



Schweizerische Eidgenossenschaft  
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Confederazione Svizzera  
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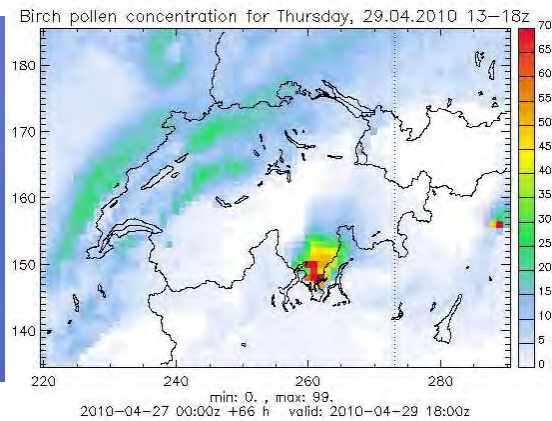
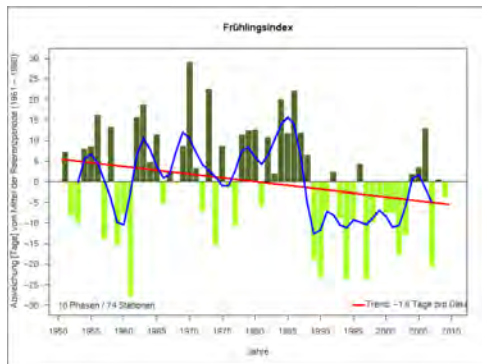
Swiss Confederation

Federal Department of Home Affairs FDHA  
Federal Office of Meteorology and Climatology MeteoSwiss

# Changements climatiques récents et risque d'allergie aux pollens

Bernard Clot

Séminaire allergies, CHUV, 3 février 2011





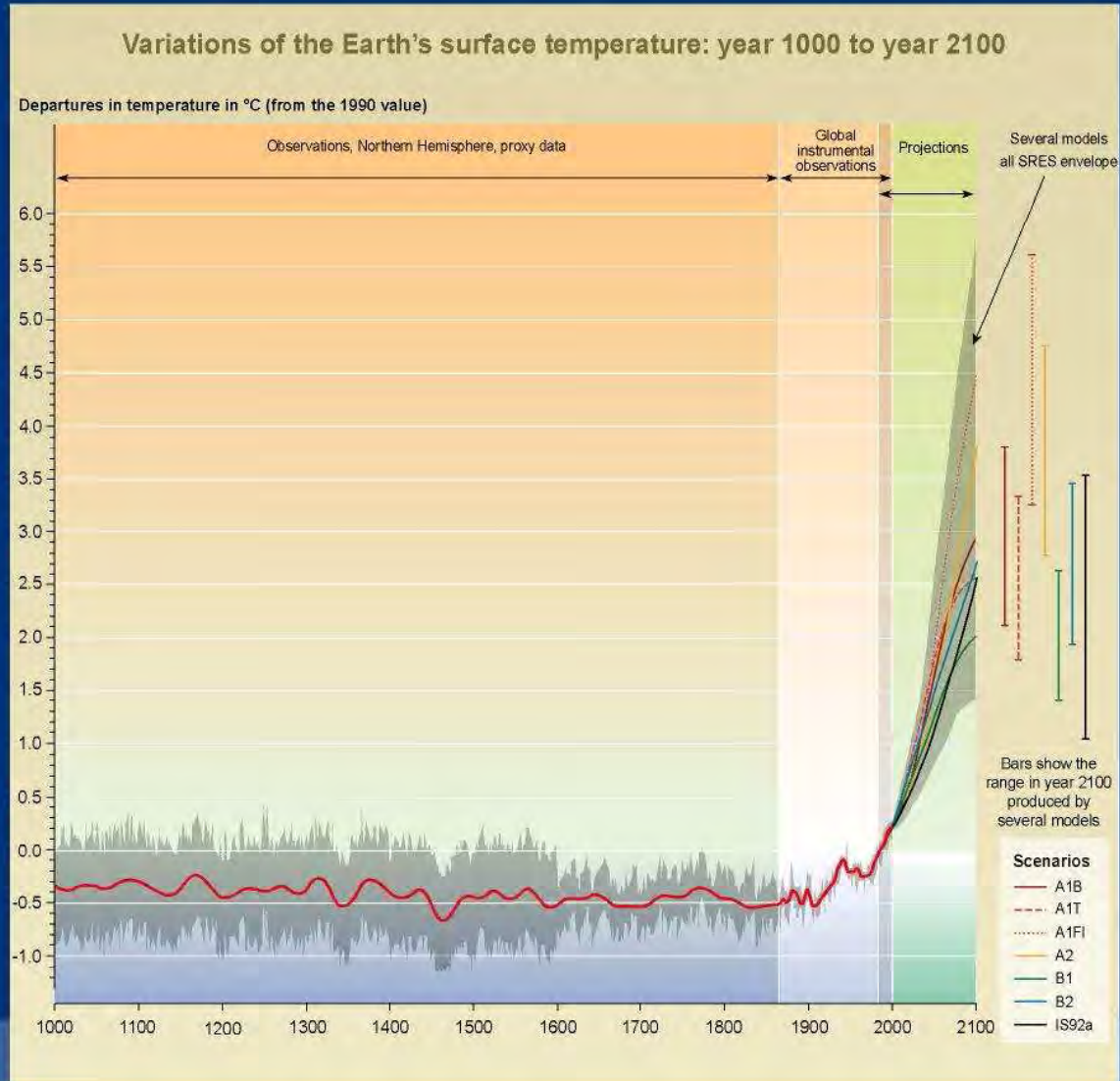
## Outline

- Changement climatique
- Pollen: mesure et évolution
- Considérations pour l'avenir
- Conclusion





# Changement climatique : température globale

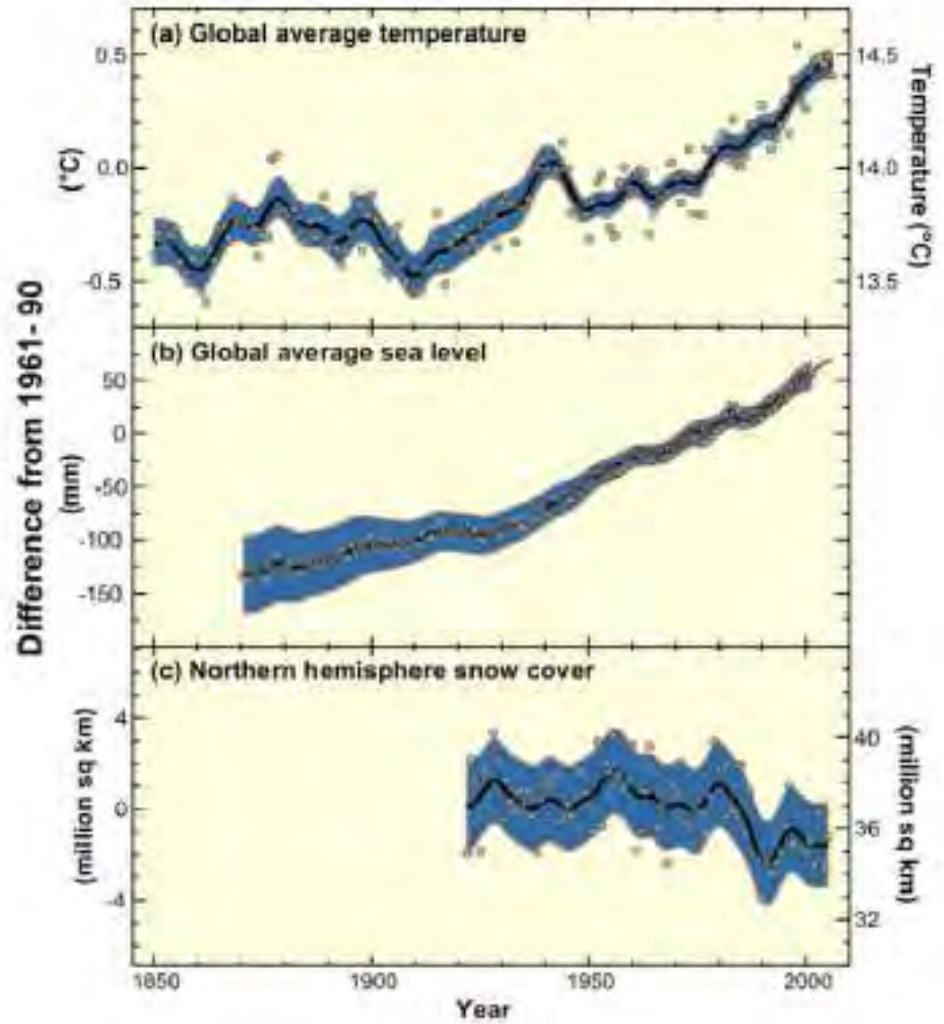


SYR - FIGURE 9-1b



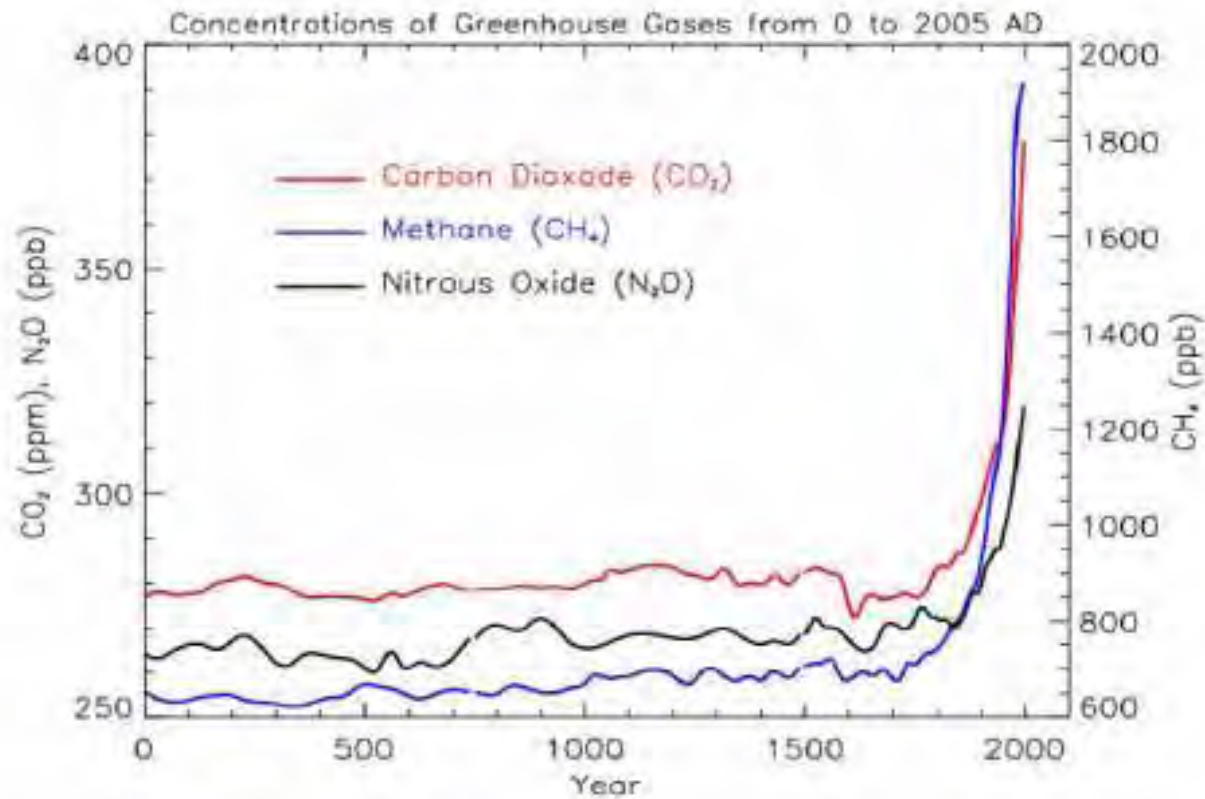
# Observations: preuves du changement qui a déjà eu lieu

