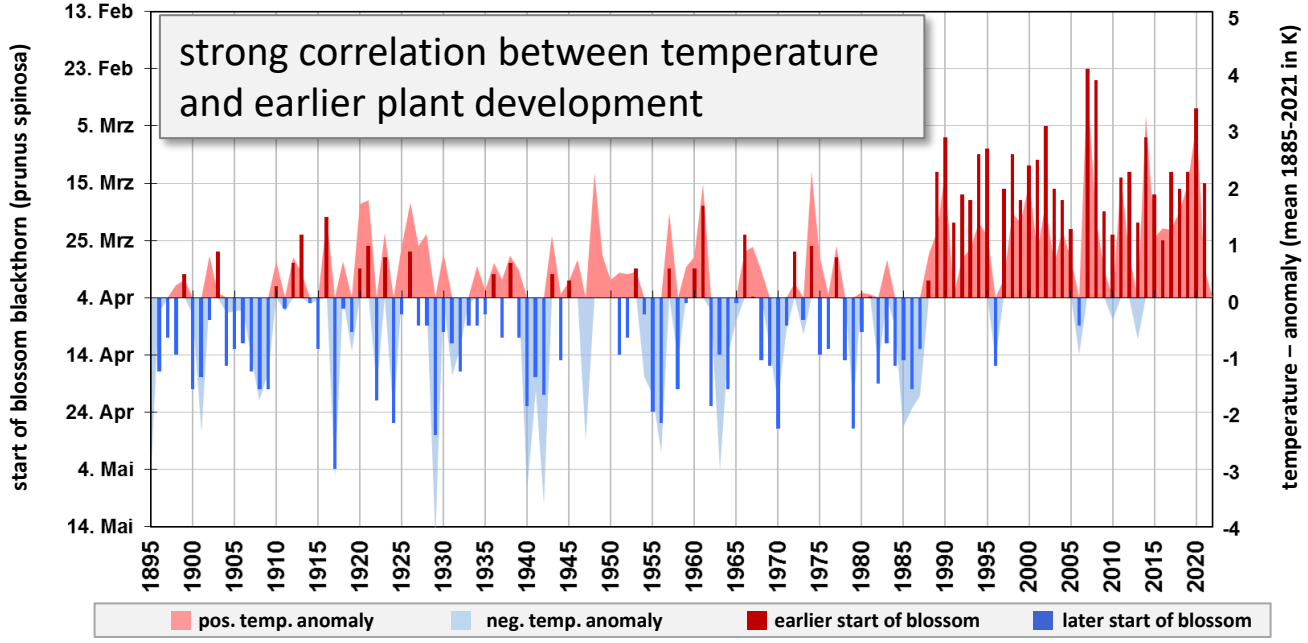
Global warming – Does it cause an increasing risk of damages due to spring frost?

Temperature and Phenology

Geisenheim (rhine valley) 1895 – 2021

start of blossom blackthorn (prunus spinosa) january – april



The German Phenological Network of the DWD

2 phenological observation programs (stationary)

ANNUAL REPORTERS

- around 1100
- data since 1951 (some data since 19th century)
- max. 184 plant stages (certain plants)
- report at the end of the year

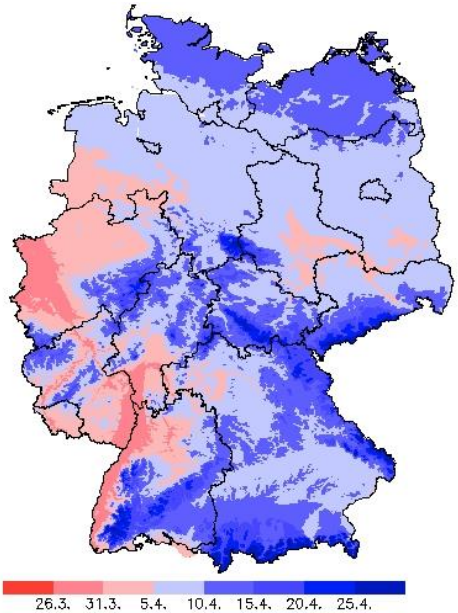
IMMEDIATE REPORTERS

- around 330 (subset of annual reporters)
- data since 1992
- max. 83 plant stages („earliest“ plants)
- report immediately

