When citizens are at the forefront of science

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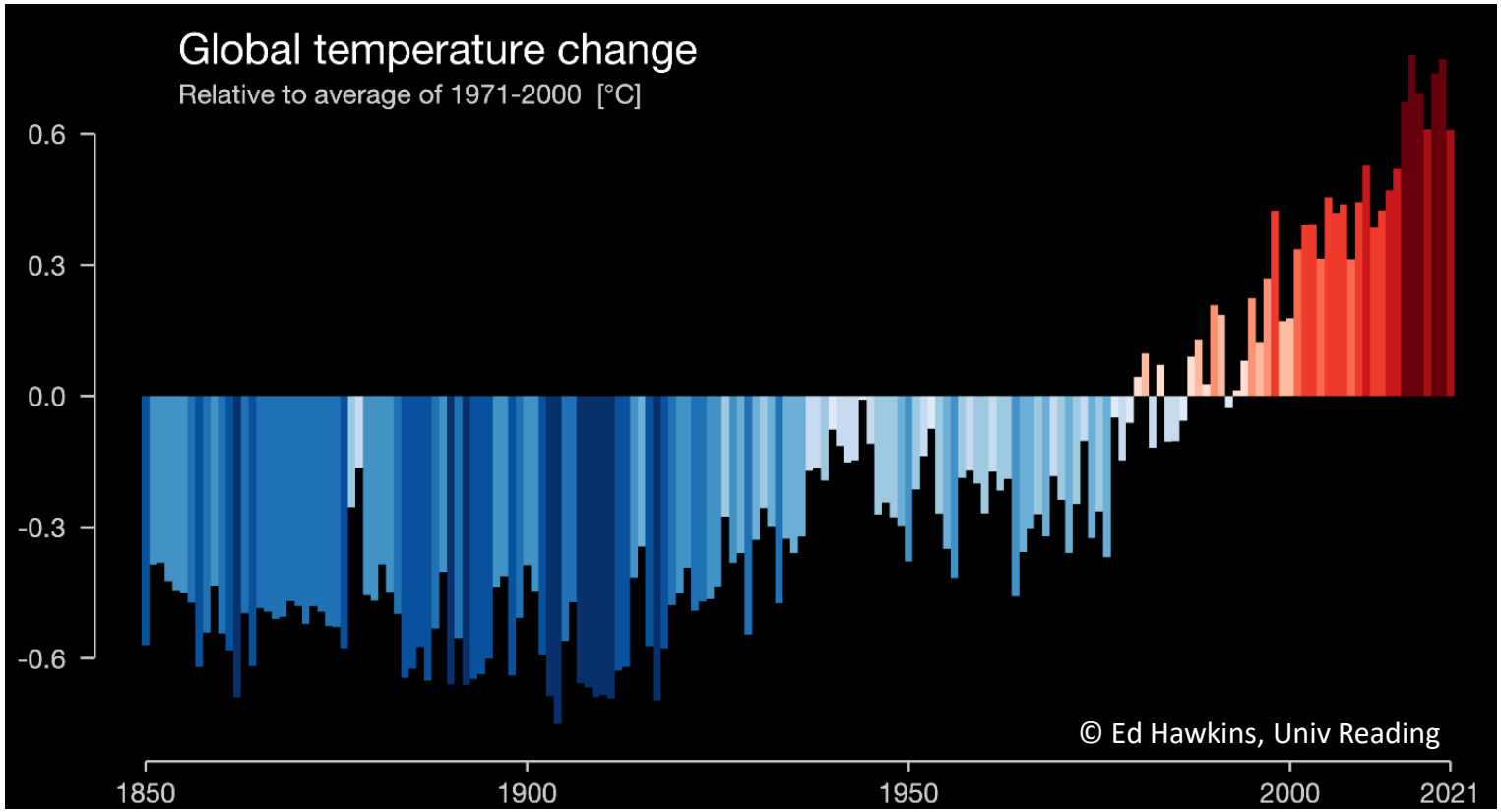
TEMPO members,

