

GLOBAL PHENOLOGY DATA

GEO 2009-2001 Working Plan Sub-task Number: US-09-03d

Elisabeth Koch, Mark D. Schwartz, Jake Weltzin

Zentralanstalt für Meteorologie und Geodynamik



OUTLINE

- Definition
- Motivation of Global Phenology Data
- Status Quo of GPD
- Potential applications
- Major results of recent phenological studies

DEFINITION

Phenology is the study of the timing of recurring biological events in the animal and plant world

Examples:

Leaf unfolding and flowering of plants in spring, fruit ripening, colour changing and leaf fall in autumn, as well as the appearance and departure of migrating birds and the timing of animal breeding are all examples.

POTENTIAL APPLICATIONS

- necessary for understanding the interaction between atmosphere and biosphere
- increase the knowledge of critical changes in the global carbon balance
- Development status of vegetation influences albedo, evapotranspiration >> energy balance of the earth – atmosphere system
- ground truth observations for NDVI-data

POTENTIAL APPLICATIONS

- coupling of ground- and satellite-based observations with meteorological measurements for crop-yield modelling
- Study of health impacts (e.g., allergies)

Description of task US-09-03d

Outputs:

- COST725 (plant phenological database of European networks)
- COST725 box in 4th Assessment Report of Working Group II (chapter 1) of the Intergovernmental Panel on Climate Change IPCC
- “Guidelines for plant phenological observations” published
- USA National Phenology Network drafted plant monitoring protocols for ~150 species

Description of task US-09-03d

Planned Activities:

- Develop a Concept and Implementation Document describing the Global Phenology Network and its initiation
- PEP725: pan European phenological Database (sponsored by EUMETNET; kickoff June 2010)

Earlier springs and later autumns: climate change sends nature awry

- Shifting seasons threaten plants, birds and insects
- Scientists urge action to counter global warming

Buzz up!

Digg it

on of Research Activities

dy has found that spring is starting six er than 30 years ago. The authors to be global warming. In some more h as Spain, spring begins a full two 0 years ago.



lan Sample, science correspon
The Guardian, Saturday 26 Aug

BBC Home News Sport Radio TV Weather Languages Search

Low graphics | Accessibility help

News services
Your news when you want it

Spring is arriving earlier ea
"conclusive proof" that glob
seasons, scientists announ

In what is believed to be the
such as the flowering of pla
scientists found that spring
Europe than in the early 19
autumn, by an average of t
report.

Countries that have experie
springs, according to the st
Spain, where early spring t
decade, spring now arrives
slower rate, with temperatu

"Not only do we clearly dem
that change is much strong
warming," said Tim Sparks,
Centre for Ecology and Hyc
Sparks said the shifting sea
ecosystems by knocking na
kiffer

BBC NEWS

News Front Page

Africa
Americas
Asia-Pacific
Europe
Middle East
South Asia
UK
Business
Health
Science & Environment
Technology
Entertainment

Also in the news

Video and Audio

Have Your Say
In Pictures
Country Profiles
Special Reports

RELATED BBC SITES

SPORT
WEATHER
ON THIS DAY

Watch One-Minute World News

Last Updated: Friday, 25 August 2006, 04:17 GMT 05:17 UK

E-mail this to a friend

Printable version

Climate changes shift springtime

A Europe-wide study has provided "conclusive proof" that the seasons are changing, with spring arriving earlier each year, researchers say.

Scientists from 17 nations examined 125,000 studies involving 561 species.

Spring was beginning on average six to eight days earlier than it did 30 years ago, the researchers said.

In regions such as Spain, which saw the greatest increases in temperatures, the season began up to two weeks earlier.

The findings were based on what was described as the world's largest study of changes in recurring natural events, such as when plants flowered.

The team of researchers also found that the onset of autumn has been delayed by an average of three days over the same period.

