COOPEUS Carbon Use Case

WP6 (Biodiversity) perspective

(AGU Fall Meeting 2014 15th December 2014)

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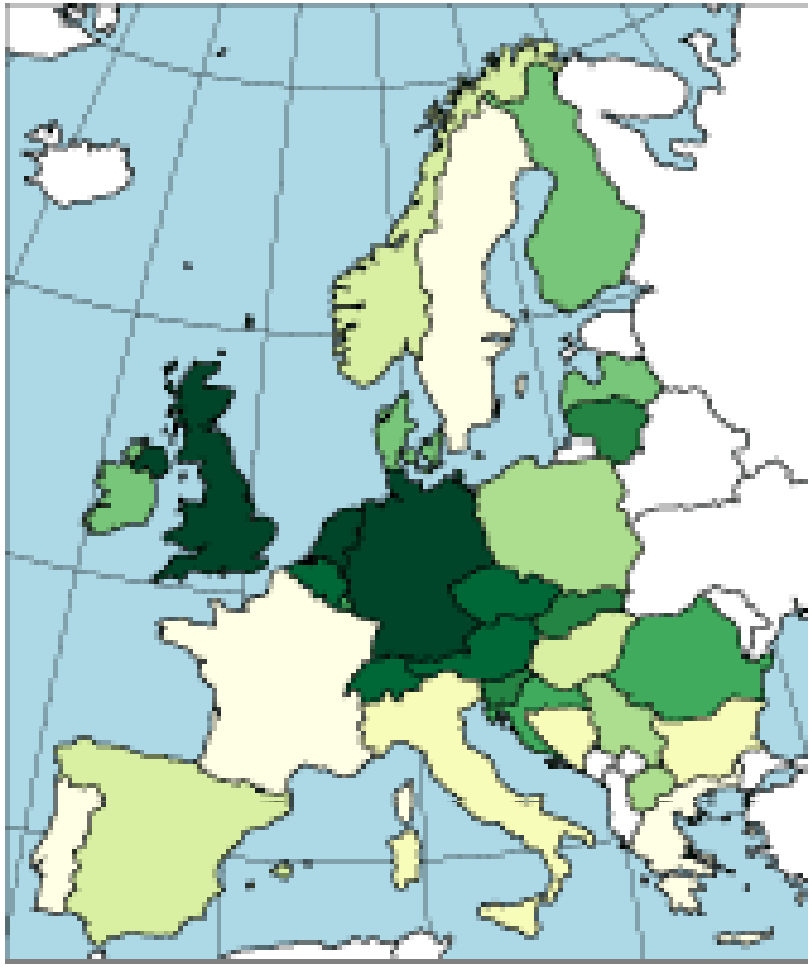
Disclaimer: we mainly work with/on computers…

Approach from WP6

- Introduce the use case describing the challenge of analyzing a model for the phenological observations, and the interest to solve it.
- Compare the different sources of phenology observations, as well as the technical issues like different formats, conventions or quality assurance methods, employed in US and EU. Describe the methods used to access data.
- Layout for an integration and data assimilation, where a central piece is the integration of the CLM.
- Understand the potential gaps existing using an "scale/systemic" approach (at the leaf level, at the plant level, at the local ecosystem level, etc.)
- Deployment of a VCoP (Virtual Community of Practice) where new ideas based on new observations, software or platforms, that could improve our understanding, could be explored.