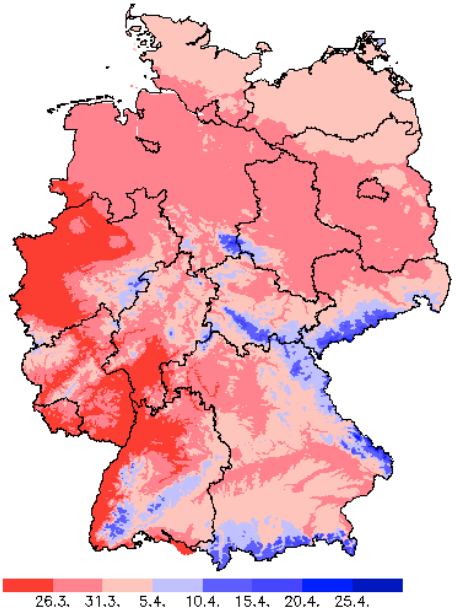
Further information: www.dwd.de/phaenologie

Start of Vegetation Period

mean 1961-1990

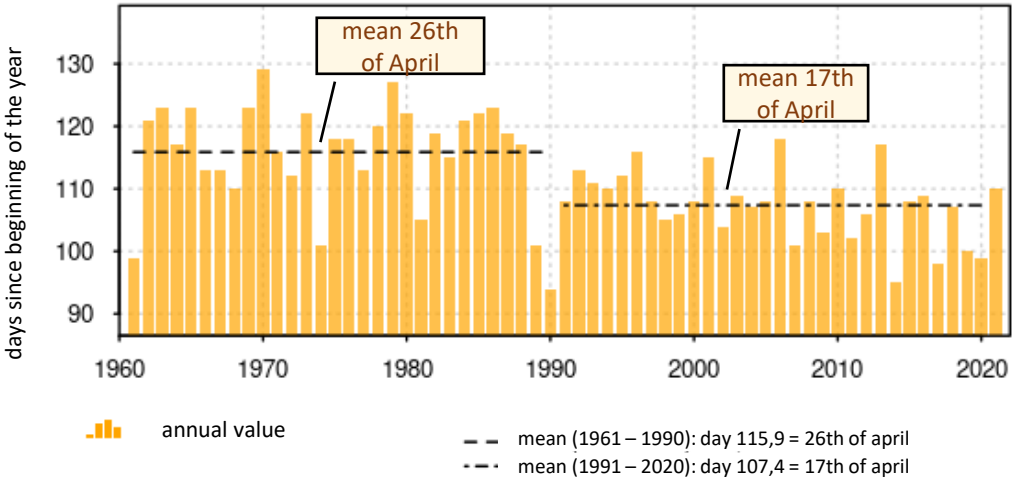


mean 1991-2020



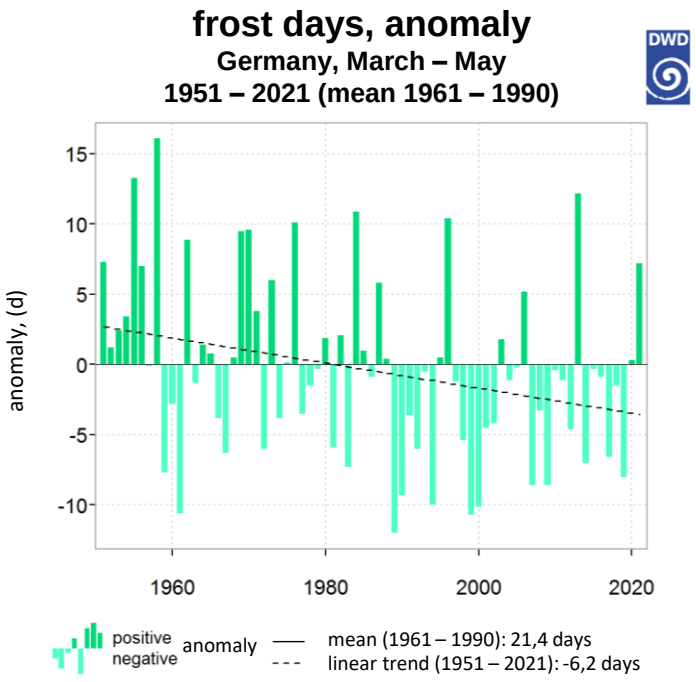
Start of Cherry Blossom

annual reporters, Germany
1961 - 2021