the volunteers of the *Observatoire des Saisons* and *Phenoclim* programs

We are in a transition to a new climate regime

- Global warming dramatically accelerated in the last 20 years

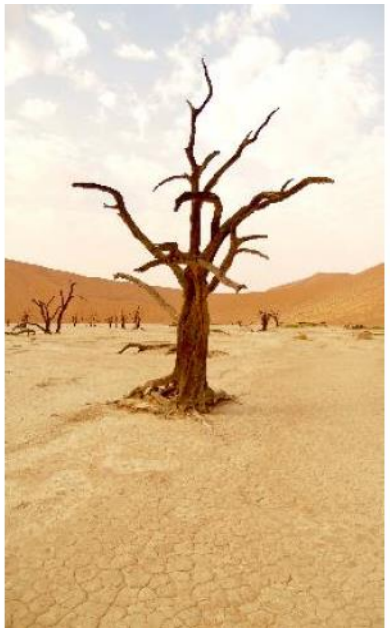


We are in a transition to a new climate regime

- The frequency of extreme climatic events is increasing

Heatwaves

Heavy rainfall



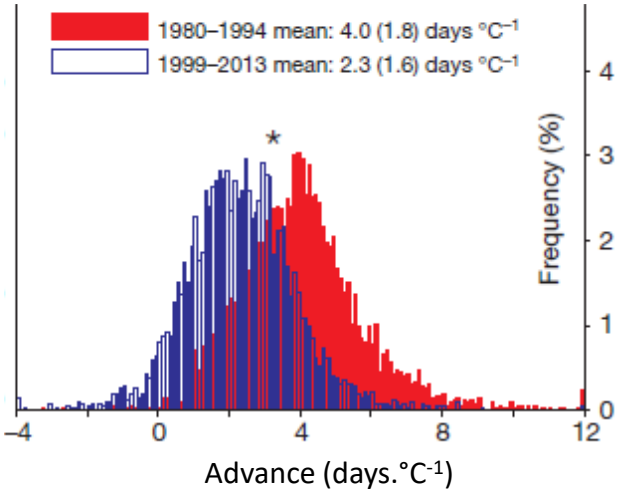
Drought

Fire weather

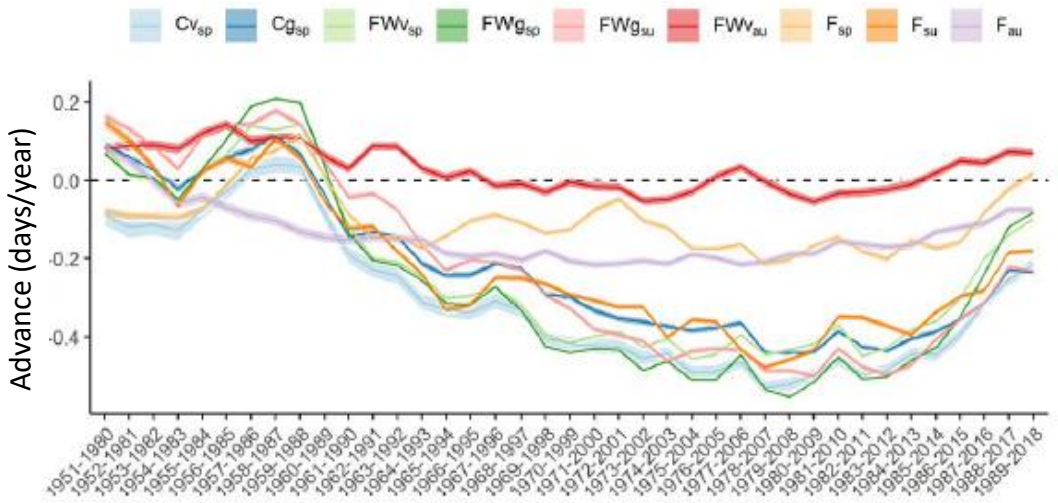
are more frequent and more extreme

What about plant seasonal activity?