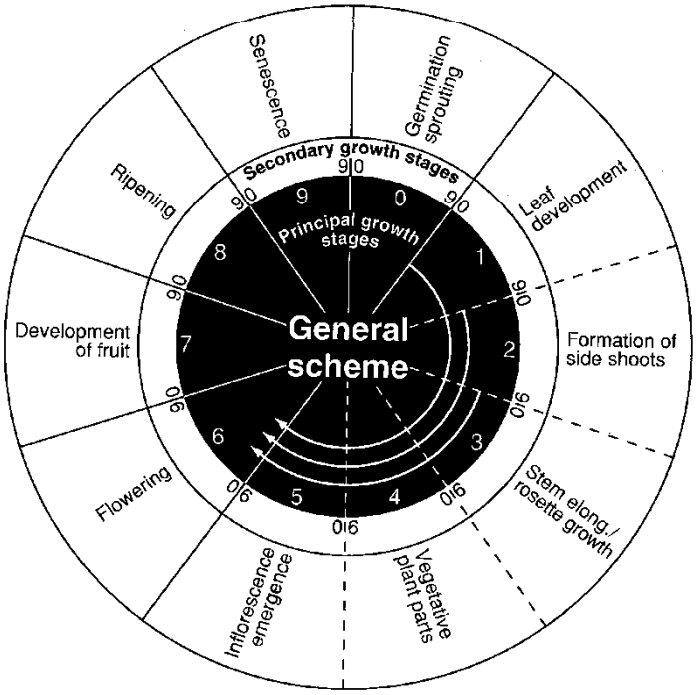
Phenology data in EU

- **PEP725** is a project funded by ZAMG, the Austrian ministry for science & research and EUMETNET (the network of European meteorological services) - with the goal to establish an open access database with plant phenology data sets for science, research and education.
- **OBJECTIVE: to promote and facilitate phenological research by delivering a pan European phenological database with an open, unrestricted data access for science, research and education**
- 20 European meteorological services and 7 partners from different phenological network operators have joined PEP725.



Phenology data in EU (II)

- Around 100 species tracked with historical series
- methodology: Kock et al 2009 Guidelines for Plant Phenological Observations, WMO tech. comm. For Climatology, OPAG2
- Monitoring principles: http://www.wmo.int/pages/prog/gcos/documents/GCOS_Climate_Monitoring_Principles.pdf



Principal Growth Stages	Description
0	Germination / sprouting / bud development
1	Leaf development (main shoot)
2	Formation of side shoots / tillering
3	Stem elongation or rosette growth / shoot development (maninshoot)
4	Development of harvestable vegetative plant parts or vegetatively propagated organs / booting (main shoot)
5	Inflorescence emergence (main shoot) / Heading
6	Flowering (main shoot)
7	Development of fruit
8	Ripening or maturity of fruit and seed
9	Senescence beginning of dormancy

Principal and secondary growth stages of the BBCH code (source Growth stags of plants, Meier, 1997)