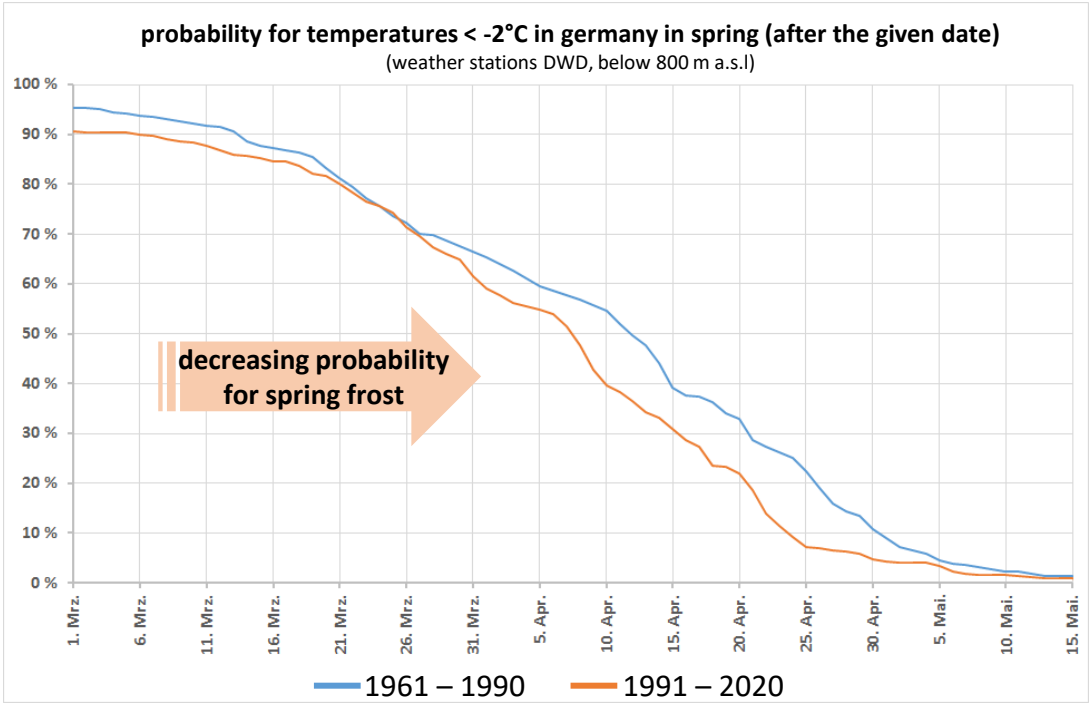


cherry blossom nowadays starts nearly 10 days earlier than in 1961-1990

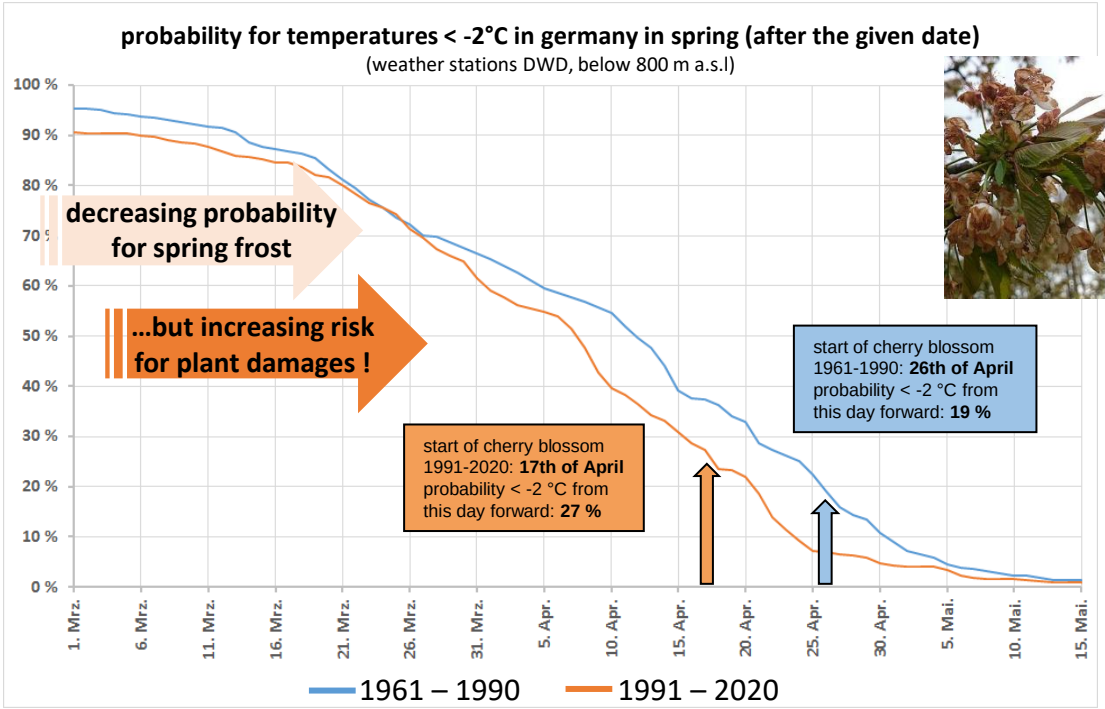
Trend Frost Days



Probability for Spring Frost

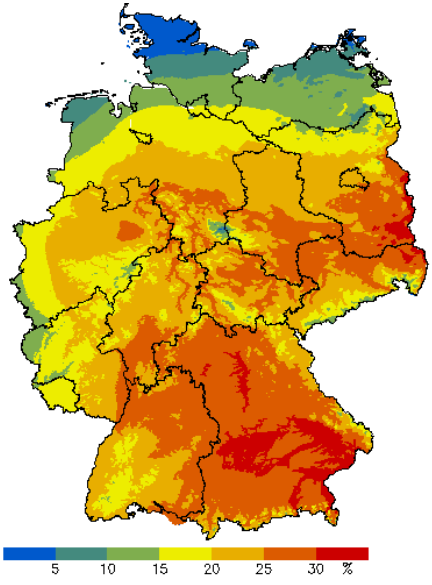


Earlier Start of Cherry Blossom vs. Spring Frost