Feeling the heat



Feeling the heat: Plants' behaviour is affected by the climate

VIDEO AND AUDIO NEWS

How climate change is affecting the seasons

Watch

FROM ACTION NETWORK



Climate change
Contacts, information and advice to help you take action

SEE ALSO

- Long-haul birds 'returning early' 02 Jul 06 | Science/Nature
- Early UK springs become 'normal' 12 Mar 04 | Science/Nature

RELATED INTERNET LINKS

- Global Change Biology
 - CEH
- The BBC is not responsible for the content of external internet sites

TOP SCIENCE & ENVIRONMENT STORIES

- 'Boom and bust' of deforestation
- Government 'must back insulation'
- Typhoons trigger slow

the largest of its kind ever

logical - naturally recurring - and 19 animal species during this is the first comprehensive around 550 plant species, and

fruiting records advanced (30 layed,' reads the report. They of 2.5 days per decade during

ed explicitly to climate change es undoubtedly demonstrates preceding months,' reads the

sons, but that change is much said Dr Sparks. 'Many plant panson of the flowering date n Austria which is only 3 days

e field of Scientific Research - ework Programme (FP6).

site at <http://www.blackwell->



STATUS QUO OF GPD



First Recorded Date of Open Flowers

Forsythia spp.

Reporting period Mar 2 - Aug 20, 2009

http://www.usanpn.org/files/shared/images/data/FORS_opfl_09.png



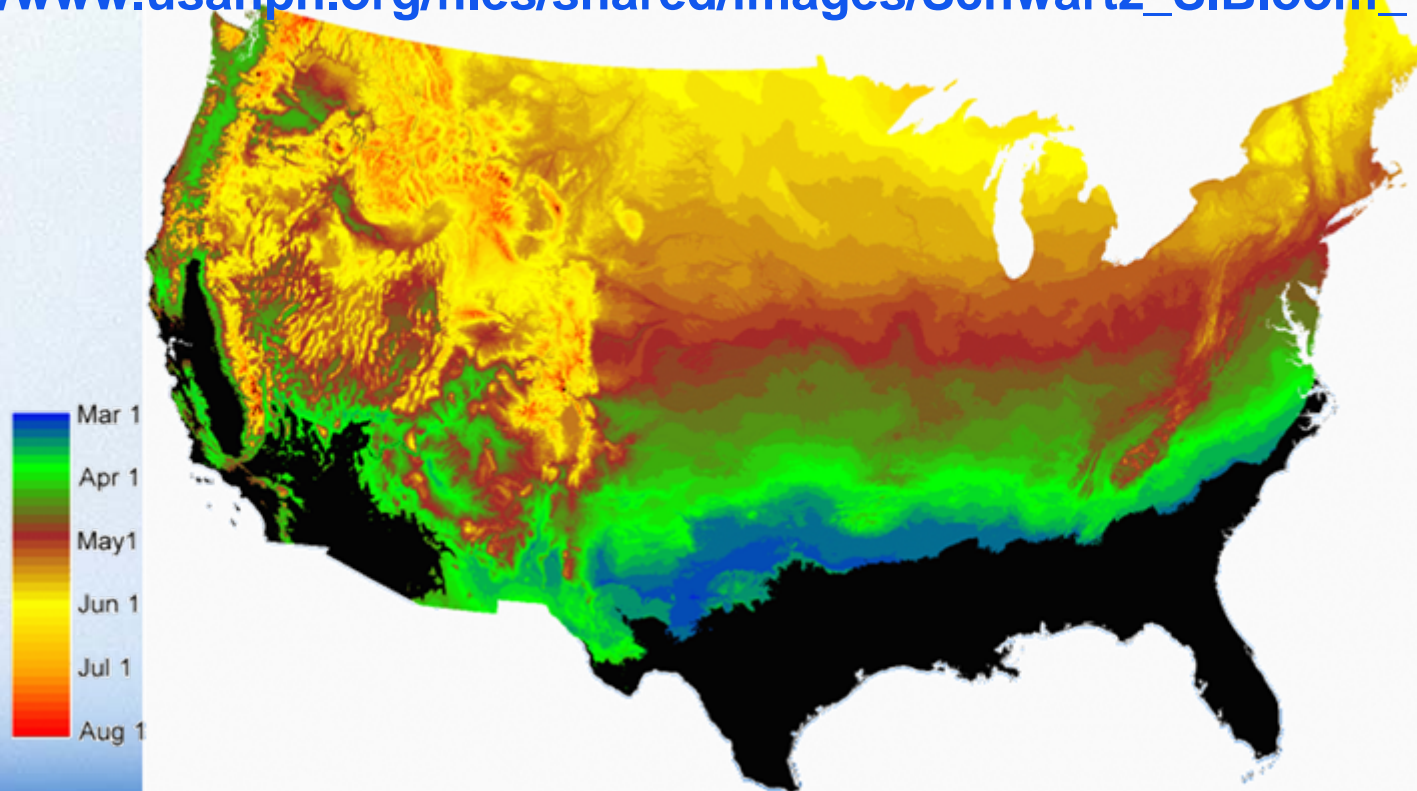