The response of spring onset to warming has not been always linear



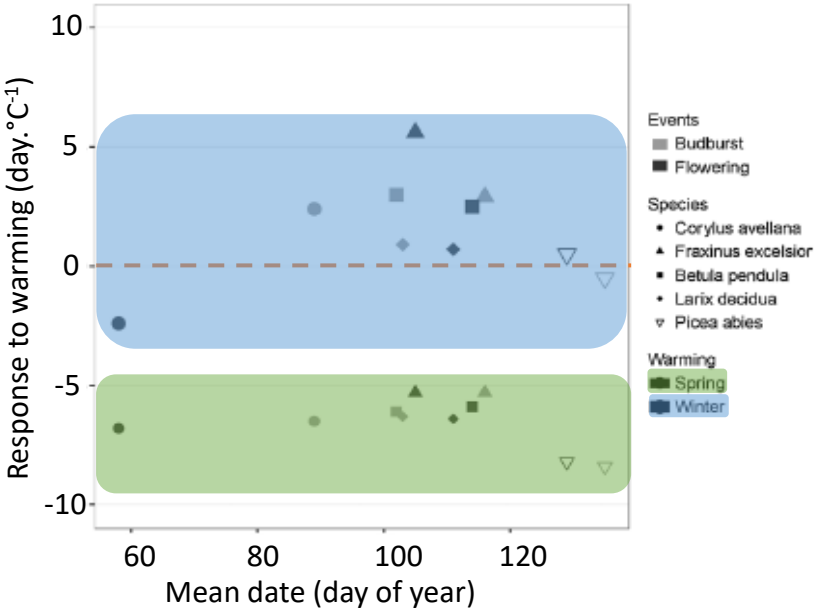
Fu et al. Nature 2015



Menzel et al. GCB 2020

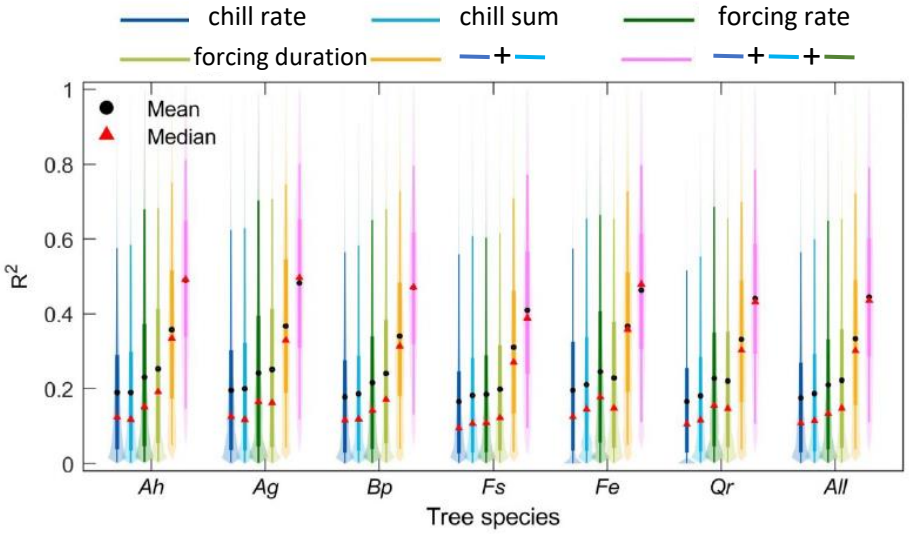
What about species seasonal activity?

Response of spring onset to spring *versus* winter warming



Asse et al AFM 2018

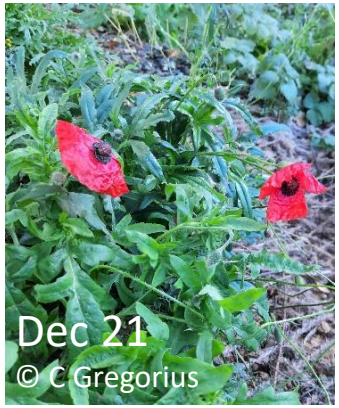
Contribution of winter chilling and spring forcing to the response of leaf unfolding date to global warming (ST)



Zhang et al NCC 2022

Abnormal phenological events

Events
Autumn and winter leaf flush and flowering
Erratic and long lasting flowering
Very early/late leaf senescence