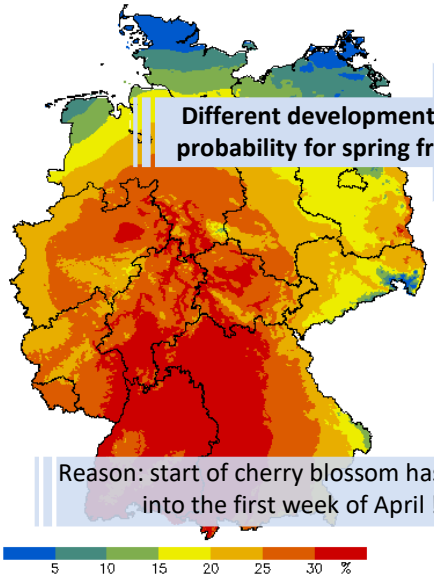


Probability for Temperatures < -2°C after Start of Cherry Blossom

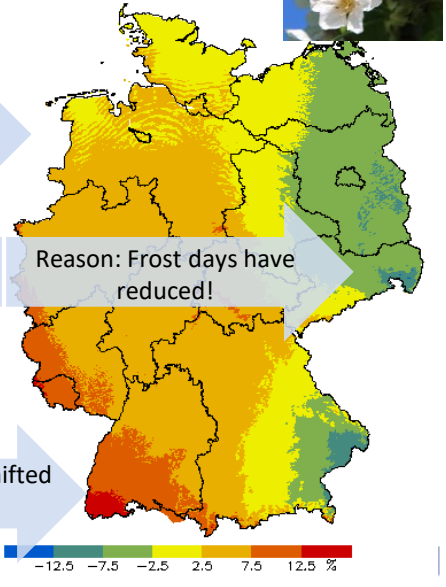
1961 - 1990



1991 - 2020



changes



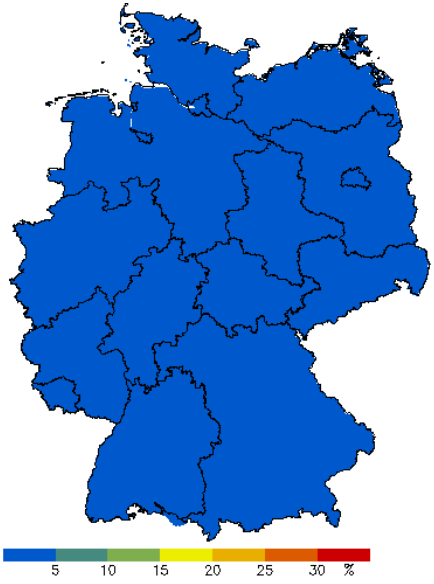
Different development of probability for spring frost

Reason: Frost days have reduced!