Analysis example

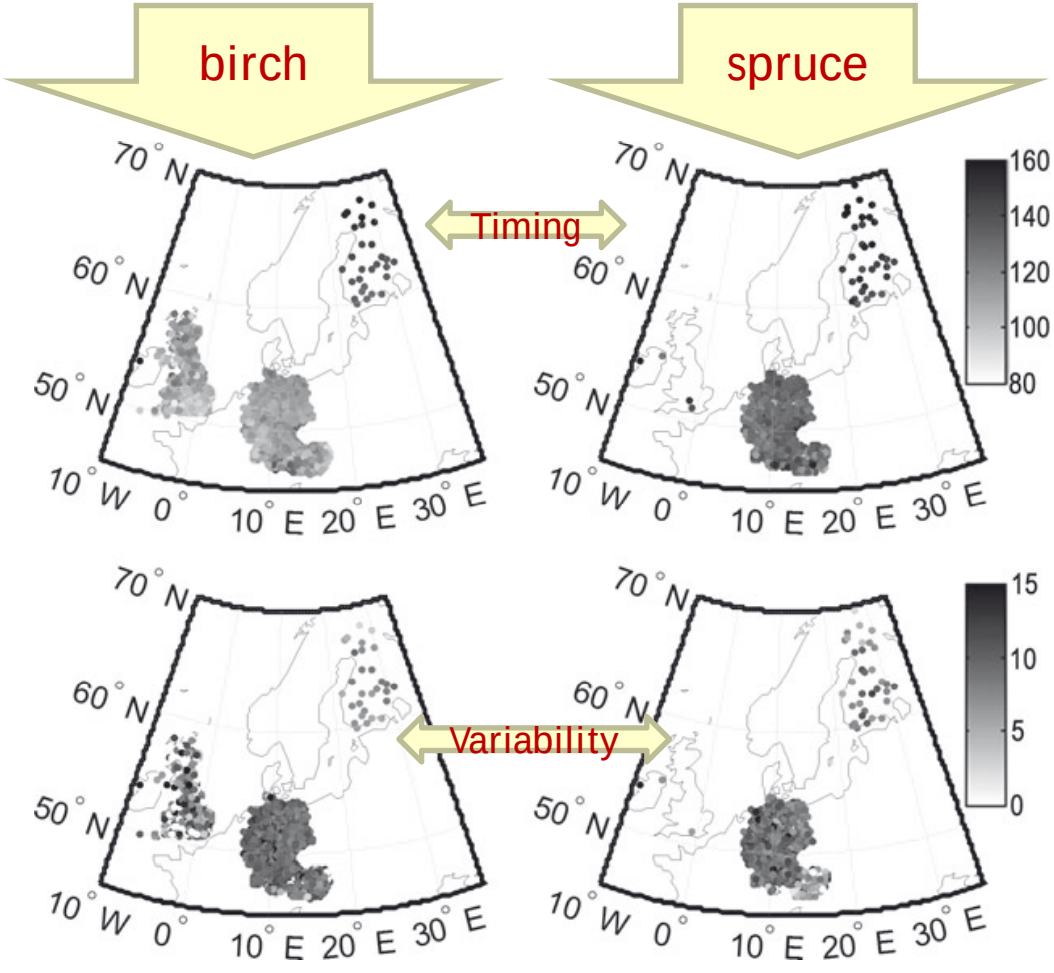
- *"Process-based models not always better than empirical models for simulating budburst of Norway spruce and birch in Europe"*

By Cecilia Olsson and Anna Maria Jonsson , Lund University, in Global Change Biology, 2014, 20, 3492-3507