- Rapport IPCC AR4





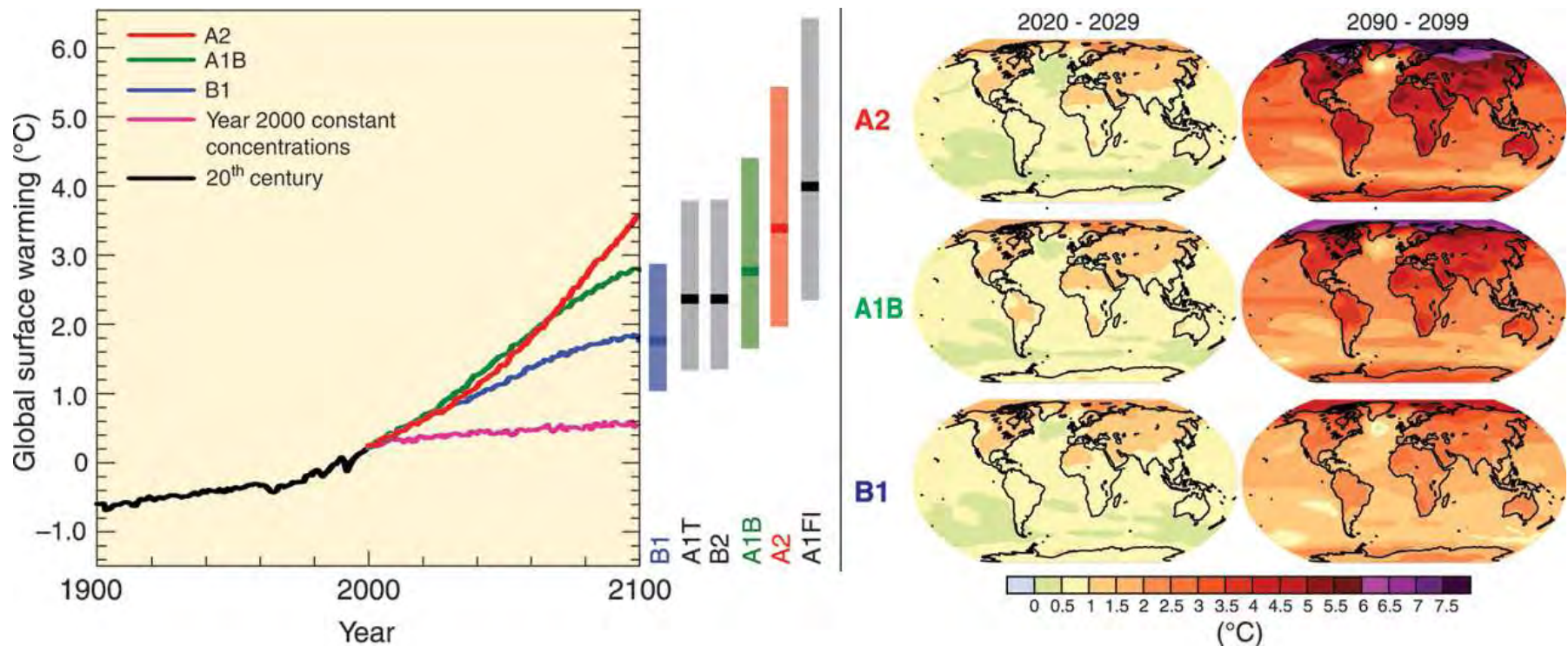
Cause: augmentation des concentrations de gaz à effet de serre



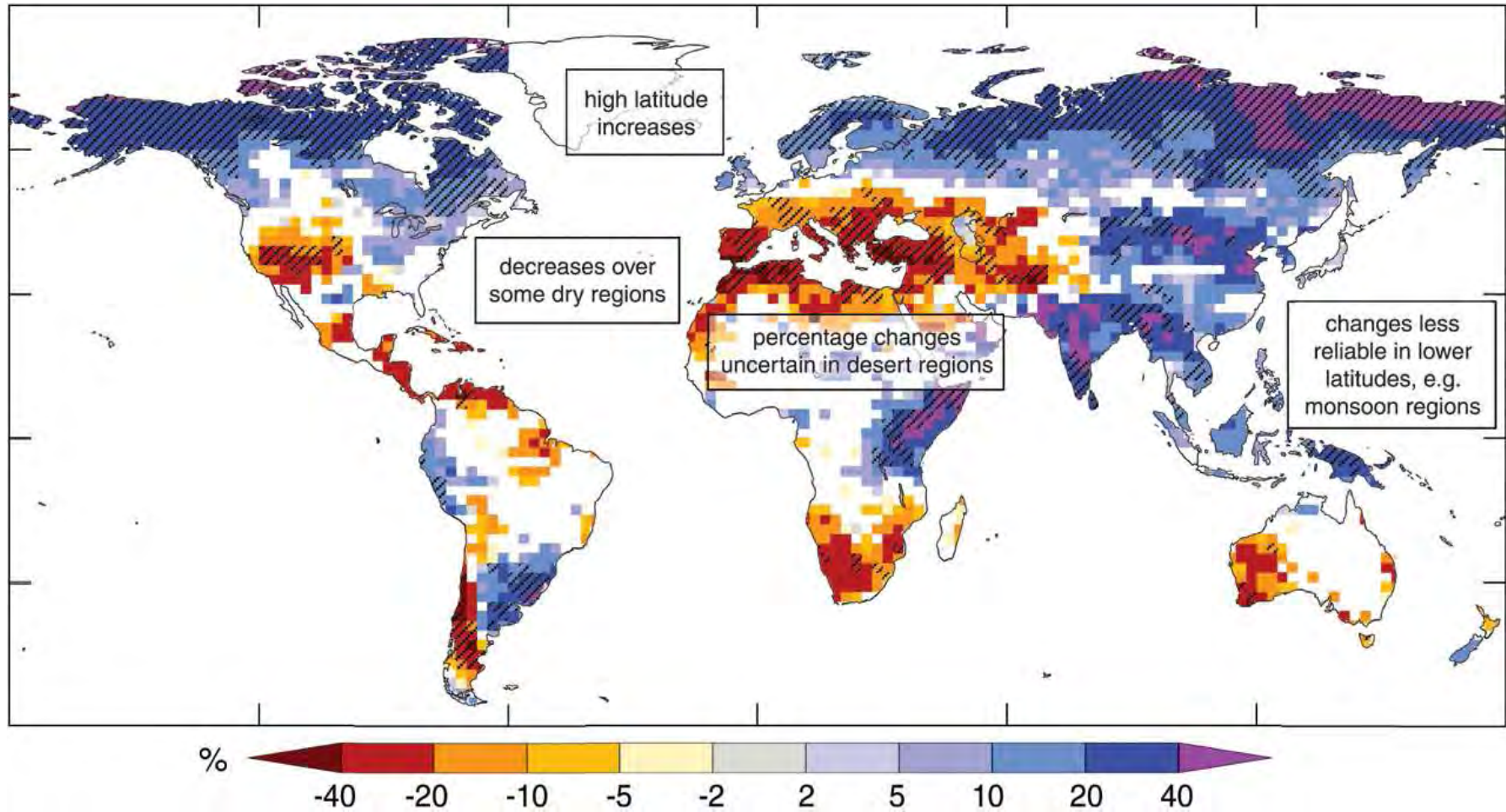


## Projections de l'augmentation de la température du globe

- Next two decades: 0.2°C / decade
- Scénario "level 2000" of greenhouse gases: 0.1°C / decade
- 2nd IPCC report (1995) : increase of 1,0 to 3,5°C → 2100
- 4th IPCC report (2007) : increase of 1,2 to 6,4°C → 2100



# Projection des précipitations au 21<sup>ème</sup> siècle

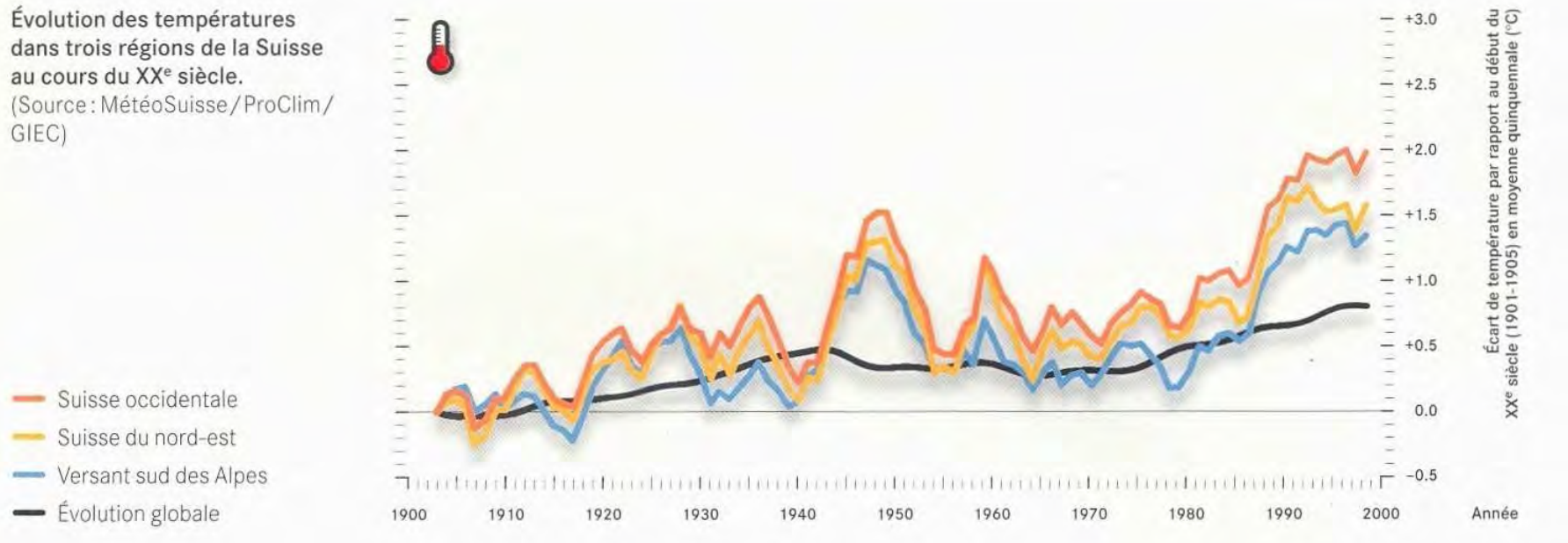


Source: IPCC



# Evolution des températures en Suisse

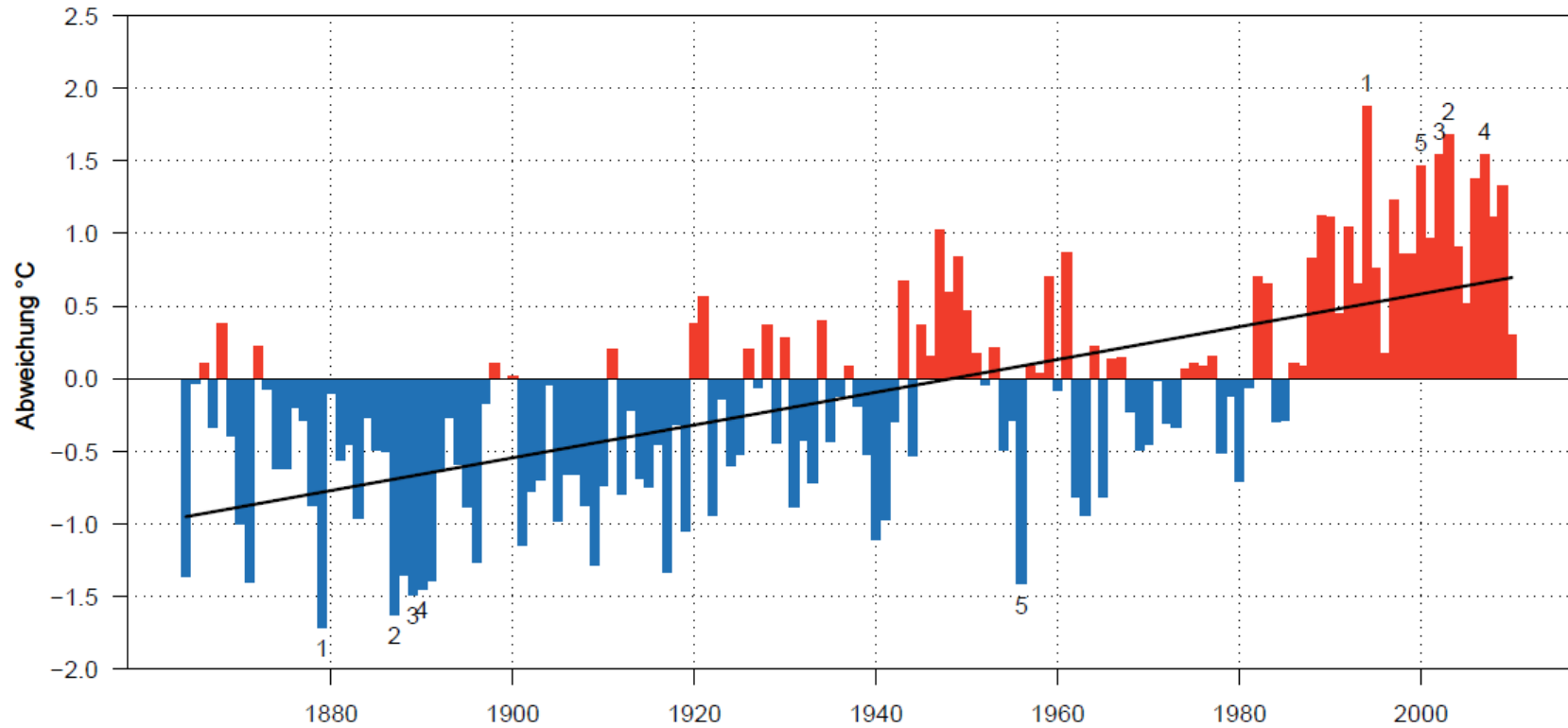
Évolution des températures dans trois régions de la Suisse au cours du XX<sup>e</sup> siècle.  
(Source : MétéoSuisse / ProClim / GIEC)





# Evolution des températures annuelles moyennes en Suisse

Jahres-Temperatur Mittel(CHD,CHM,BAS,BER,DAV,ENG,GVE,LUG,SAE,SIA,SIO,SMA) 1864-2010  
Abweichung vom Durchschnitt 1961-1990