STATUS QUO OF GPD



1996 SI First Bloom Dates

SI spring index: modelled lilac honeysuckle 1st bloom dates

http://www.usanpn.org/files/shared/images/Schwartz_SIBloom_1996_0.png



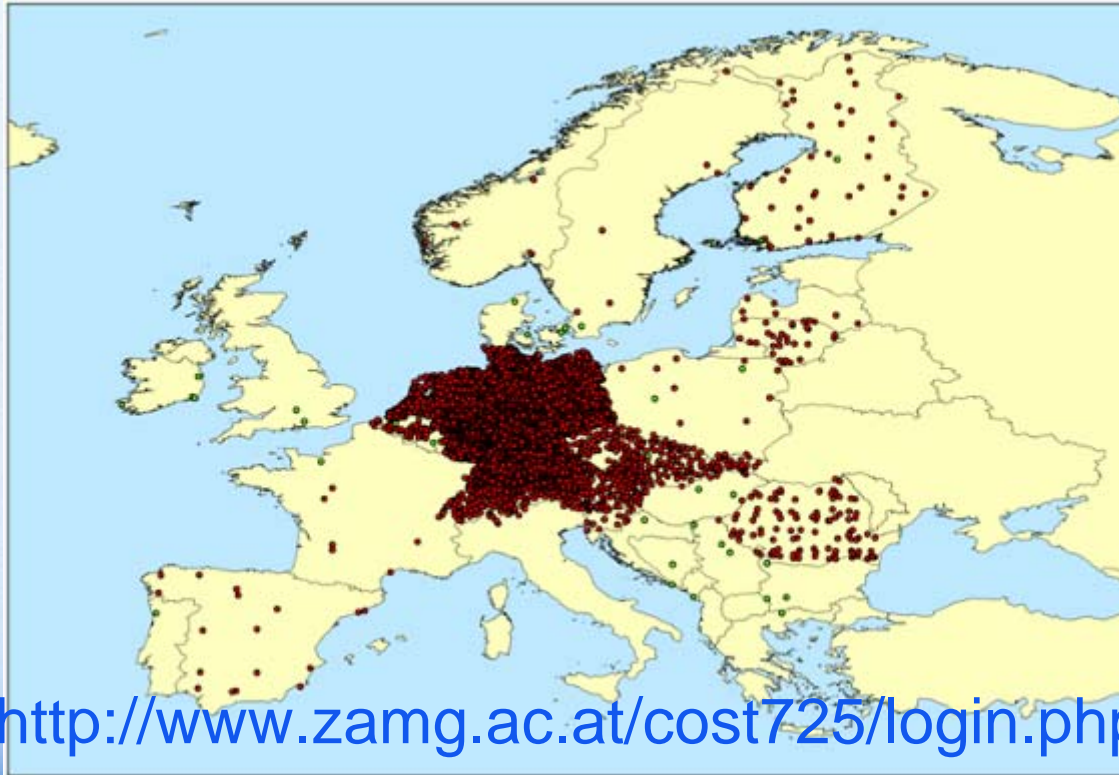
STATUS QUO OF GPD

Pan European **PEP725** Phenology DB



STATUS QUO OF GPD

Pan European **PEP725** Phenology DB follow up COST725

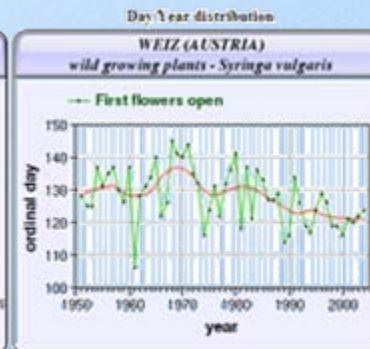
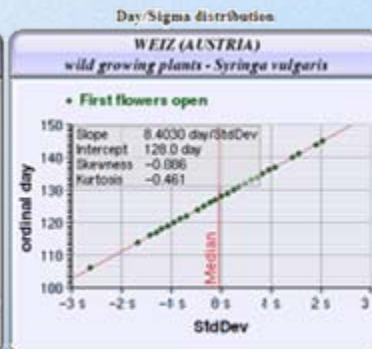
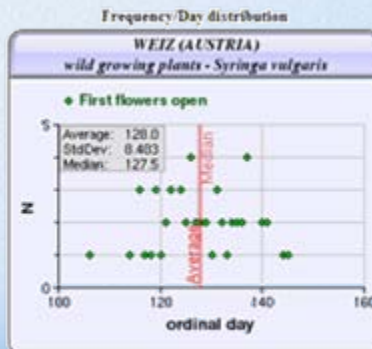
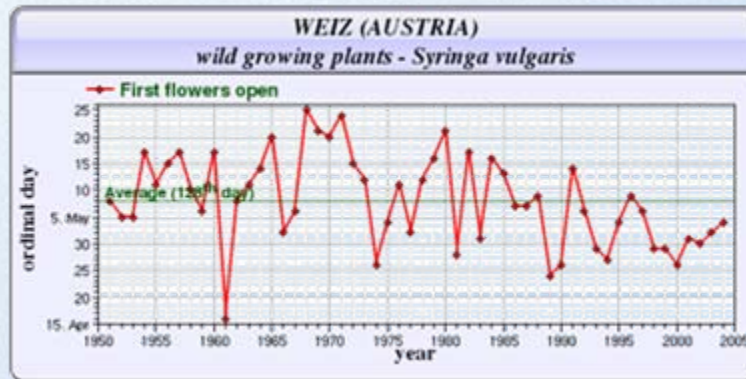


<http://www.zamg.ac.at/cost725/login.php>

STATUS QUO OF GPD

Pan European **PEP725** Phenology DB

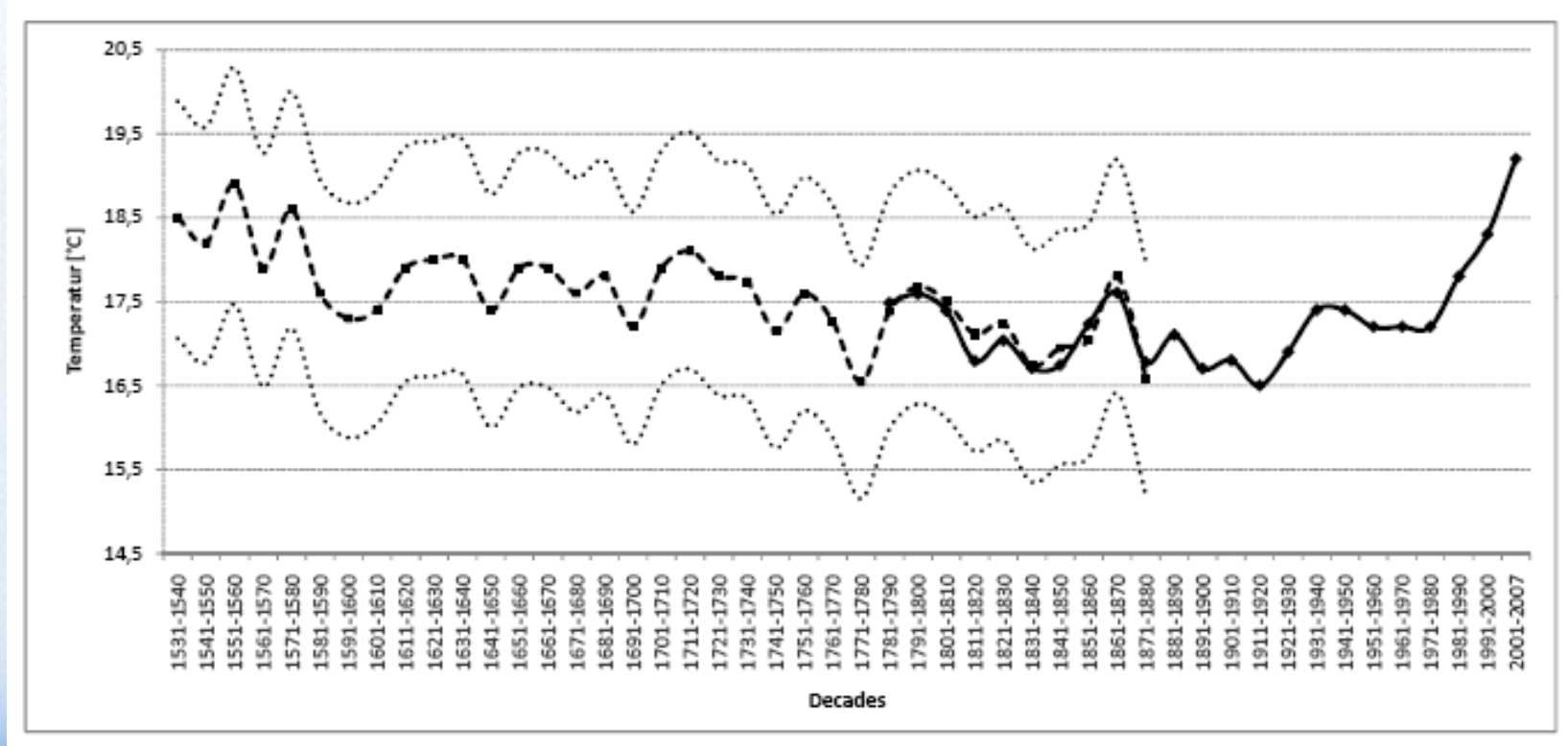
(points are clickable)



