2001

Site	Statistics	1995	1996	1997	1998	1999	2000	2001
Barcelona	No. days	364	363	351	362	358	365	363
	Mean	299,40	249,32	432,51	342,00	271,69	375,54	371,50
	Std. deviation	312,24	301,58	435,18	423,95	283,85	408,13	443,68
	CV	1,04	1,21	1,01	1,24	1,04	1,09	1,19
	Maximum	2268	2607	2870	4365	1520	2909	2890
Bellaterra	No. days	347	345	365	363	358	361	365
	Mean	709,44	374,83	695,06	520,82	425,08	547,54	543,60
	Std. deviation	785,05	382,59	753,28	674,20	461,00	567,35	672,57
	CV	1,11	1,02	1,08	1,29	1,08	1,04	1,24
	Maximum	5463	2570	6432	6871	2506	3346	3979

# Median daily *Cladosporium* spores concentration with trend (Friedman's supersmoothing), Barcelona 1995-2001



# Conclusions

## Fungal spores spectrum in Catalonia

### Alphabetical relation of allergenic spores:

*Agaricus*  
*Alternaria*  
*Arthrinium*  
*Aspergillus-Penicillium*  
*Chaetomium*  
*Cladosporium*  
COPRINACEAE  
*Drechslera-Helminthosporium*  
*Epicoccum*  
*Fusarium*  
*Ganoderma*  
*Leptosphaeria*  
*Nigrospora*  
*Periconia*  
*Polythrincium*  
*Puccinia*  
*Stemphylium*  
*Tilletia*  
*Torula*  
*Ustilago*  
XYLARIACEAE

### Rank of allergenic spores:

*Cladosporium*, COPRINACEAE, *Alternaria*, *Ustilago*  
*Asp-Penicill*, *Leptosphaeria*, *Arthrinium*, *Drechs-Helminth*, *Agaricus*...

### Rank of localities:

Manresa  
Girona  
Lleida  
Bellaterra  
Tarragona  
Barcelona

↓ +  
-  
Total spores  
Allergenic spores  
Highest annual indexes

### Rank of localities following the diversity of taxa with highest annual indexes:

Girona  
Manresa - Lleida  
Bellaterra  
Tarragona - Barcelona

↓ +  
-  
Total spores  
Allergenic spores  
Highest annual indexes

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