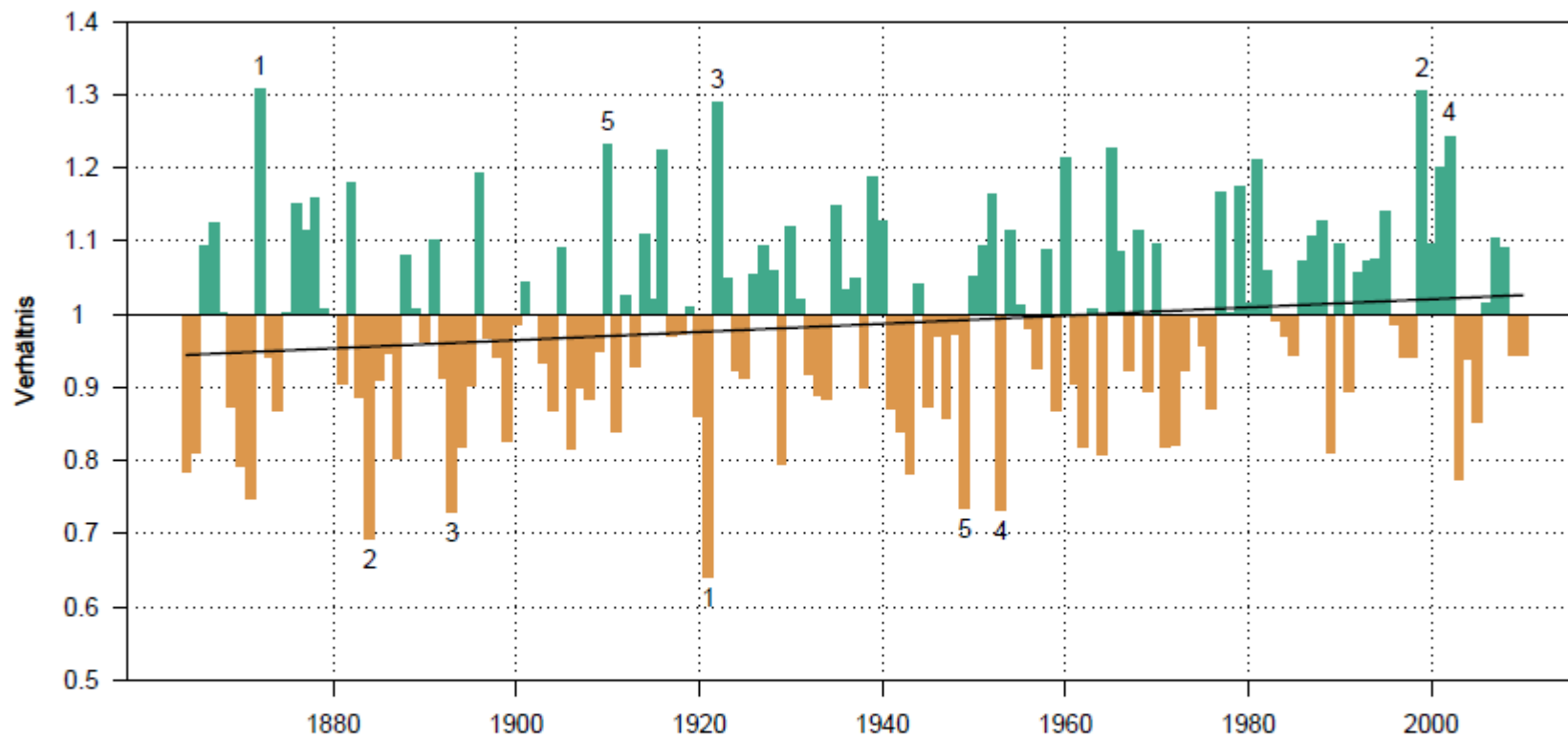
- Jahre über dem Durchschnitt 1961-1990
- Jahre unter dem Durchschnitt 1961-1990
- Linearer Trend 1864-2010 (least squares):  $1.13^{\circ}\text{C}/100\text{y}$  (p-val: 0)

Jahr 2010:  $+0.3^{\circ}\text{C}$  (Rang 37)  
Jahr 2010:  $+0.3^{\circ}\text{C}$  (Rang 111)



# Evolution des précipitations en Suisse

Jahres-Niederschlag Mittel(CHD,CHM,BAS,BER,DAV,ENG,GVE,LUG,SAE,SIA,SIO,SMA) 1864–2010  
Verhältnis zum Durchschnitt 1961–1990



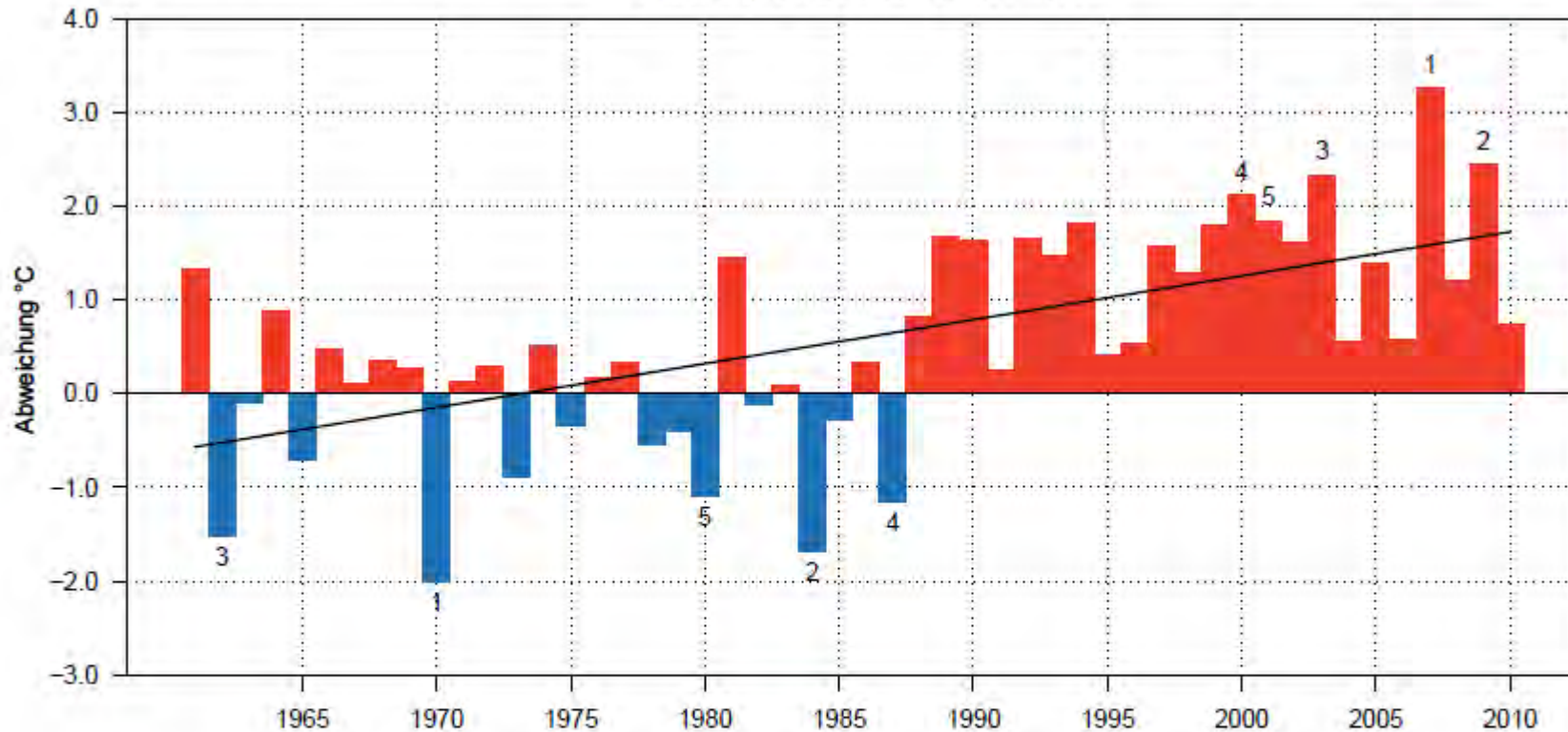
■ Jahre über dem Durchschnitt 1961–1990  
■ Jahre unter dem Durchschnitt 1961–1990  
— Linearer Trend 1864–2010 (Theil–Sen): 5.6%/100y (p-val: 0.049)

Jahr 2010: 94% (Rang 88)  
Jahr 2010: 94% (Rang 60)



# Spring average temperatures (MAM)

Quartals-Temperatur (MAM) Mittel(CHD,CHM,BAS,BER,DAV,ENG,GVE,LUG,SAE,SIA,SIO,SMA) 1961–2010  
Abweichung vom Durchschnitt 1961–1990



- Jahre über dem Durchschnitt 1961–1990
- Jahre unter dem Durchschnitt 1961–1990
- Linearer Trend 1961–2010 (least squares):  $0.47^{\circ}\text{C}/10\text{y}$  (p-val: 0)

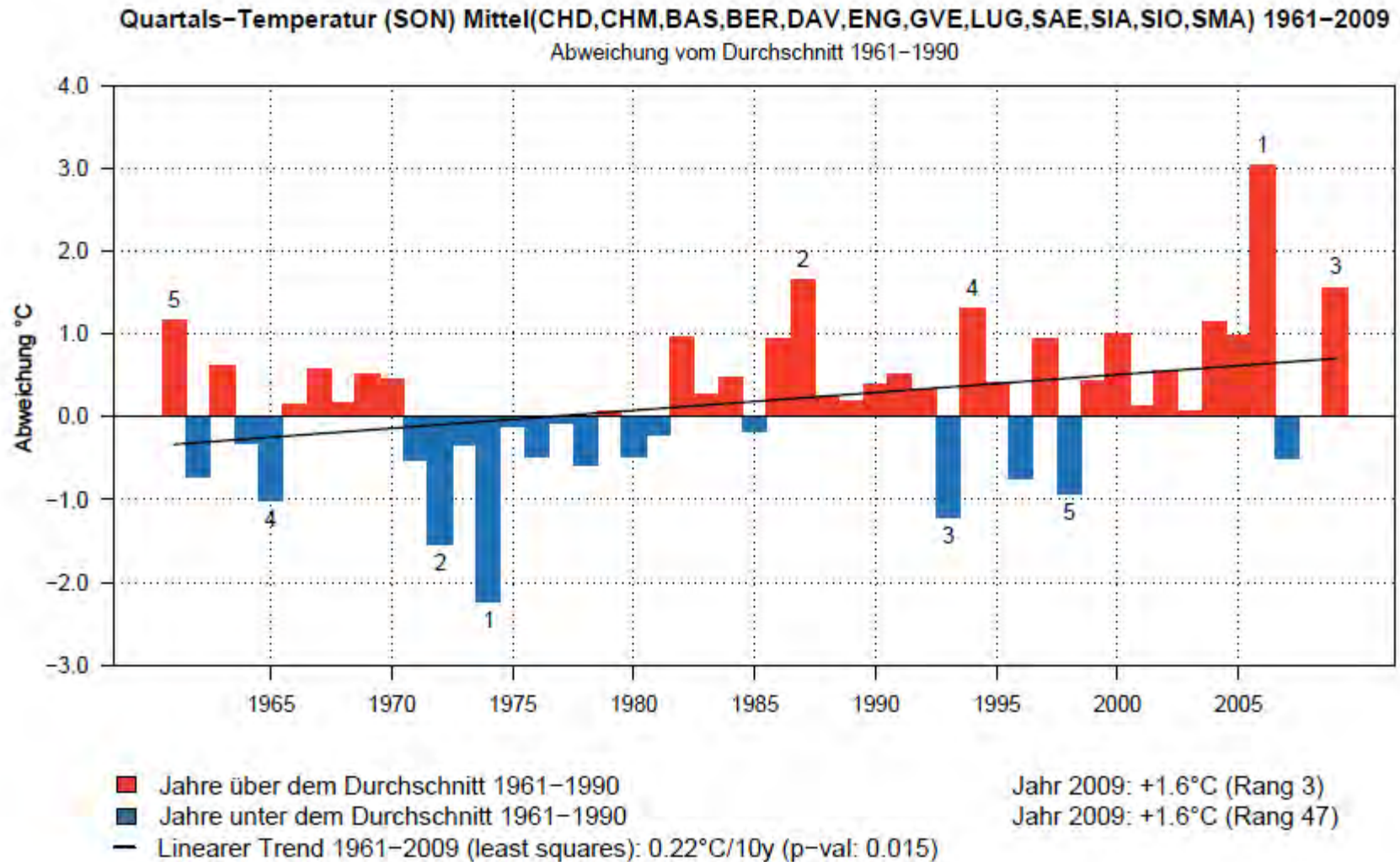
Jahr 2010:  $+0.7^{\circ}\text{C}$  (Rang 21)

Jahr 2010:  $+0.7^{\circ}\text{C}$  (Rang 30)