EARS & ZAMG, STSM (Ljubljana, Vienna, April-November 2008)

MAJOR RESULTS OF RECENT PHENO STUDIES

- Temperature reconstruction with grape harvest dates back to the 16th century in Vienna



Historical sources – archival sources – StA Klosterneuburg

1667

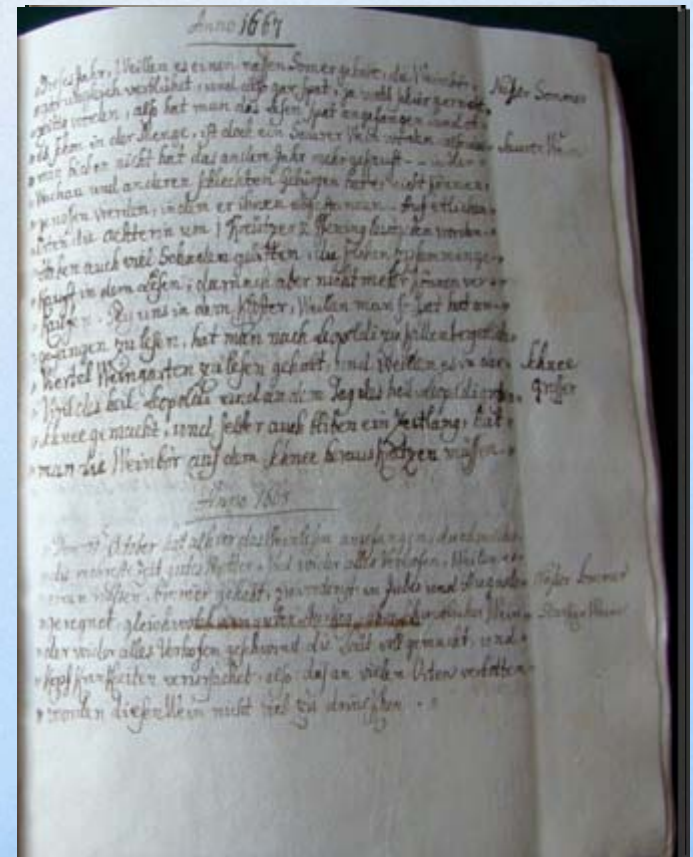
Wine flowering: diverse withered; late ripeness and harvest after 15 november; quantity good; quality: sour; wineprice: ?

HS 221 StA Klosterneuburg

Anno 1667

Nasser Sommer, **Saurer Wein**. Dieses Jahr, Weillen es einen nassen Somer gehabt, die Weinbör gar ungleich verblühet, und also **gar spat, ja wohl schier gar nicht zeitig worden**, also hat man das **Lesen spat** angefangen, und ob es schon in der Menge, ist doch ein Saurer Wein worden, also das man solchen nicht hat das andere Jahr mehr gekauft ...

Bey uns in dem Kloster, Weillen man so spat hat angefangen zu lesen, hat man nach Leopoldi zu Kallenberg etliche ... Weingarten zu lesen gehabt, und weillen es in der Vigil des heil: Leopoldi und an dem Tag des heil: Leopoldi grossen Schnee gehabt, und selber auch bliben ein Zeitlang, **hat man die Weinbör aus dem Schnee herauskratzen müssen**.