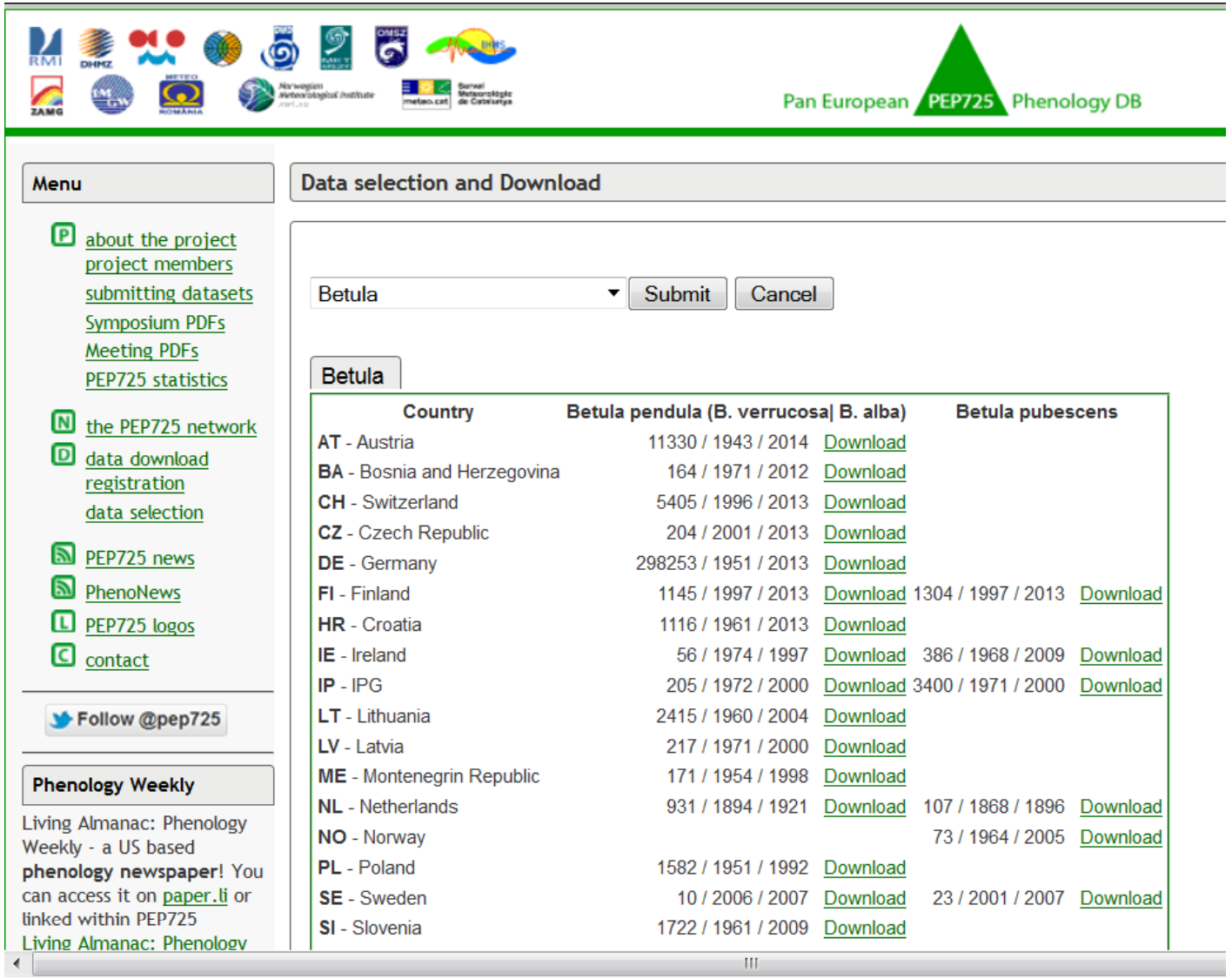
Phenology data: pep725 data on:

Betula pendula (Birch) , leaf unfolding on the first visible leaf stalk (BBCH11)

Picea abies (Norway spruce), first leaves separated (BBCH10)



Example: data access



Pan European PEP725 Phenology DB

Menu

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Phenology Weekly

Living Almanac: Phenology Weekly - a US based **phenology newspaper**! You can access it on paper.li or linked within PEP725
Living Almanac: Phenology

Data selection and Download

Betula | Submit | Cancel

Betula

Country	Betula pendula (B. verrucosa| B. alba)		Betula pubescens	
AT - Austria	11330 / 1943 / 2014	Download		
BA - Bosnia and Herzegovina	164 / 1971 / 2012	Download		
CH - Switzerland	5405 / 1996 / 2013	Download		
CZ - Czech Republic	204 / 2001 / 2013	Download		
DE - Germany	298253 / 1951 / 2013	Download		
FI - Finland	1145 / 1997 / 2013	Download	1304 / 1997 / 2013	Download
HR - Croatia	1116 / 1961 / 2013	Download		
IE - Ireland	56 / 1974 / 1997	Download	386 / 1968 / 2009	Download
IP - IPG	205 / 1972 / 2000	Download	3400 / 1971 / 2000	Download
LT - Lithuania	2415 / 1960 / 2004	Download		
LV - Latvia	217 / 1971 / 2000	Download		
ME - Montenegrin Republic	171 / 1954 / 1998	Download		
NL - Netherlands	931 / 1894 / 1921	Download	107 / 1868 / 1896	Download
NO - Norway			73 / 1964 / 2005	Download
PL - Poland	1582 / 1951 / 1992	Download		
SE - Sweden	10 / 2006 / 2007	Download	23 / 2001 / 2007	Download
SI - Slovenia	1722 / 1961 / 2009	Download		