© MeteoSchweiz



# Autumn average temperatures (JJA)



© MeteoSchweiz



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- Changement climatique
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☞ Différentes échelles de temps et différents moments:  
influences des facteurs météorologiques

long terme (climat) →

l'année précédente →

pause hivernale →

année en cours →

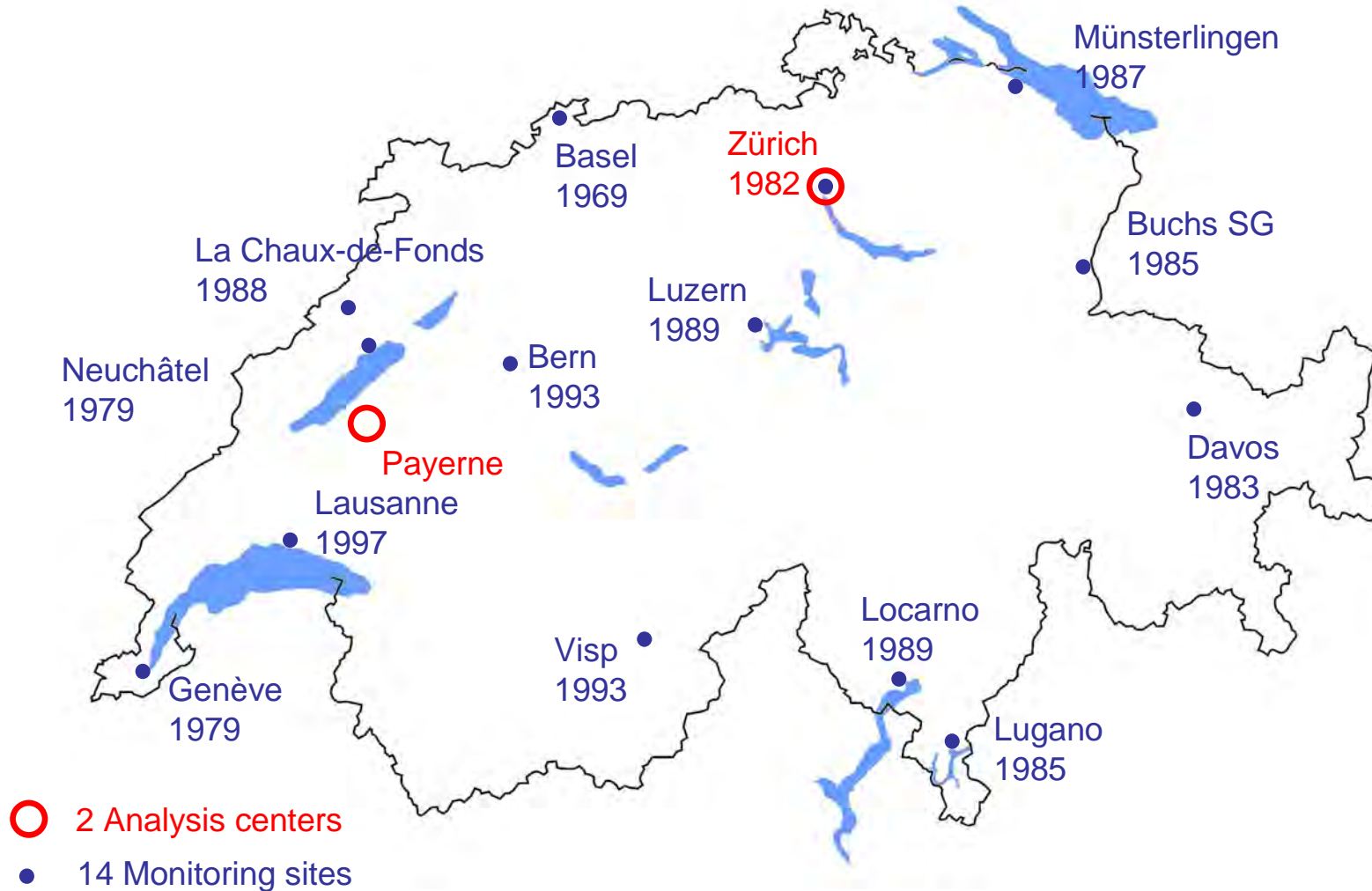
floraison → pollen →

↓  
PREVISIONS



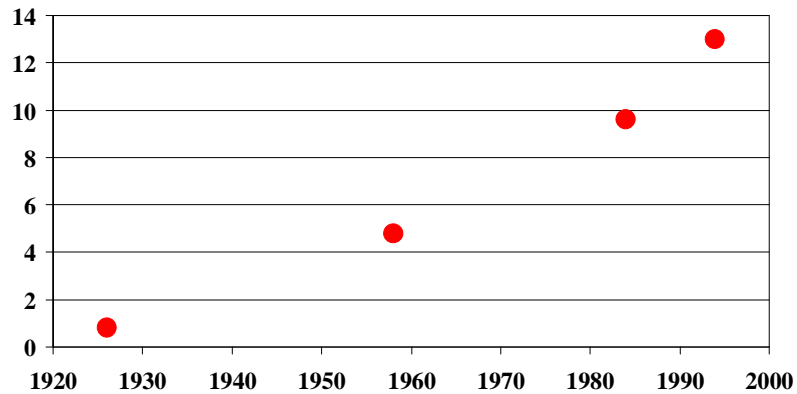


# Le réseau national de mesure du pollen en Suisse





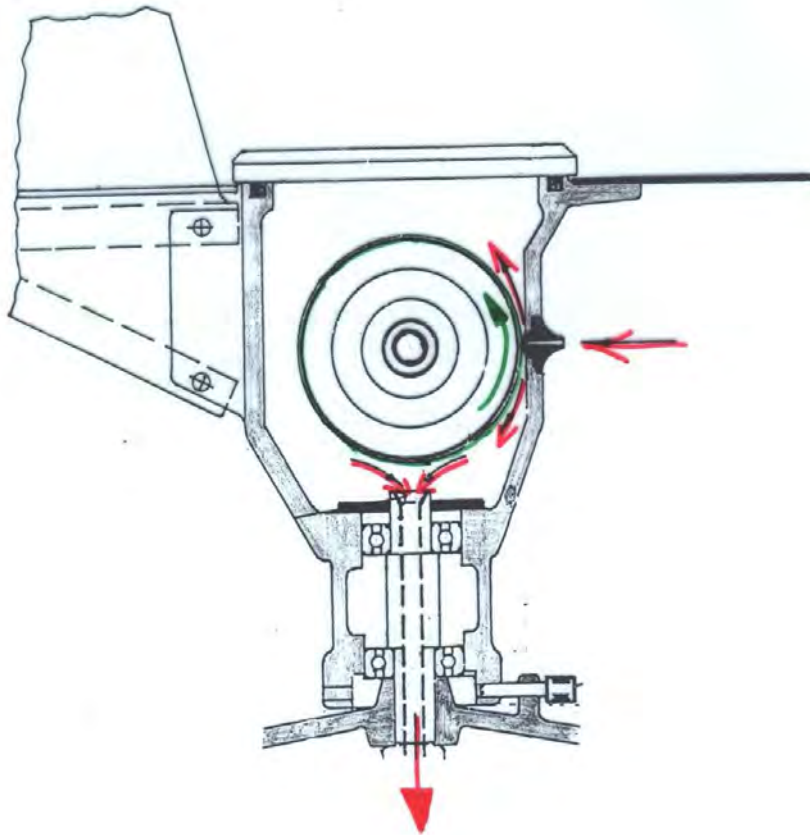
## Prévalence des pollinoses en Suisse [%]



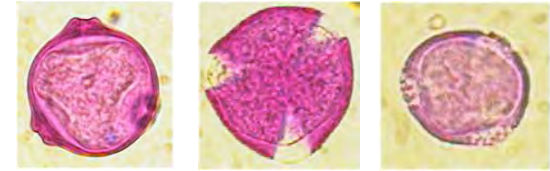
Year	Prevalence [% of the population]
1926	0.8
1958	4.8
1984	9.6
1994	13
2010	15 - 20

## Capteur de pollen

- air flow rate 10 litres / minute
- particles deposited on a tape



## Analyse et comptage



- tape prepared for microscope analysis
- pollen grains identified and counted

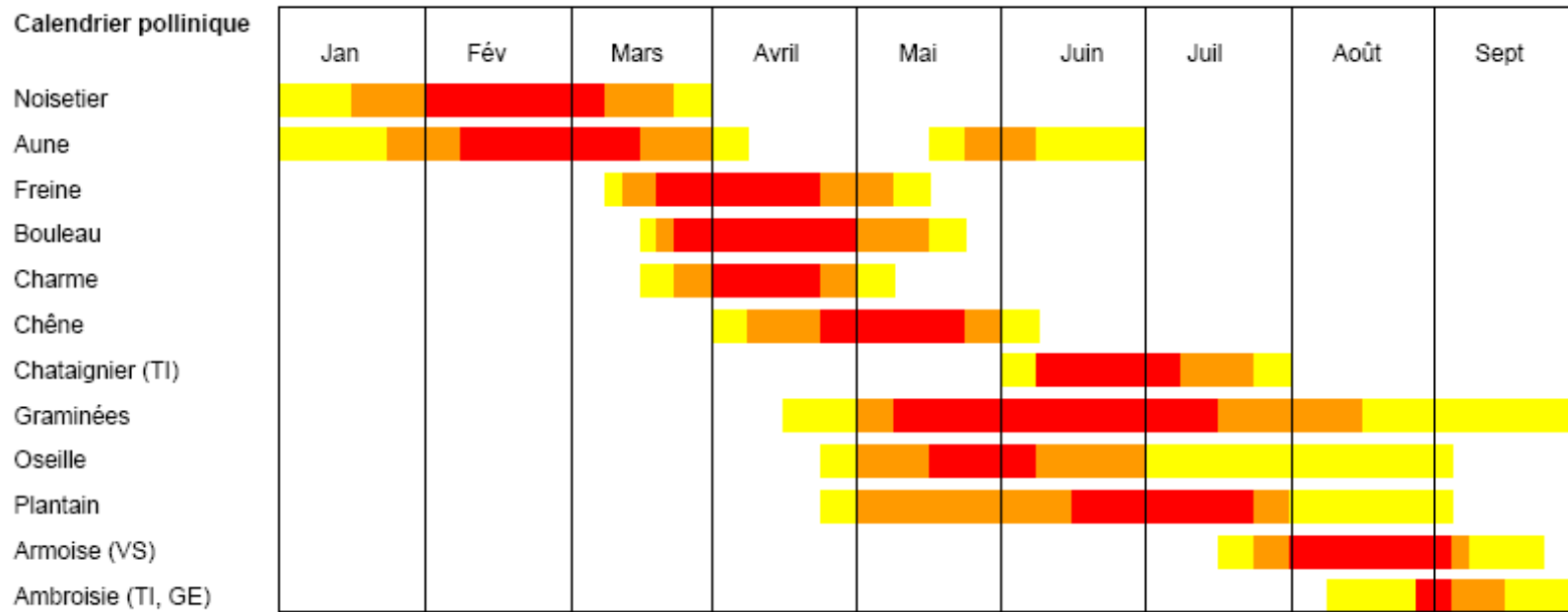


pollen grain

20  $\mu\text{m}$

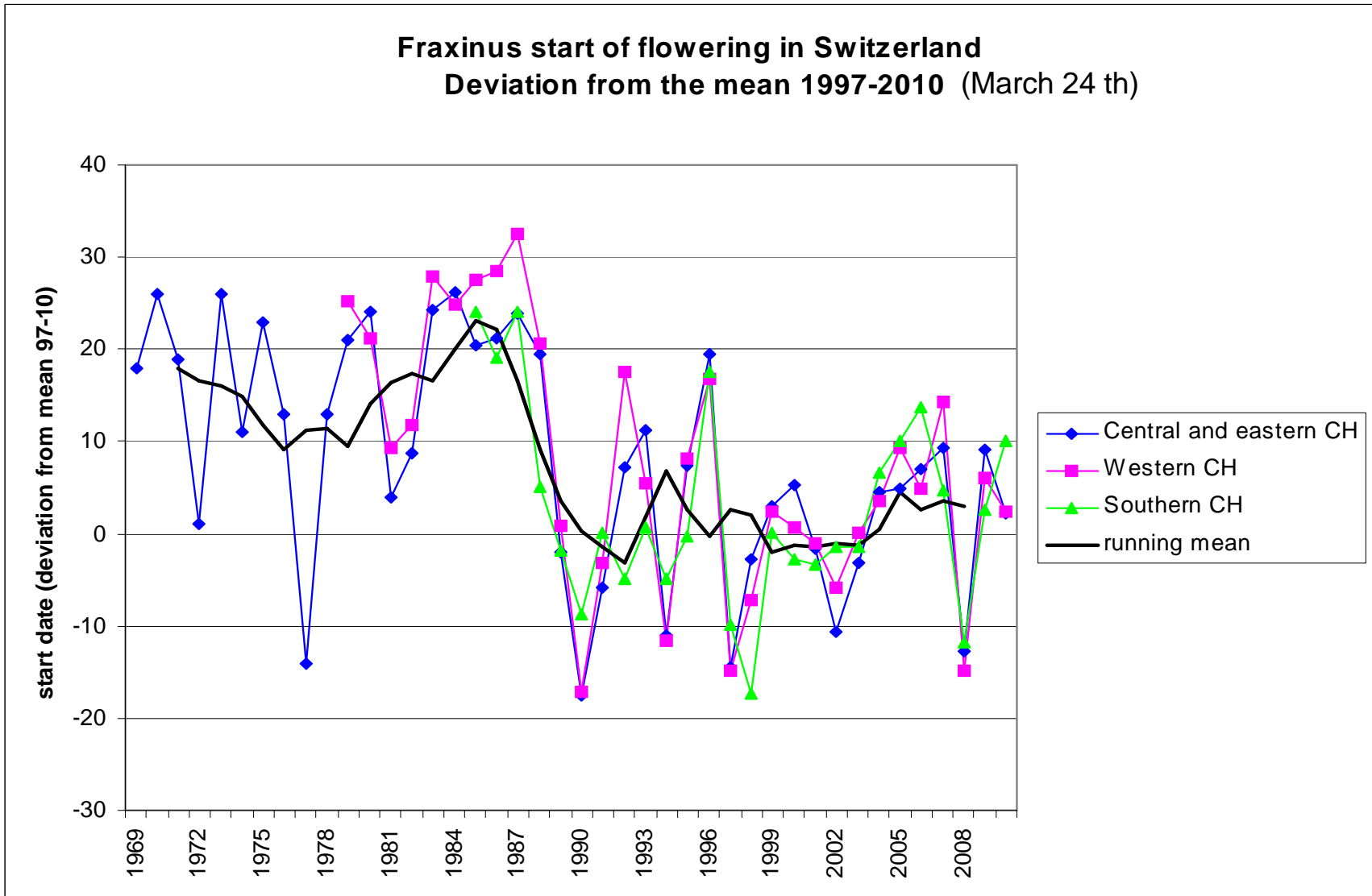


# Calendrier pollinique en Suisse





# Début de la saison du frêne: variabilité et tendances





## Saisons plus précoces

### Basel since 1969

- Corylus - 23 days, sign.
- Betula - 11 days, sign.
- Fraxinus - 22 days, sign.
- Poaceae - 4 days, n.s.
- Urtica - 8 days, sign.