MAJOR RESULTS OF RECENT PHENO STUDIES



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



Box 1.3. Phenological responses to climate in Europe: the COST725 project

The COST725 meta-analysis project used a very large phenological network of more than 125,000 observational series of various phases in 542 plant and 19 animal species in 21 European countries, for the period 1971 to 2000. The time-series were systematically (re-)analysed for trends in order to track and quantify phenological responses to changing climate. The advantage of this study is its inclusion of multiple verified nationally reported trends at single sites and/or for selected species, which individually may be biased towards predominant reporting of climate-change-induced impacts. Overall, the phenology of the species (254 national series) was responsive to temperature of the preceding month, with spring/summer phases advancing on average by 2.5 days/°C and leaf colouring/fall being delayed by 1.0 day/°C.

The aggregation of more than 100,000 trends revealed a clear signal across Europe of changing spring phenology with 78% of leaf unfolding and flowering records advancing (31% significantly (sig.)) and only 22% delayed (3% sig.) (Figure 1.6). Fruit ripening was mostly advanced (75% advancing, 25% sig.; 25% delayed, 3% sig.). The signal in farmers' activities was generally smaller (57% advancing, 13% sig.; 43% delayed, 6% sig.). Autumn trends (leaf colouring/fall) were not as strong. Spring and summer exhibited a clear advance by 2.5 days/decade in Europe, mean autumn trends were close to zero, but suggested more of a delay when the average trend per country was examined (1.3 days/decade).

The patterns of observed changes in spring (leafing, flowering and animal phases) were spatially consistent and matched measured national warming across 19 European countries (correlation = -0.69 , $P < 0.001$); thus the phenological evidence quantitatively mirrors regional climate warming. The COST725 results assessed the possible lack of evidence at a continental scale as 20%, since about 80% of spring/summer phases were found to be advancing. The findings strongly support previous studies in Europe, confirming them as free from bias towards reporting global climate change impacts (Menzel et al., 2006b).