Abnormal phenological events

Events	Consequences
Autumn and winter leaf flush and flowering	Frost damage Mismatch with pollinators Fruit abortion Resource loss
Erratic and long lasting flowering	Flower malformation Increased mismatch between trees –> decreased pollination success and yield
Very early/late leaf senescence	Increased/decreased growing season length

The exceptional 2015-2016 winter

PHENOCLIM

Observatoire des Saisons

À PROPOS

ACTUALITÉS

ÉVÈNEMENTS

COMMENT PARTICIPER

ESPÈCES À OBSERVER

RÉSULTATS

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RELAIS

Accueil › Actualités › Des floraisons en automne ? Partagez vos observations ! Connexion

LE 10 OCTOBRE 2019, PAR ADMIN

Des floraisons en automne ? Partagez vos observations !

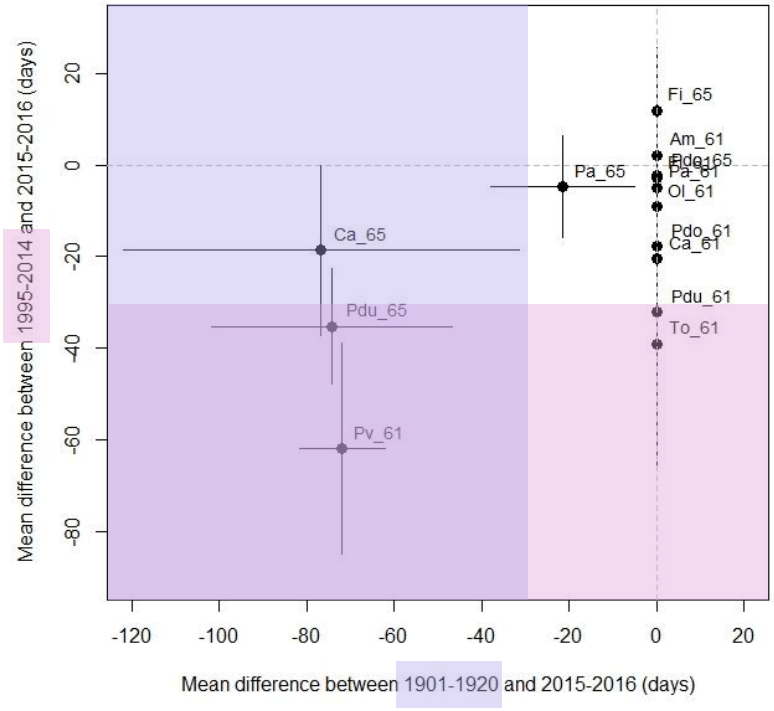
Depuis 2015, vous avez été plusieurs à nous mentionner de nouvelles floraisons automnales, indicatrices d'un déreglement du rythme saisonnier de certaines espèces. Ces floraisons exceptionnelles s'expliquent en partie par les conditions météorologiques de ces derniers mois : été très sec et automne chaud.

Ce phénomène n'est pas encore bien expliqué et vos observations sont précieuses pour mieux le comprendre !