### Average Basel, Zürich, Neuchâtel since 1982

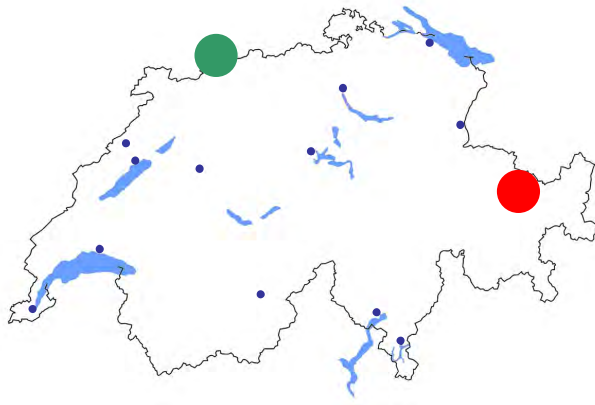
- Corylus - 13 days, n.s.
- Betula - 11 days, n.s.
- Fraxinus - 21 days, sign.
- Poaceae - 10 days, sign.
- Urtica - 10 days, sign.



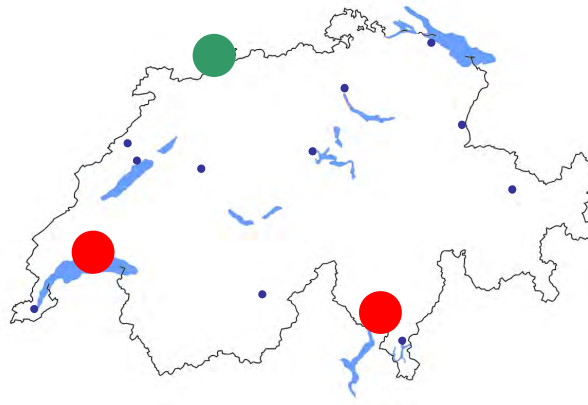
# Season start: significant trends

- Earlier
- Later

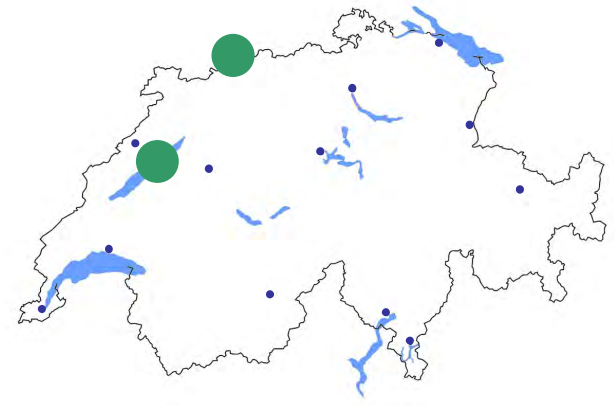
### Corylus



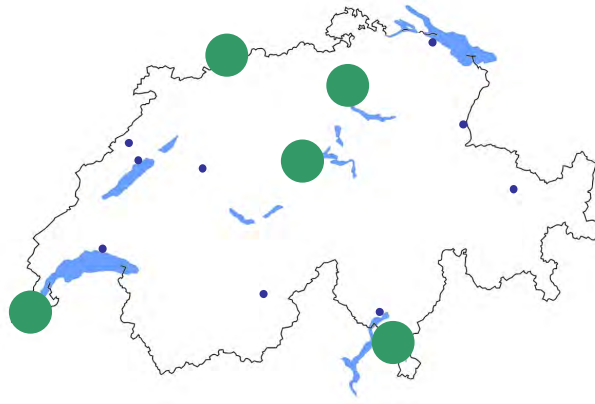
### Betula



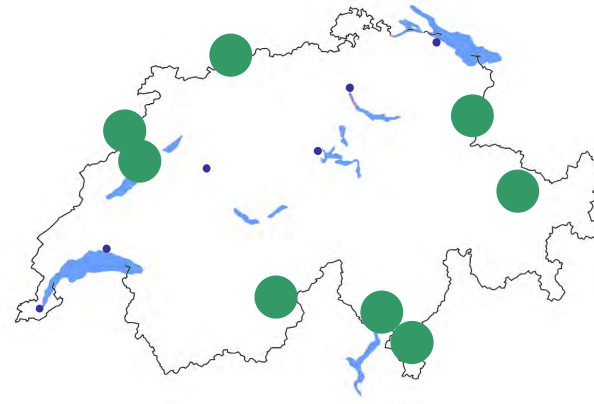
### Fraxinus



### Poaceae



### Urtica

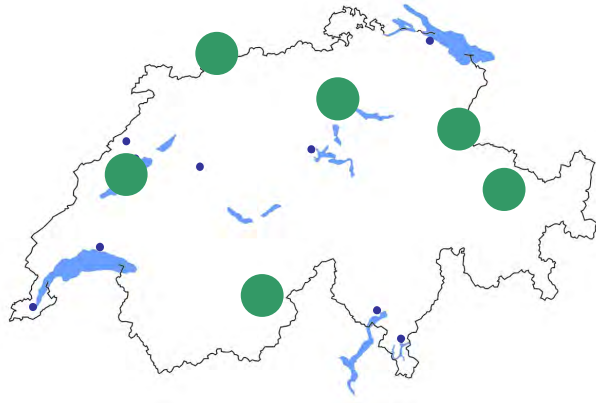




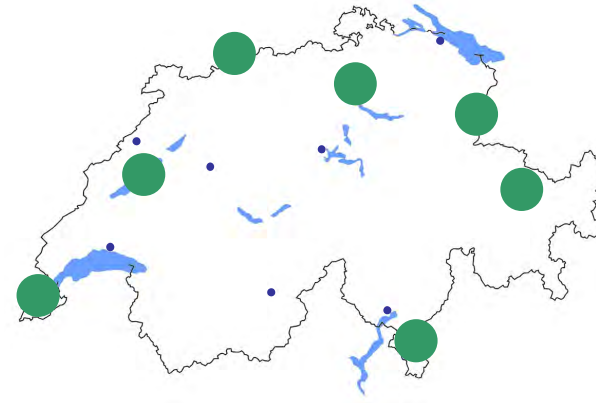
# Season end: significant trends

- Earlier
- Later

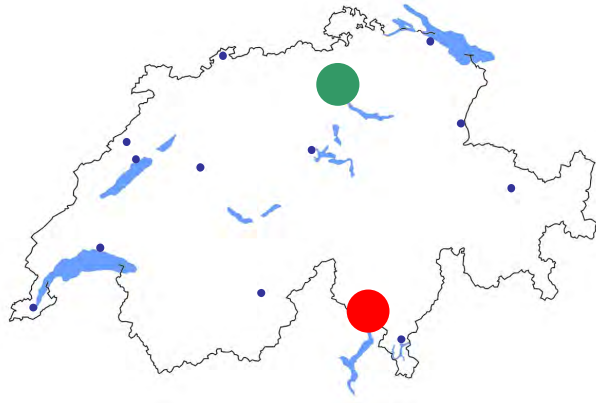
## Betula



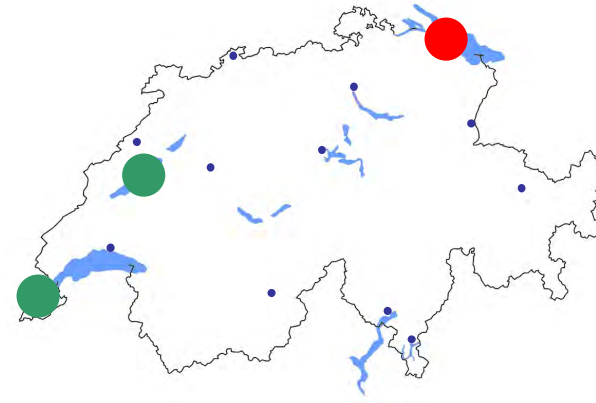
## Fraxinus



## Poaceae



## Urtica

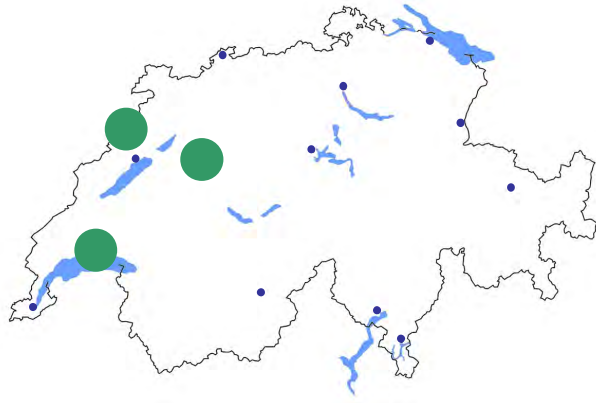




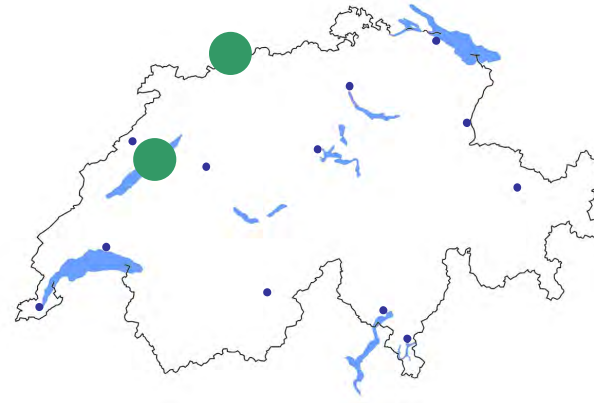
# Season duration: significant trends

- Shorter
- Longer

## Betula



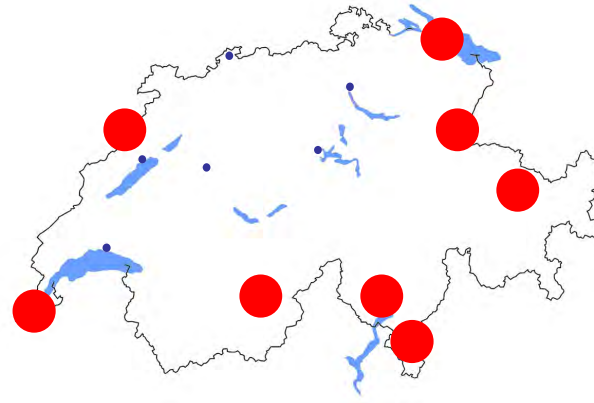
## Fraxinus



## Poaceae

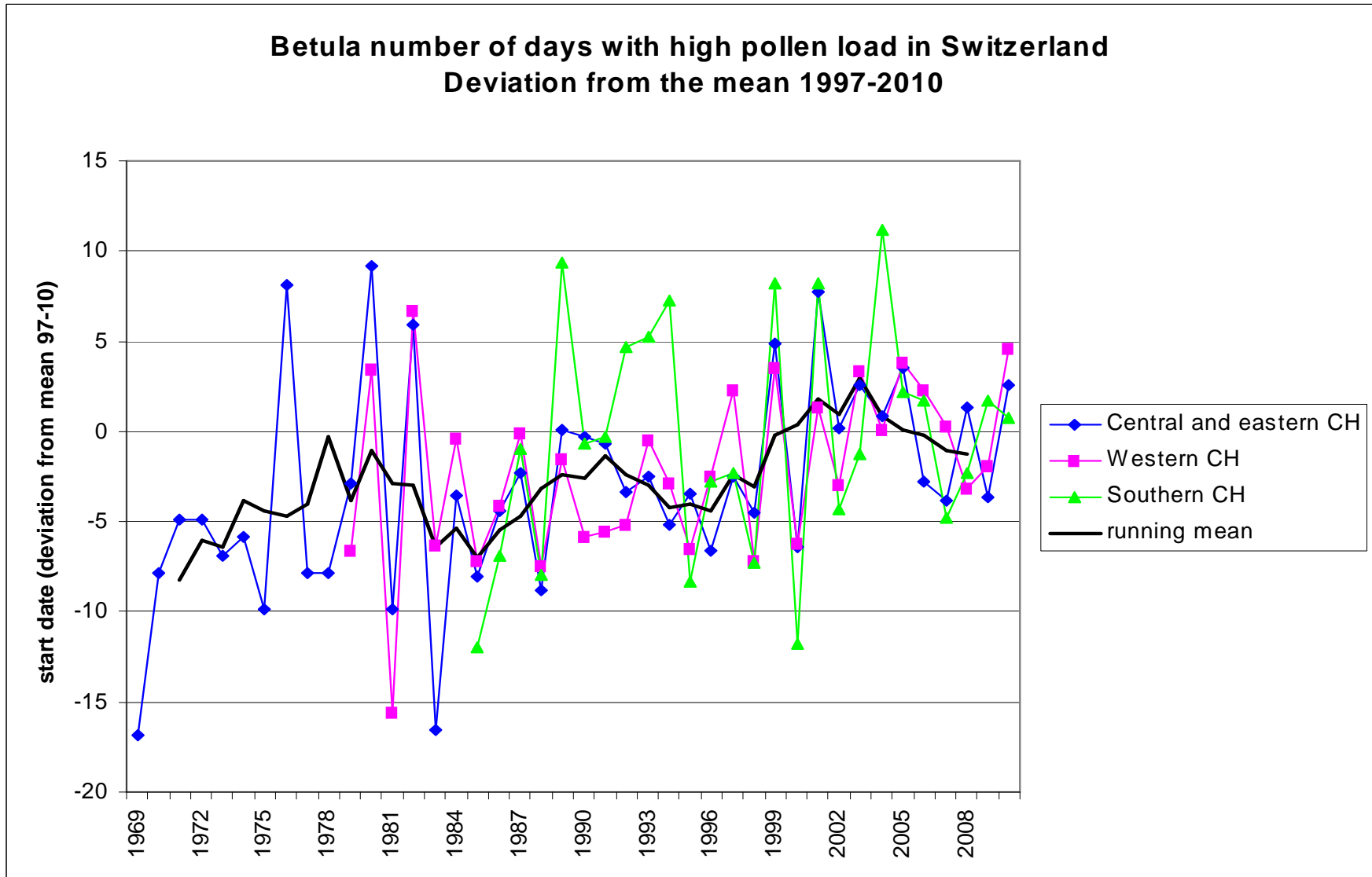


## Urtica





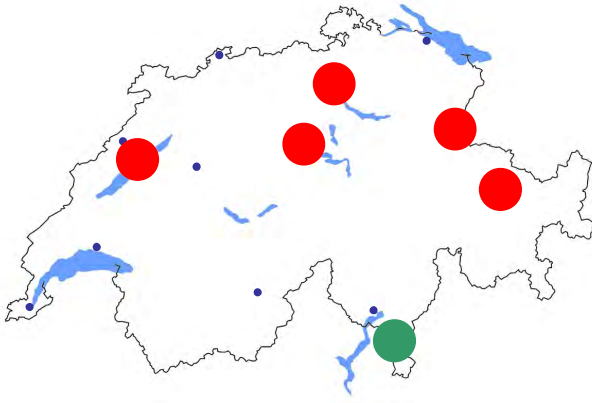
# Severity of birch pollen season



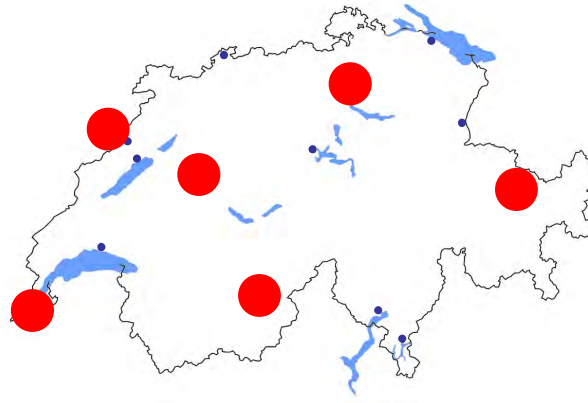
 SPI: significant trends

- Less
- More

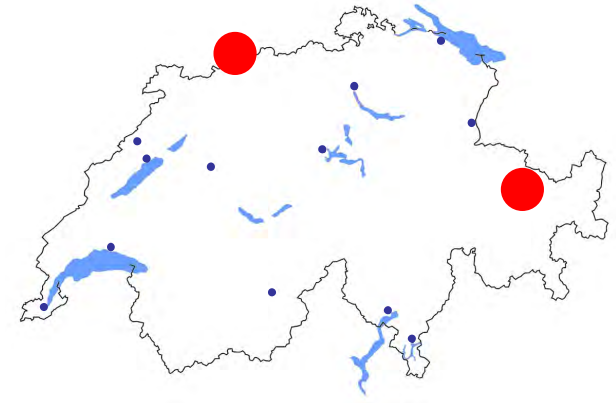
Corylus



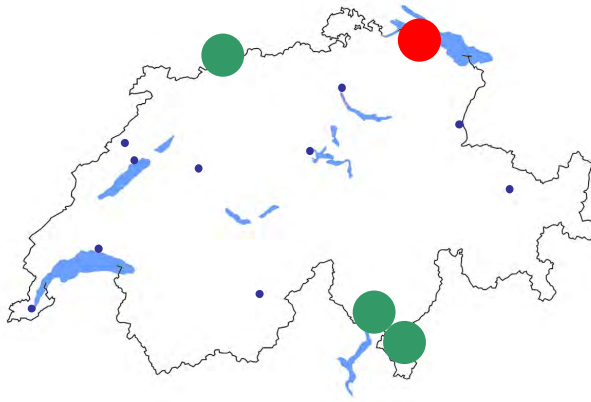
Betula



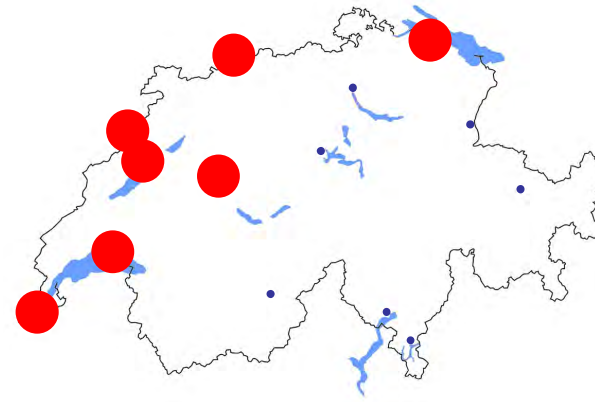
Fraxinus



Poaceae



Urtica

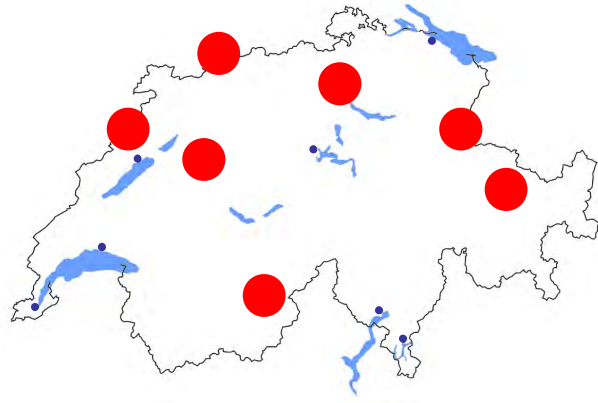




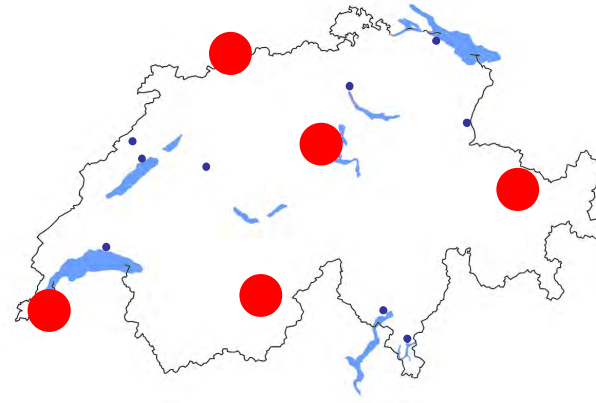
Number of days with high pollen load:  
significant trends

- Lower
- Higher

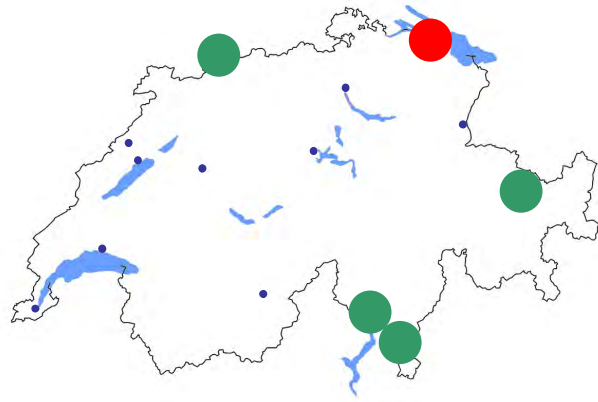