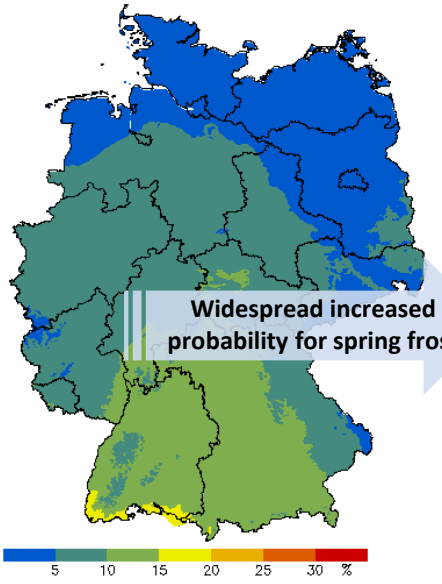
Reason: start of cherry blossom has shifted into the first week of April !

Probability for Temperatures < -2°C after Start of Apple Blossom

1961 - 1990

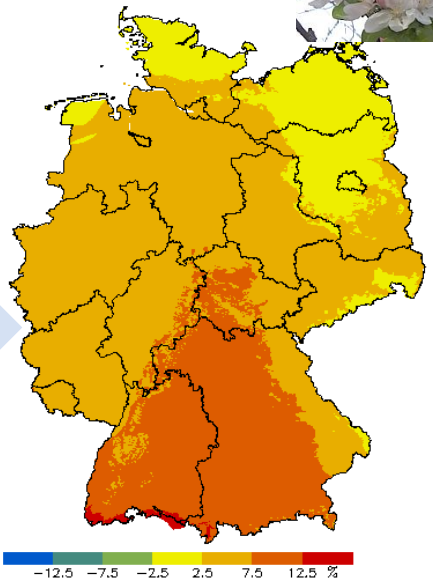


1991 - 2020



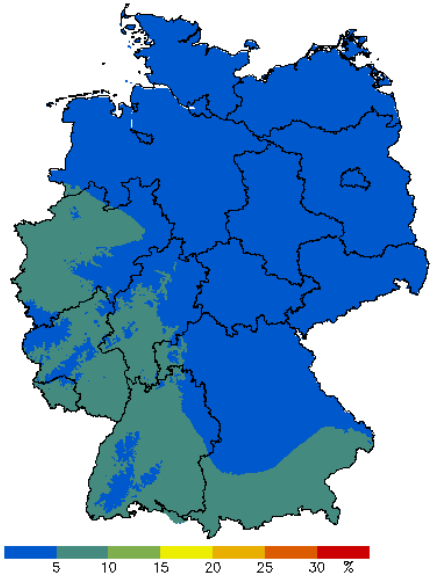
Widespread increased probability for spring frost