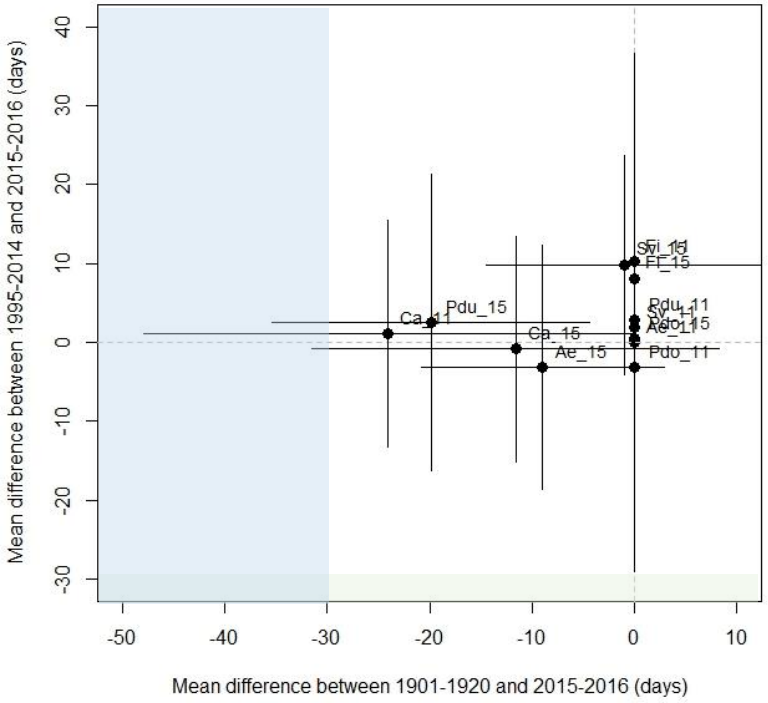
The exceptional 2015-2016 winter

Season shift of flowering

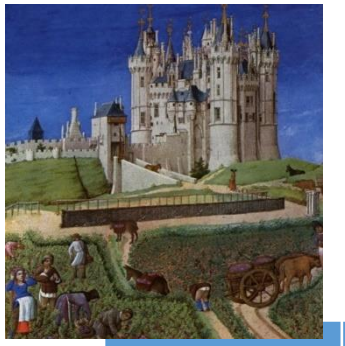
Flowering date



Leaf unfolding date



The exceptional 2015-2016 winter



How exceptional?

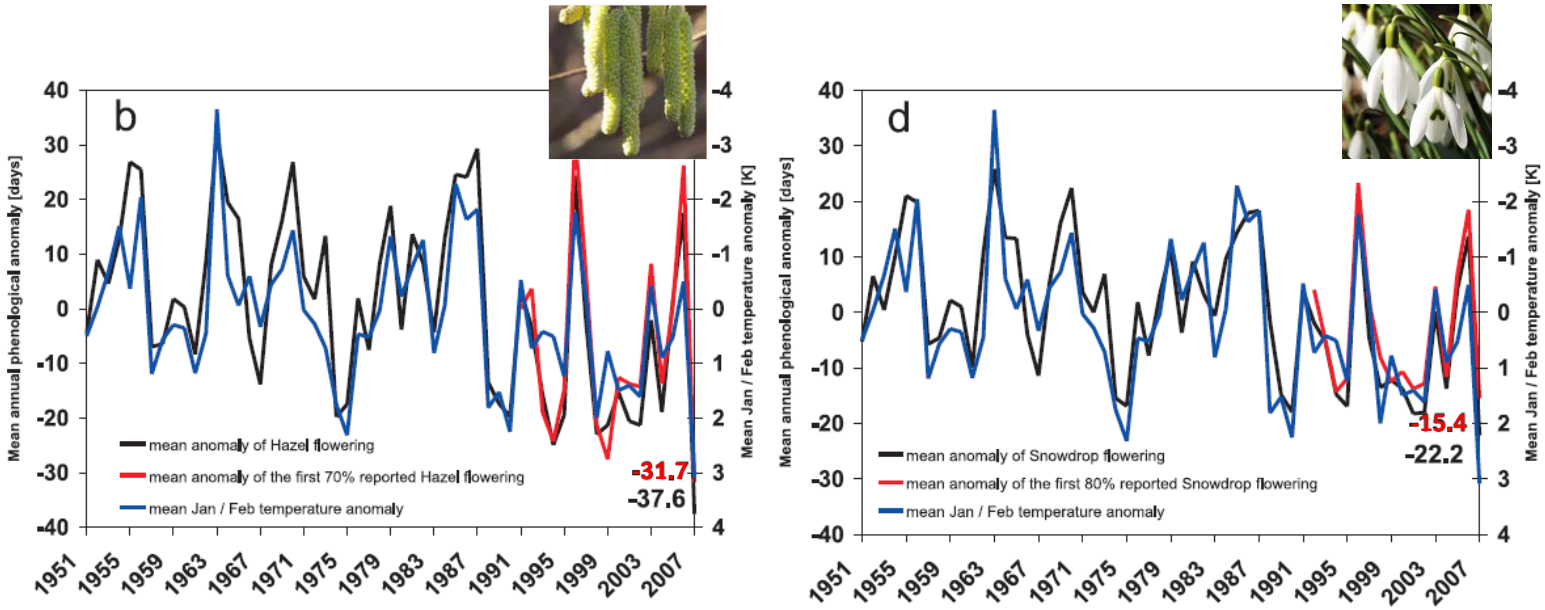
Years	Species	Phenological anomaly	Reference
1116-1117	Strawberries	Flowering in autumn and fruit ripe at Christmas	Pfister et al., 1998
1186-1187	Fruit trees Birds	Flowering in December-January Nesting in December-January	Pfister et al., 1998
1289-1290	Trees Grapevine	No leaf color change in autumn Flowering in January	Angot 1883 Pfister et al . 1998
1327-1328	Fruit trees Grapevine	Flowering in January Flowering in April, ripe late July	Angot 1883