Betula



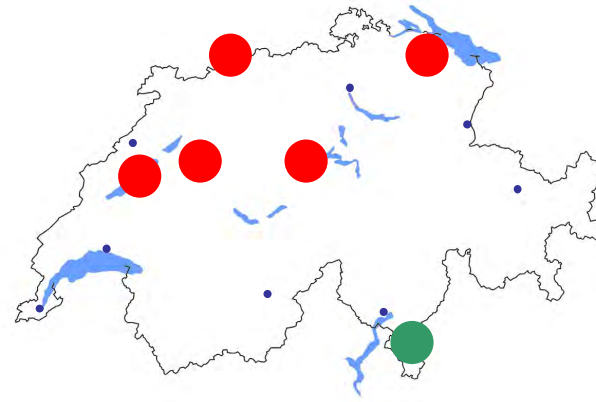
Fraxinus



Poaceae



Urtica





# Pollen trends in Europe (1974-2002)

Tiré de: S. Jaeger, TESA, 2003

pollentype	n=	timing			duration		intensity	
		start	peak	end	len	nofdays	peakval	anntotl
Aune	2305	-2	-2	-2	0	0	0	0
Noisetier	2285	-2	-2	-2	2	0	0	0
Cyprès	1768	-2	-2	0	2	2	2	2
Peuplier	1650	-2	-2	-2	2	2	0	0
Saule	1706	-2	-2	-2	2	1	0	0
Bouleau	2552	-2	-2	-2	0	-2	0	0
Frêne	2033	-2	-2	0	2	2	0	0
Platane	1924	-2	-2	-2	0	2	2	2
Olivier	999	0	0	0	0	-2	0	0
Pin	1877	-2	-2	0	2	2	0	0
Graminées	2532	-2	-2	0	2	2	2	2
Châtaignier	1350	-2	-2	-2	0	0	2	2
Chénopod.	1958	-2	0	2	2	2	2	2
Urticacées	2184	-2	-2	2	2	2	2	2
Ambroisie	760	-1	0	2	2	2	1	2
Armoise	2127	-2	0	2	2	2	0	0
Mercuriale	596	-2	-1	0	2	0	0	0

-2 earlier   
 2 later   
 -2 less   
 2 more



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 Tendance: rudéralisation



Plantain, armoise, chénopode

🇨🇭 Tendances: extension de l'aire de répartition, introductions



Pariétaire

 Tendances: introductions



Cyprès, olivier, Cryptomeria (cèdre du Japon)

## Risques liés à la gestion des espaces urbanisés

Plus de pollen = risque accru

- plantation d'arbres dans les villes et les jardins
  - exemple: bouleau
  - exemple: platane



☝ Risques liés à la gestion des espaces urbanisés



*Alnus spaethii* à Buchs (Photo M. Gassner)



## Risques liés à la gestion des espaces urbanisés

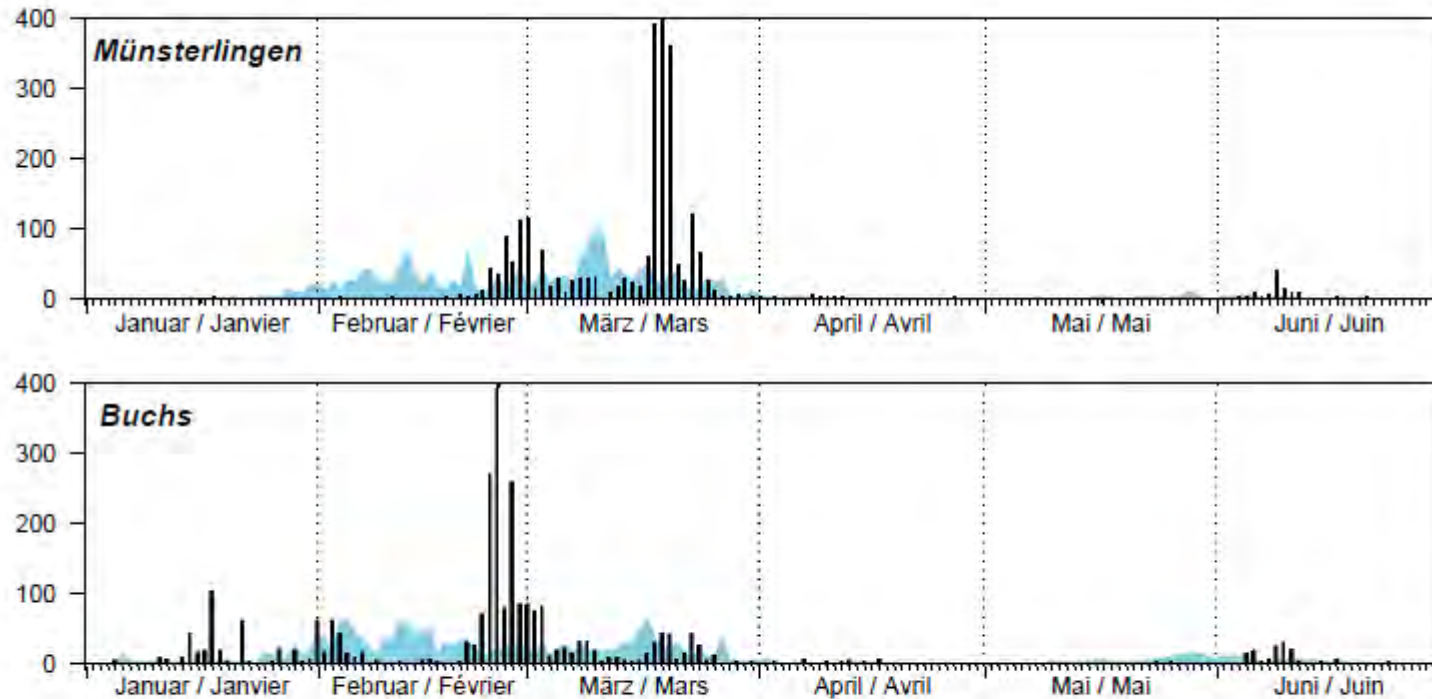


Abb. 9 Vergleich der Erlenpollensaison in Buchs (mit Blüte der Purpurerle im Januar und Februar) und Münsterlingen. Im Mai/Juni: nur schwache Grünerlenpollensaison.