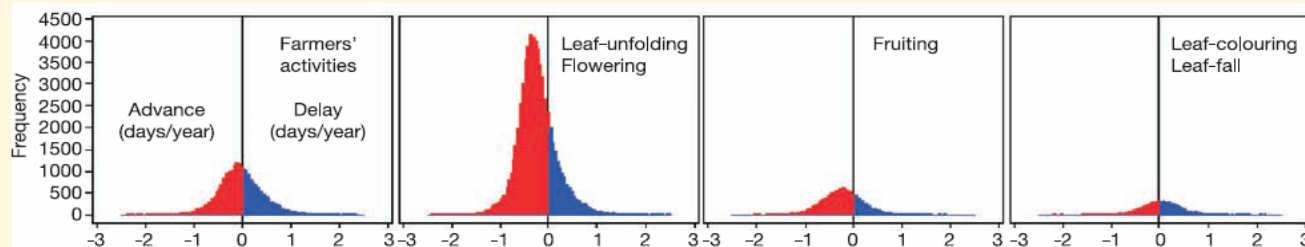
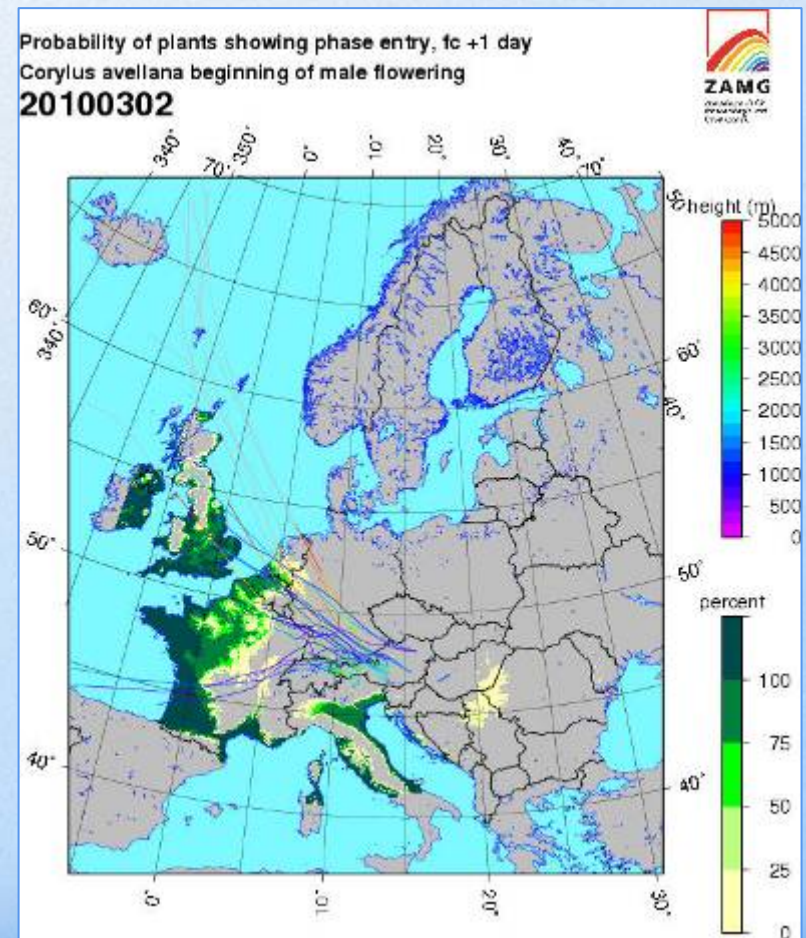
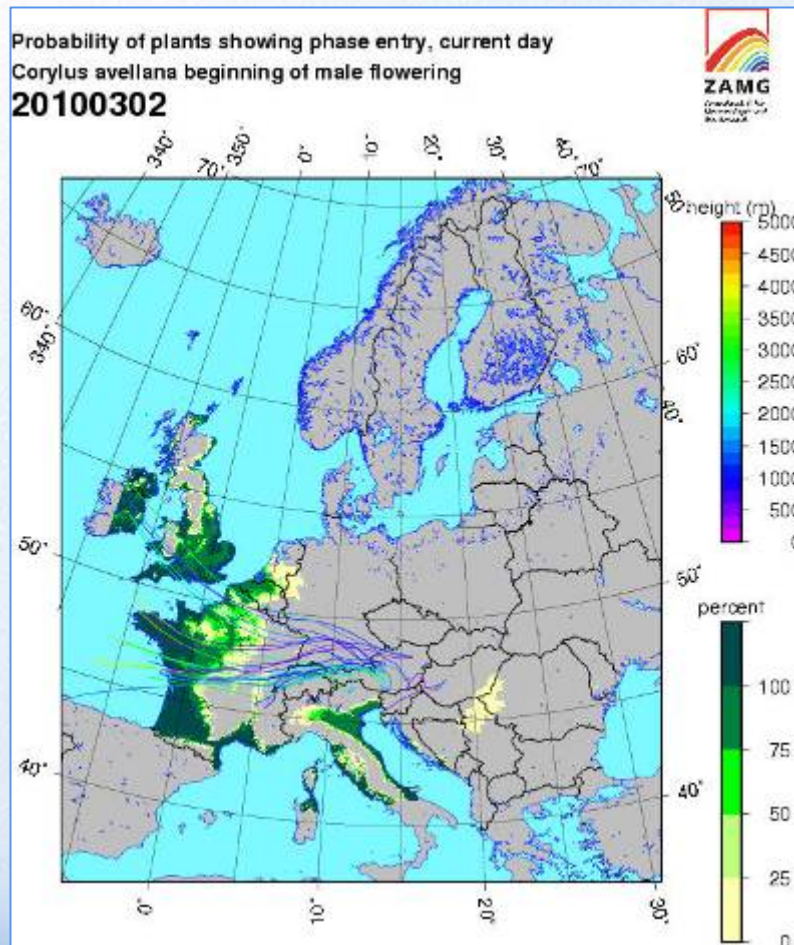


Figure 1.6. Frequency distributions of trends in phenology (in days/year) over 1971 to 2000 for 542 plant species in 21 European countries. From Menzel et al. (2006b)



Transport of pollen



UPCOMING ACTIVITIES

- PEP725: 5 years budget, kickoff June 2010
- Restructuring of database
- Interdisciplinary international conference on phenology: **Phenology 2010: Climate change impacts and adaptation.** Trinity College Dublin, Ireland 14 - 17 June 2010
- **International Workshop on the Validation of Satellite-based Land Surface Phenology Products,** Trinity College Dublin, Ireland, 18 June 2010

THE END