Example: Picea Abies

PEP_ID	National_ID	LON	LAT	ALT	NAME
19525	1	158.666	44.8	246	Bihac
19526	2	17.45	44.05	562	Bugojno
19527	5	18.433	43.866	560	Ilidza
19528	4	17.8	433.333	99	Mostar
19529	3	186.833	445.333	305	Tuzla
20454	6	184.228	438.678	630	Sarajevo

bbch	description
0	Sowing
7	Beginning of sprouting
10	**First leaves seperated (mouse ear)**
11	Leaf unfolding (first visible leaf stalk)
13	Leaf unfolding (50%)
14	Leaf unfolding (4.true leaves, leaf pairs or whoris unfolded)
15	Leaf unfolding (5.true leaves, leaf pairs or whoris unfolded)
31	First node just above surface detectable
39	maximum stern length or rosette diameter reached)
48	Maximum of total tuber mass reached, tubers detach easily from stolons, skin set not yet complete (skin easily removable with thumb)
49	Skin set complete: (skin at apical end of tuber not removable with thumb) 95% of tubers in this stage
51	First flower buds visible
55	Middle of heading: half of inflorescence emerged
59	End of heading: inflorescence fully emerged
60	Beginning of flowering
61	Flowering 10% (male)
62	beginning of flowering, 20% of flowers open
65	30% of flowers open, maize:male:beginning of pollen shedding female: tips of stigmata visible

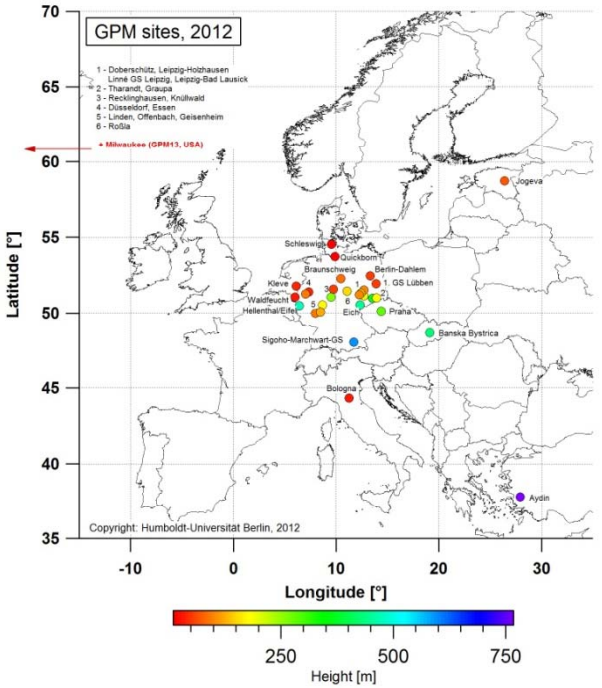
PEP_ID	BBCH	YEAR	DAY
19528	10	1971	87
19527	10	1971	110
19528	10	1972	77
19527	10	1972	108
19528	10	1973	82
19527	10	1973	121
19528	10	1974	71
19527	10	1974	101
19529	10	1977	98
19527	10	1977	98
19528	10	1978	110
19529	10	1978	129
19528	10	1979	127
19527	10	1979	140
19525	10	1979	145
19528	10	1980	93
19527	10	1980	126
19528	10	1981	83
19527	10	1981	128
19528	10	1982	91
19529	10	1982	128
19527	10	1982	132
19529	10	1983	115
19527	10	1983	128
19525	10	1984	315
19529	10	1985	118
19529	11	2001	113
19529	60	2001	135
19529	11	2002	113

Other initiatives

- The **G**lobal **P**henological **M**onitoring Programme (GPM) is coordinated by the Humboldt-University of Berlin.

  It is an initiative of the Phenology Study Group of the International Society of Biometeorology http://www.biometeorology.org/.

- Phenological Observations will be done in **special GPM-gardens throughout the world between approximately 35°N to the Arctic Circle and southern tropics to 50°S**.