*Alnus spaethii* à Buchs en 2010

## Risques liés aux plantes envahissantes

- exemple: Trachycarpus
- exemple: solidage





## Ambroisie, le pire pollen ou quand le pollen devient une pollution

- Ambroisie
- Herbe-à-poux
- Ambrosia
- Traubenkraut
- Ragweed
- *Ambrosia artemisiifolia*

[www.ambrosia.ch](http://www.ambrosia.ch)

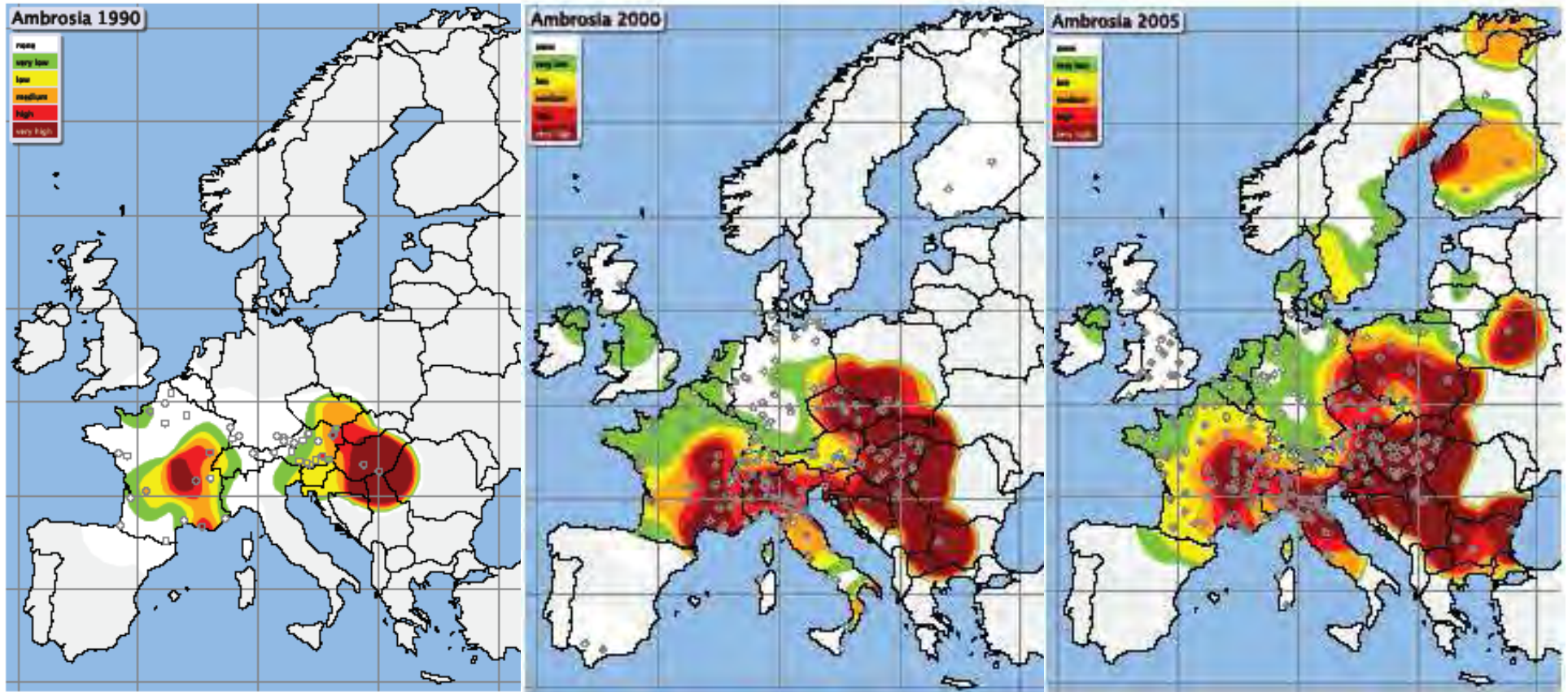


# Pollen d'ambrosie Europe

1990

2000

2005



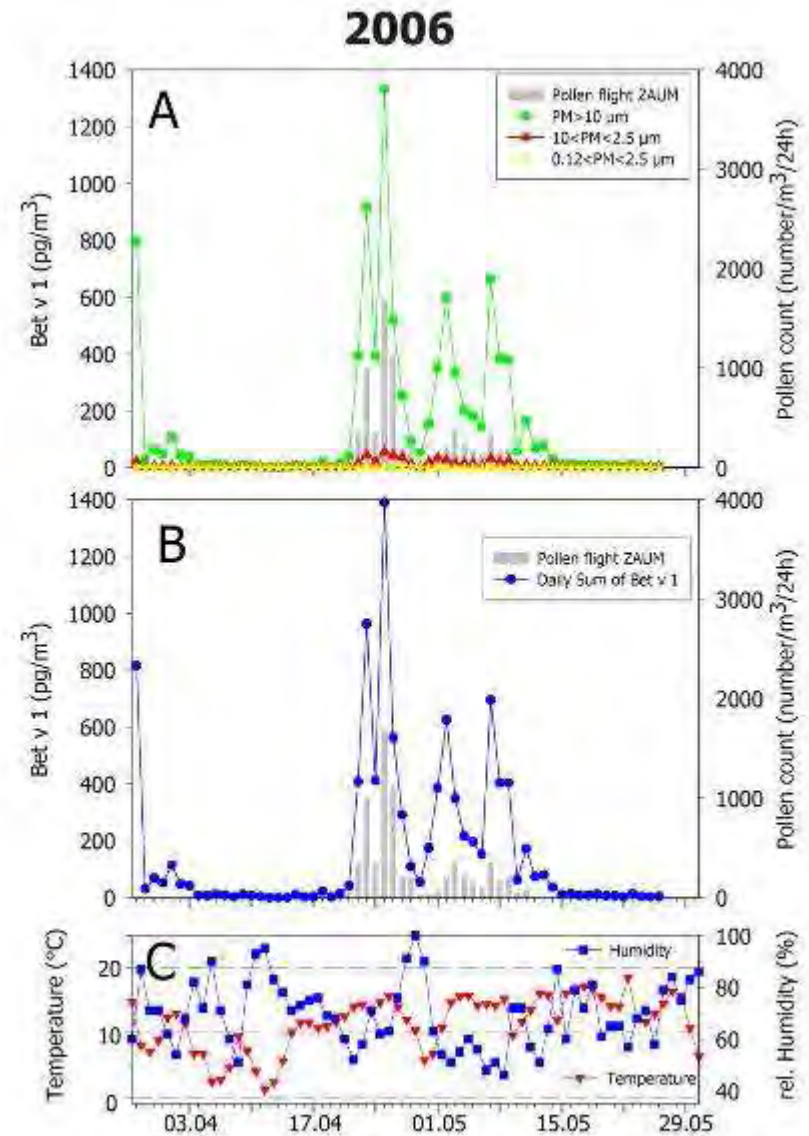
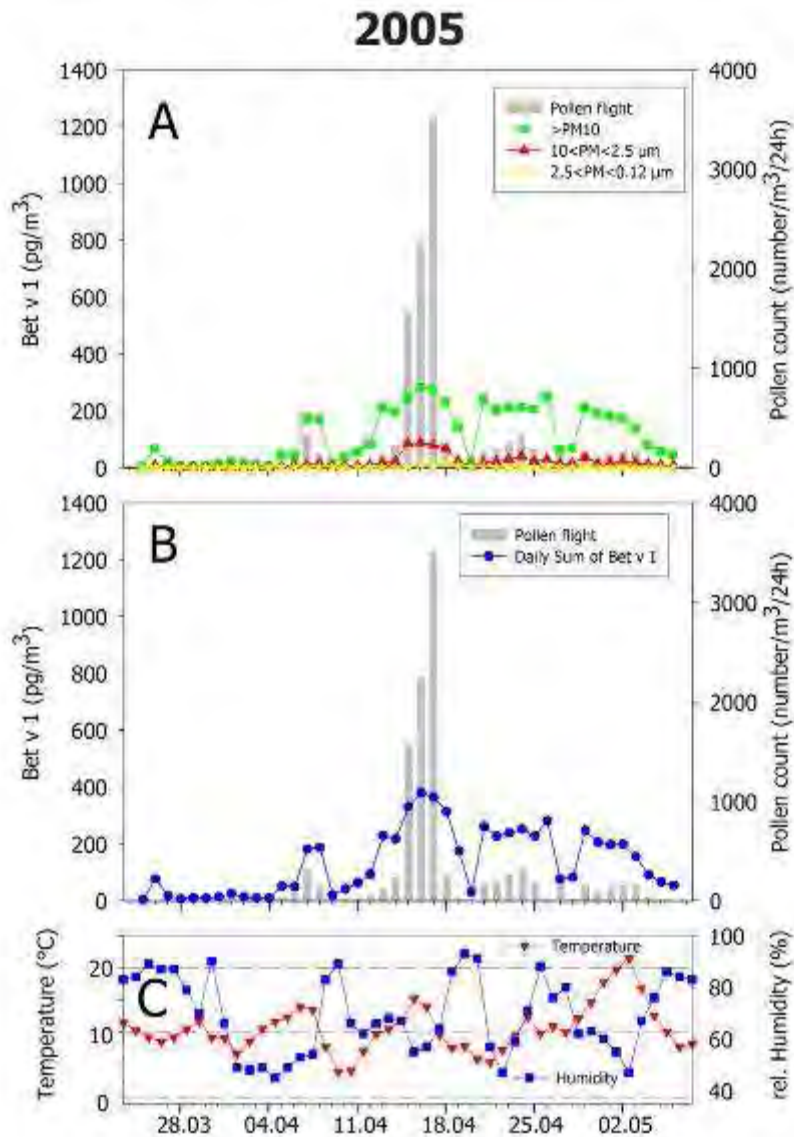
none	0 - 2,2
Very low	2,2 - 8,9
Low	8,9 - 20,0
Moderate	20,0 - 35,6
High	35,6 - 55,6
Very high	55,6 - max

Courtesy S. Jäger, EPI

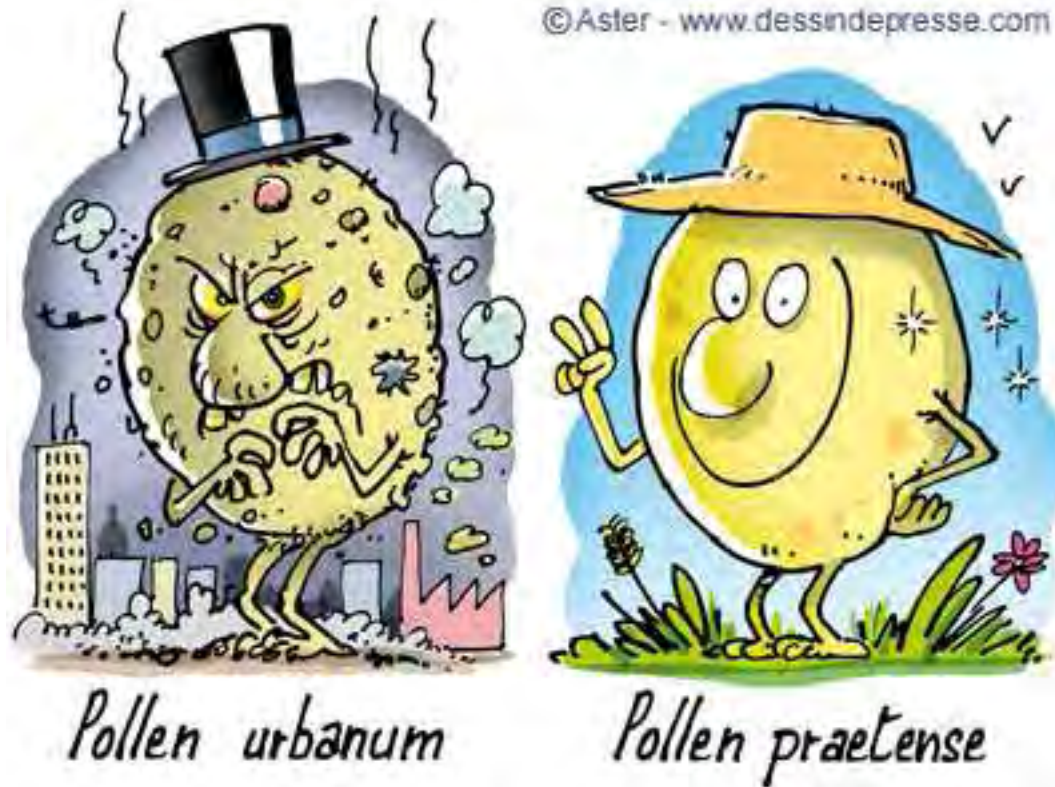


# Allergènes contenus dans le pollen

*Buters et al EAACI 2007, Int Arch Allergy Immunol 2008;145*



☞ Effets de la pollution de l'air





## Autres aspects à considérer

- Le grain de pollen contient aussi différentes substances actives dans la réaction allergiques et l'inflammation (pro-inflammatoires, immunomodulatrices)
- Exposition simultanée ou successive à plusieurs allergènes
  - Extérieur: pollen, spores (champignons, moisissures)
  - Intérieur: acariens, animaux, spores...