The exceptional 2015-2016 winter

How exceptional?

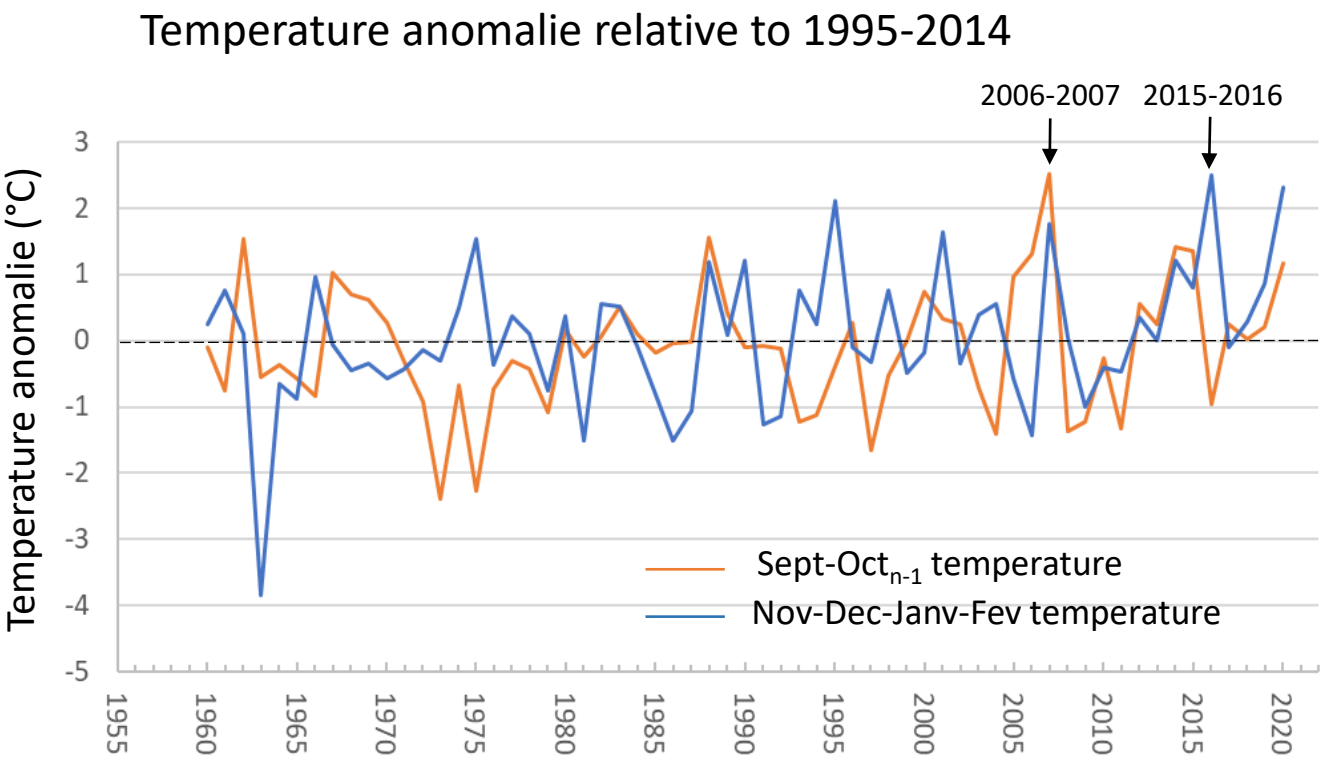
2006-2007: the former warmest winter on record