In these gardens a standard programme (fruit trees) and an extended programme (ornamental shrubs) will be observed. Not all species in the programme can grow at each site. The number of observed species in a garden depends mainly on the local climate conditions. Phenological observations will be done by:

Professional observers,
Schools subscribed to the Global Phenology Garden of the GLOBE Programme (Global Learning and Benefit the Environment), and Volunteers.

In the vicinity of each GPM-Garden a meteorological station should be located.

EARTH & LIFE INSTITUTE

LifeWatch Wallonie-Bruxelles

presented by Inès Moreau

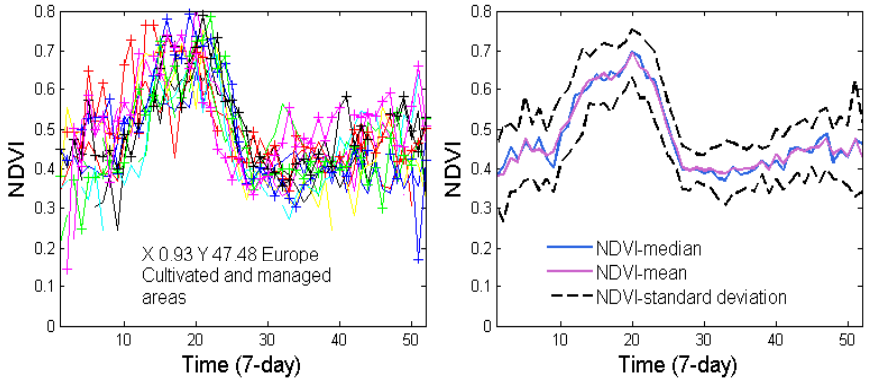
Vienna, April the 29th 2014

Prs P. Defourny, J. Radoux, C. Rousseau, Th. De Maet, C. Lamarche and A. Verhegghen

UCL UNIVERSITÉ CATHOLIQUE DE LOUVAIN

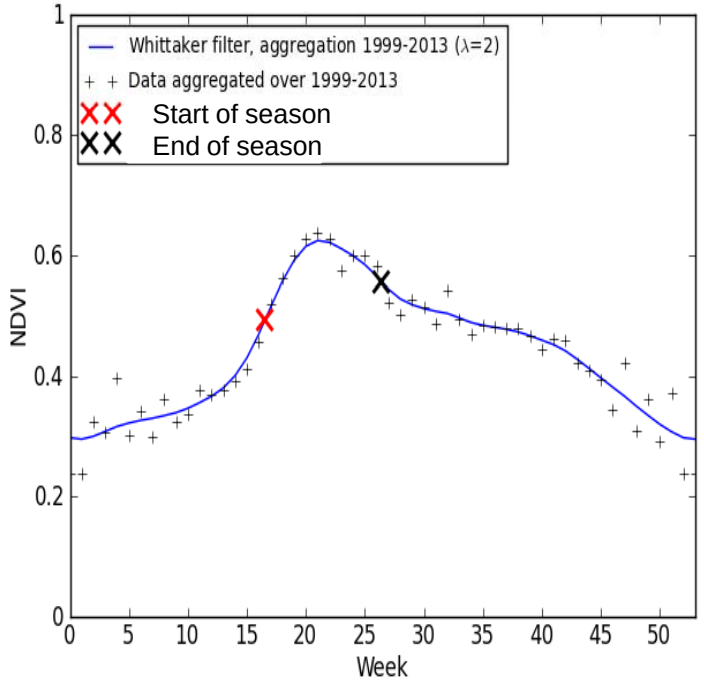
Vegetation profiles are very useful for ecosystem dynamics

- NDVI is a widely used vegetation index
- Smoothing of the time series remains necessary