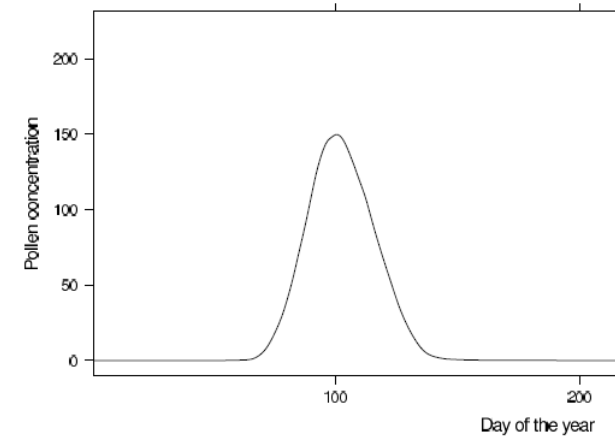
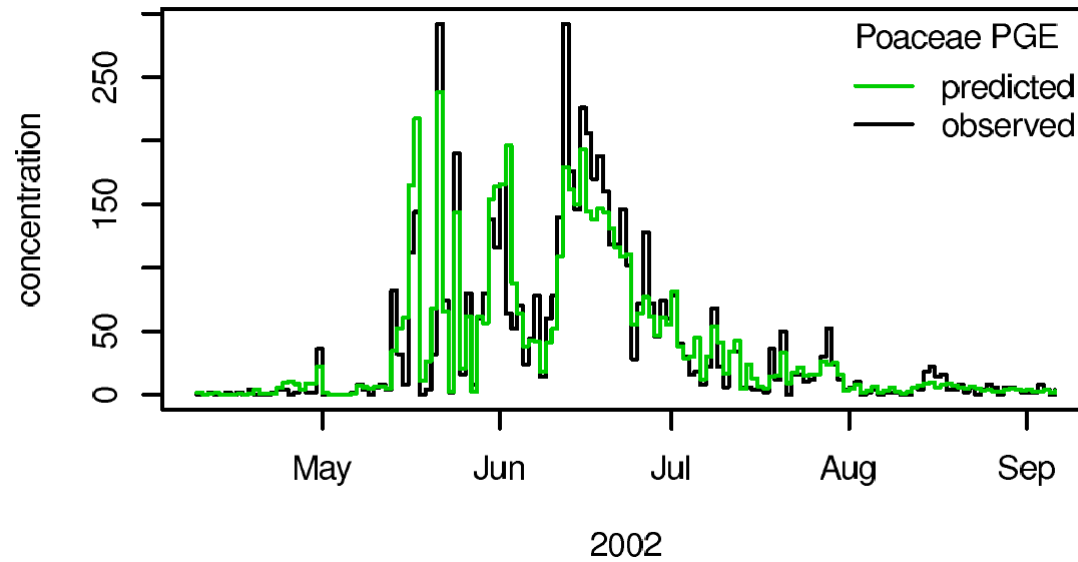
 **Mesurer le pollen automatiquement avec des techniques récentes: divers prototypes**





## Forecasts

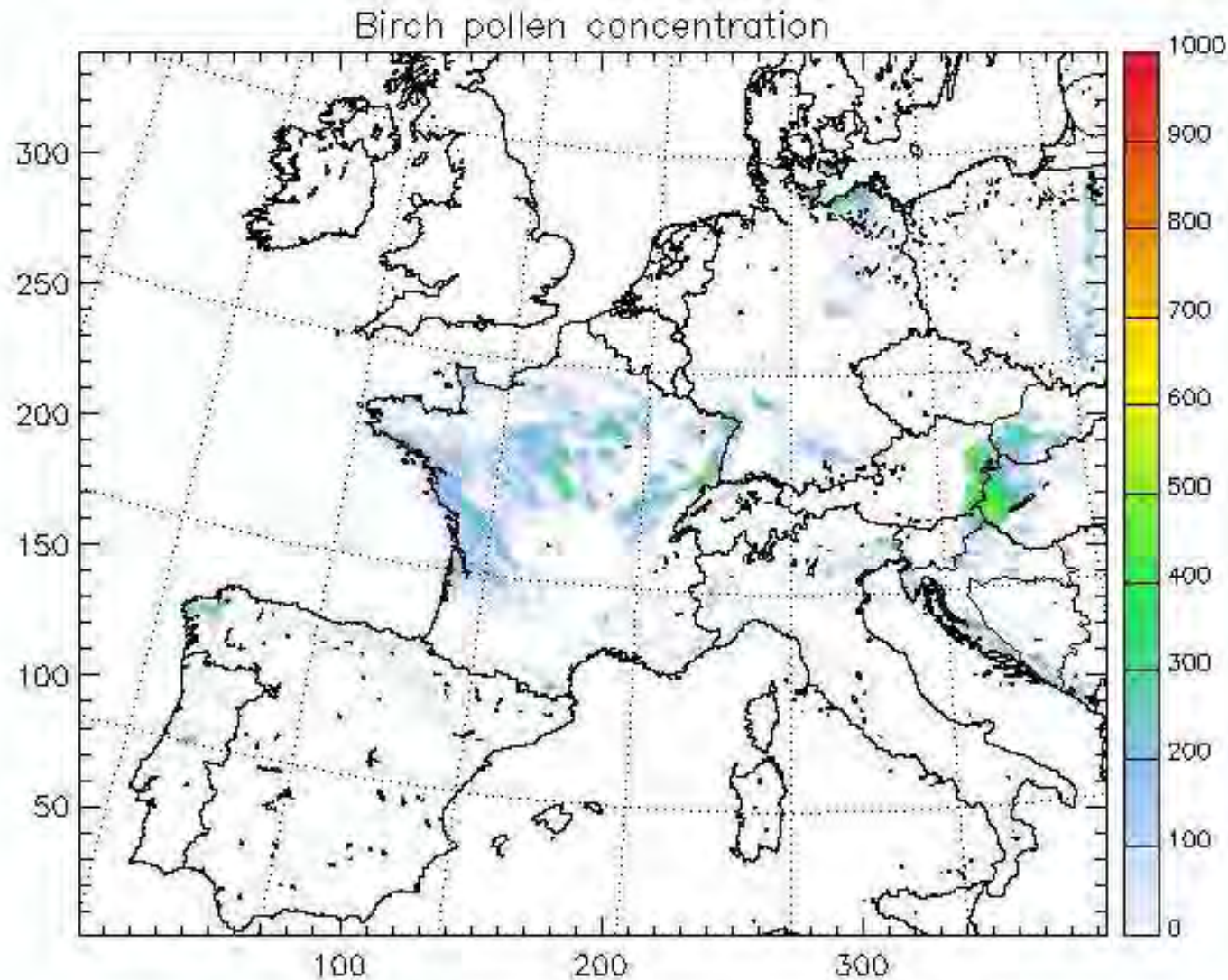
- filling in the gaps
- forecasting pollen concentrations





# COSMO-ART:

Model run April 17 – April 20, 2010 verification and modifications in hand



2010-04-17 00:00z +1 h valid: 2010-04-17 01:00z



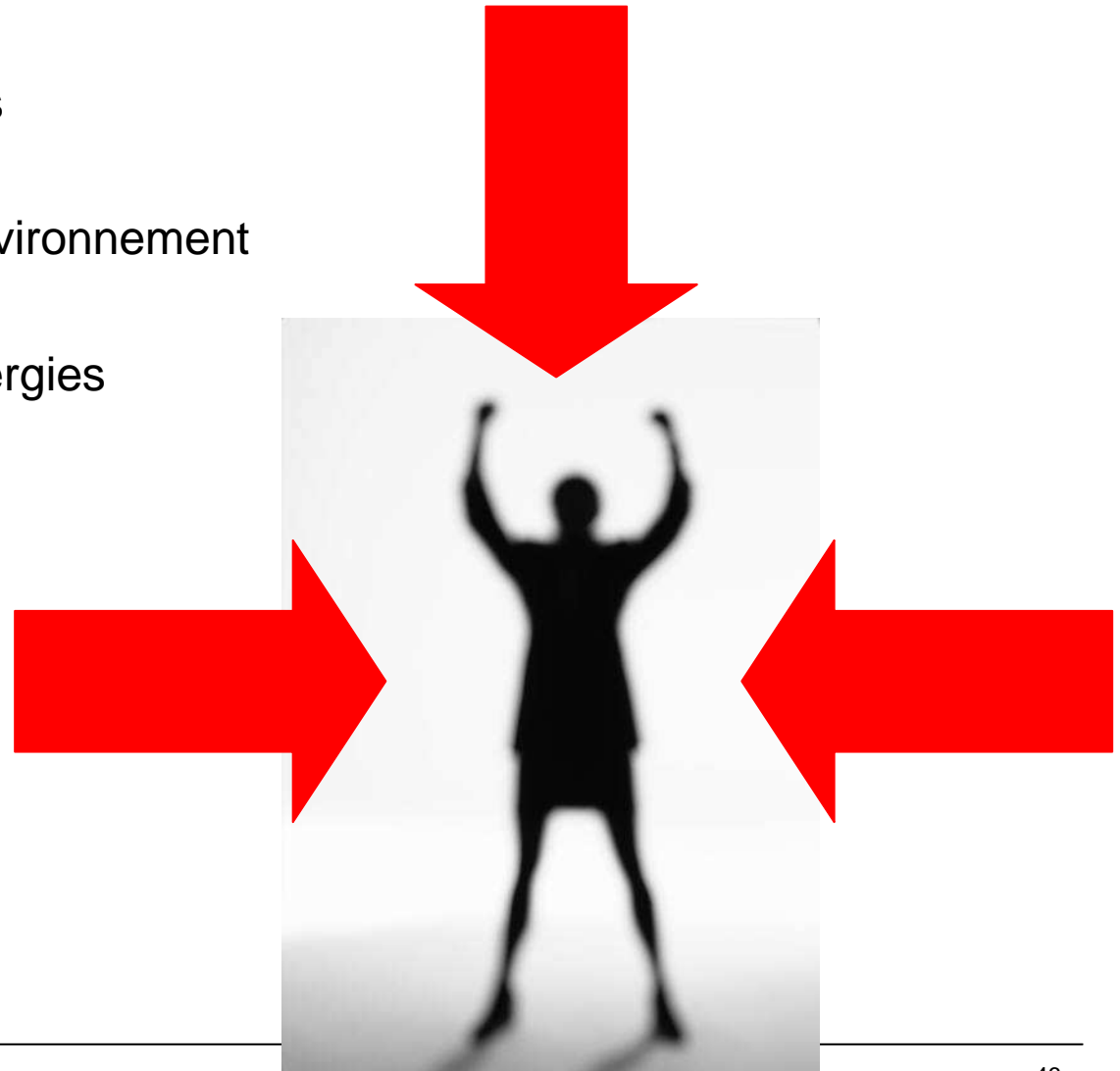
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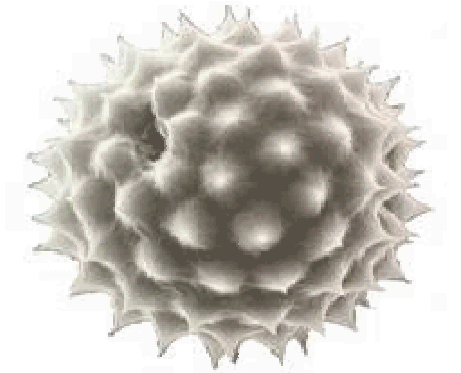


## Comprendre - agir

- changement climatique
- introductions de plantes
- ambroisie
- changements dans l'environnement
- pollution
- développement des allergies



 Merci de votre attention



Internet

[www.pollenetallergie.ch](http://www.pollenetallergie.ch)

[www.meteosuisse.ch](http://www.meteosuisse.ch)

Europe → [www.polleninfo.org](http://www.polleninfo.org)