Flowering date anomalie of hazel and snow drop in Germany



Luterbacher et al 2007

The exceptional 2015-2016 winter



- Sept-Oct 3.6 times cooler than 2006
- Nov to Fev 0.3 times hotter than 2007

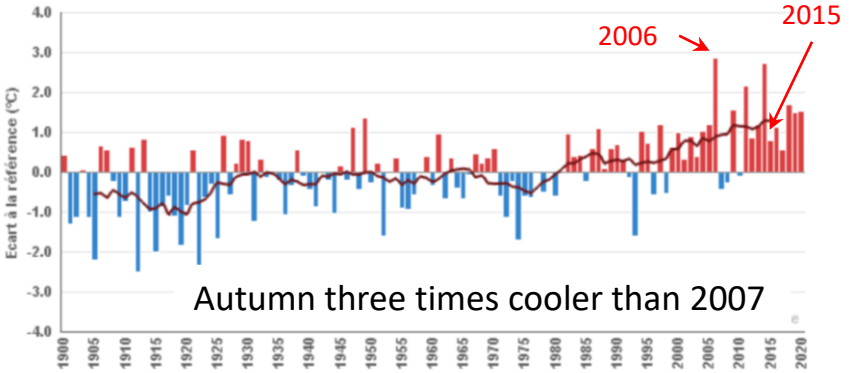
Lessons and consequences

- Citizen science programs are an efficient way to collect observations on abnormal phenological events and sometimes the only one
- Current databases and protocoles are not always adapted to collect exceptional phenological events
- Abnormal phenological events make it more and more difficult the stastistical detection of erroneous data
- Our understanding of the regulation of plant activity is still very much deficient
- We are unable to forecast such events and their consequences although they might become more and more frequent

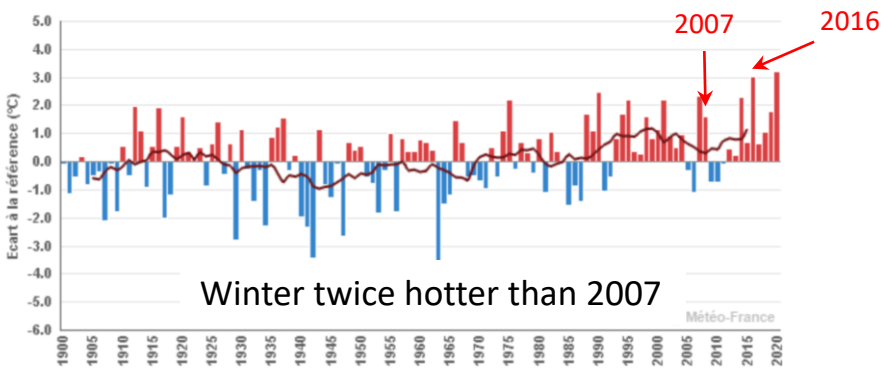
Acknowlegments

The exceptional 2015-2016 winter

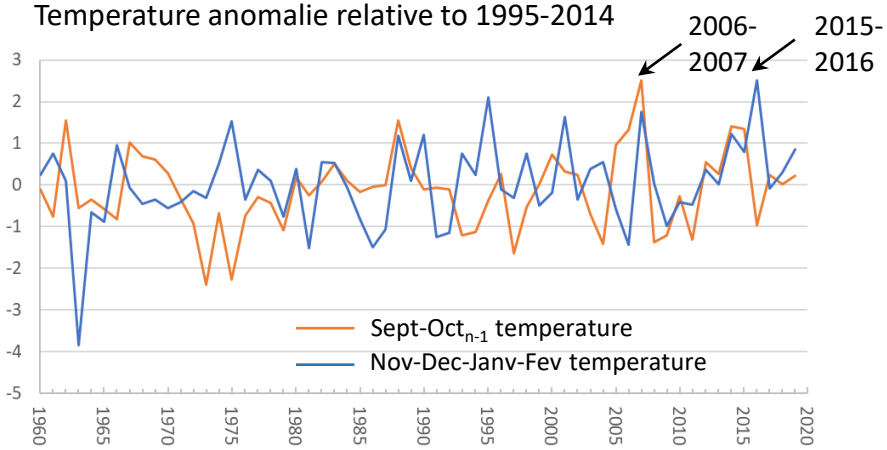
Sept-Oct-Nov temperature in France – Reference 1961-1990