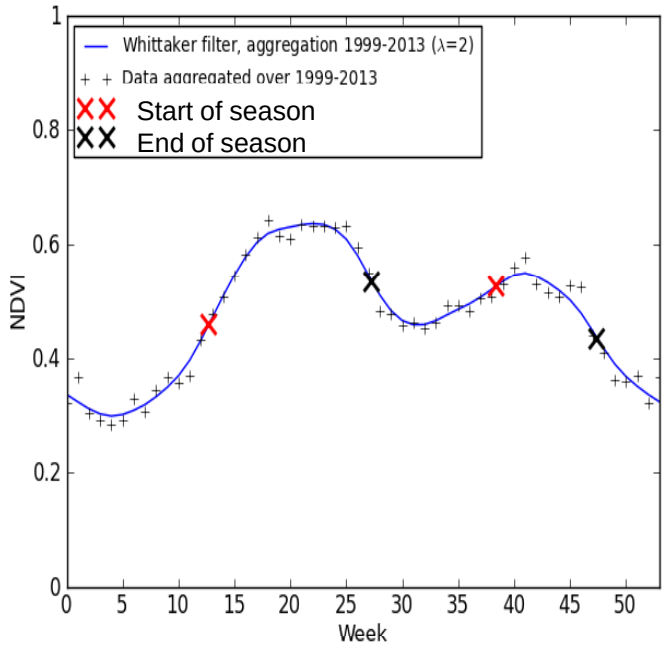


- Smoothing filter (Whittaker) implemented

Metrics are extracted from smoothed profiles



One season



Two seasons

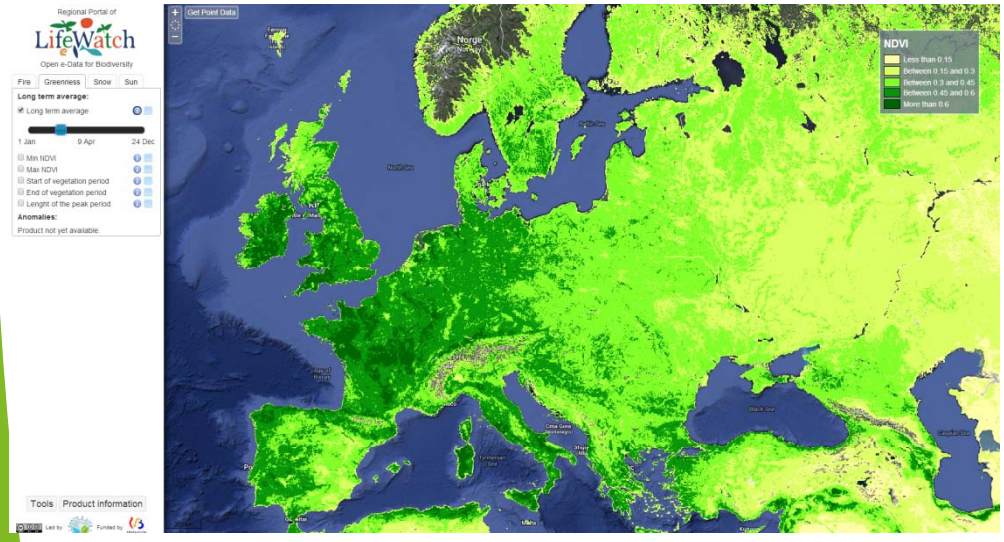
LifeWatch

E-Science European Infrastructure for Biodiversity and Ecosystem Research

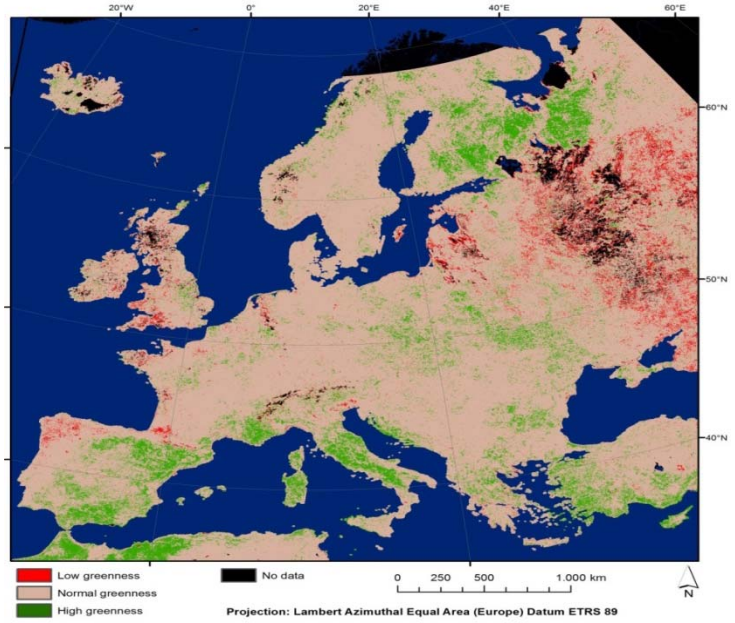
Overview of the growing season at European scale