changes

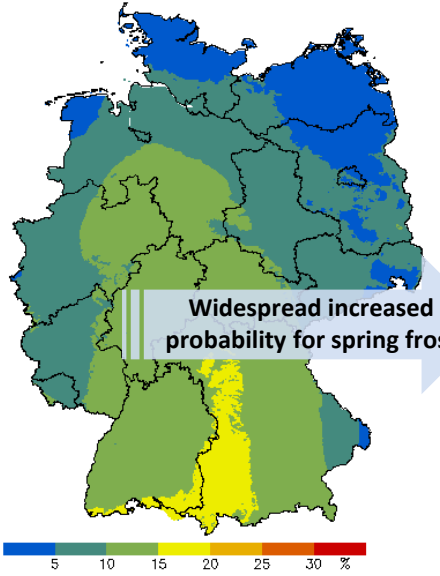


Probability for Temperatures < -2°C after Start of Rapeseed Blossom

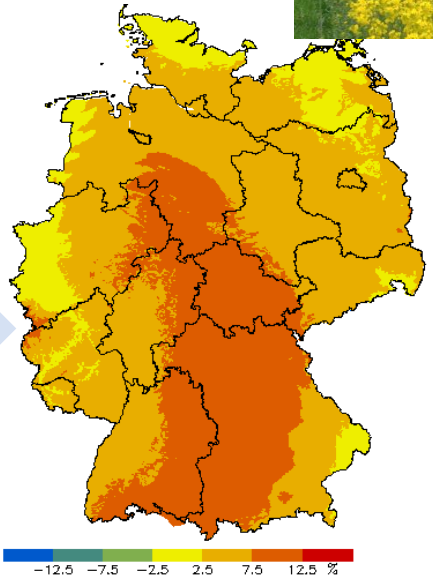
1961 - 1990



1991 - 2020

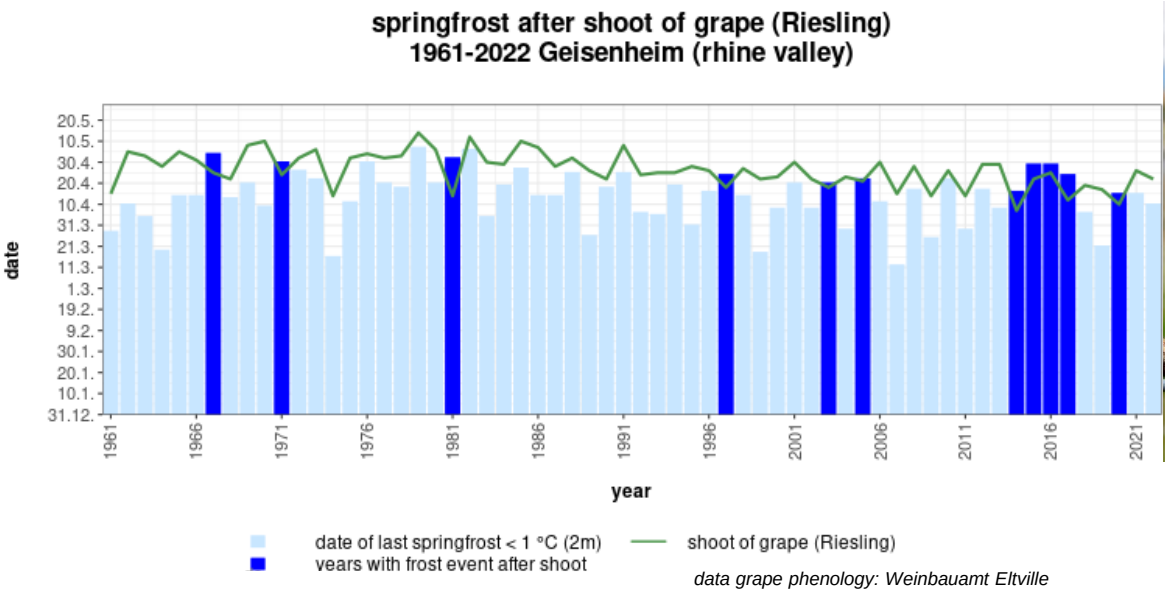


changes



Widespread increased probability for spring frost

Probability for Temperatures < 1 °C after Start of Grape Blossom



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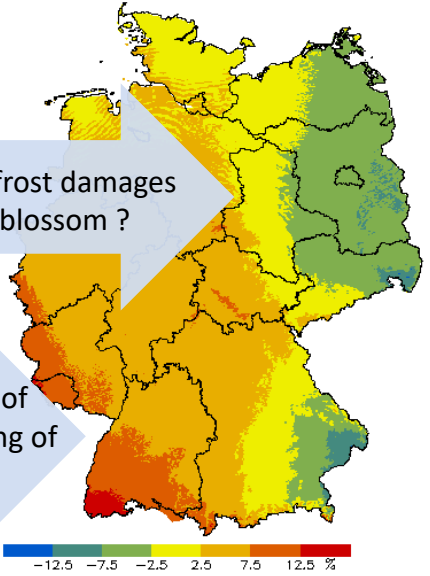
Expected Developments in Future ?

1961 - 1990

1991 - 2020

changes in past



Increasing risk of spring frost damages due to earlier cherry blossom ?

Increasing or decreasing risk of spring frost damages (weakening of cold snaps?)

Conclusions

- **In the future still increasing temperatures, leading to**
  - decreasing risk of spring frost
  - further shifts in spring development depending on typal limits
- **Regional different effects:**
  - Partly increasing risks for damages due to spring frost (e.g. Germany)
  - Partly decreasing risk (South-western Germany?)

Further evaluation of recent development for different cultures

Search for ways of predicting the changes

Regional frost risk maps, based on small-scale orography, type of vegetation and phenology

Contact:

Bianca Plückhahn
Department Agrometeorology
Frankfurter Str. 135
63067 Offenbach

Bianca.Plueckhahn@dwd.de
Agrarmeteorologie@dwd.de
Tel.: +49 (0) 69 / 8062 - 2302