Dec-Jan-Fev temperature in France – Reference 1961-1990



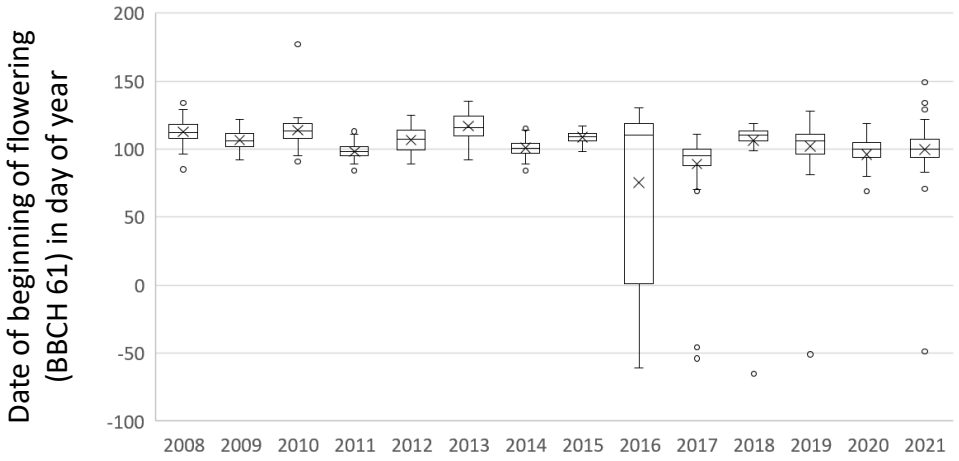
Temperature anomalie relative to 1995-2014



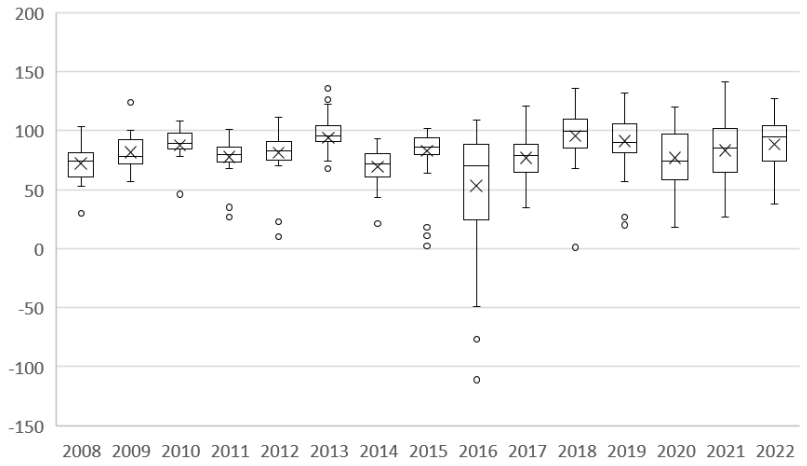
The exceptional 2015-2016 winter

Season shift of flowering

Lilac



Primerose



Abnormal phenology events

Event	Biological response	Climatic conditions	Frequency post 2020	Consequences
Late summer, autumn and winter leaf flush and flowering	No dormancy induction at autumn	Increased temperature in autumn	↗	Frost damage Leaf malformation Mismatch with pollinators Fruit abortion Resources loss Weakening of the tree
	Abnormally short post dormancy	Increased temperature in winter following a short cold spell in autumn	↗	
	Dormancy break following a destruction of the foliage	Heat wave, Drought, Storm	↗	
Erratic and long lasting flowering	Incomplete dormancy break	Increased winter temperature	↗	Flower malformation Increased mismatch between trees – decreased pollination success and yield
Very early leaf senescence	Early cues triggering leaf senescence	Increased summer drought	↗	Increased growing season length