http://www.lifewatch.eu/ecosystem-phenology

http://maps.elie.ucl.ac.be/lifewatch/geoviewer.html



Long term average



Anomalies

LifeWatch
E-Science European Infrastructure for Biodiversity and Ecosystem Research

Potential contribution to COOPEUS

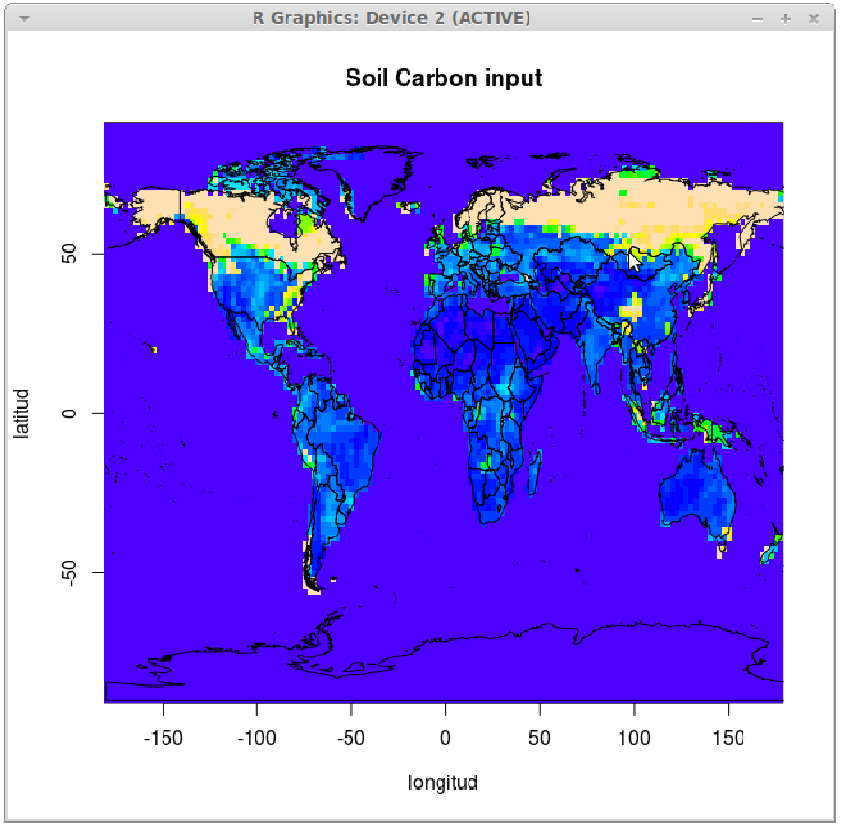
- Data could be provided before official release
  - Long term average
  - Standard deviation on the long term average

  → Global
  - Metrics
    - Number, start(s), end(s) of vegetation periods
    - Maximum and minimum NDVI

  → Pan-European

CLM Community Land Model

- The Community Land Model is the land model for the Community Earth System Model (CESM) and the Community Atmosphere Model (CAM)
- CLM have been installed in our Supercomputer Altamira, as part of (latest) CESM 1.2 version).
- Some tests: configuring model, dependencies, etc.
- I/O Data Format: NetCDF

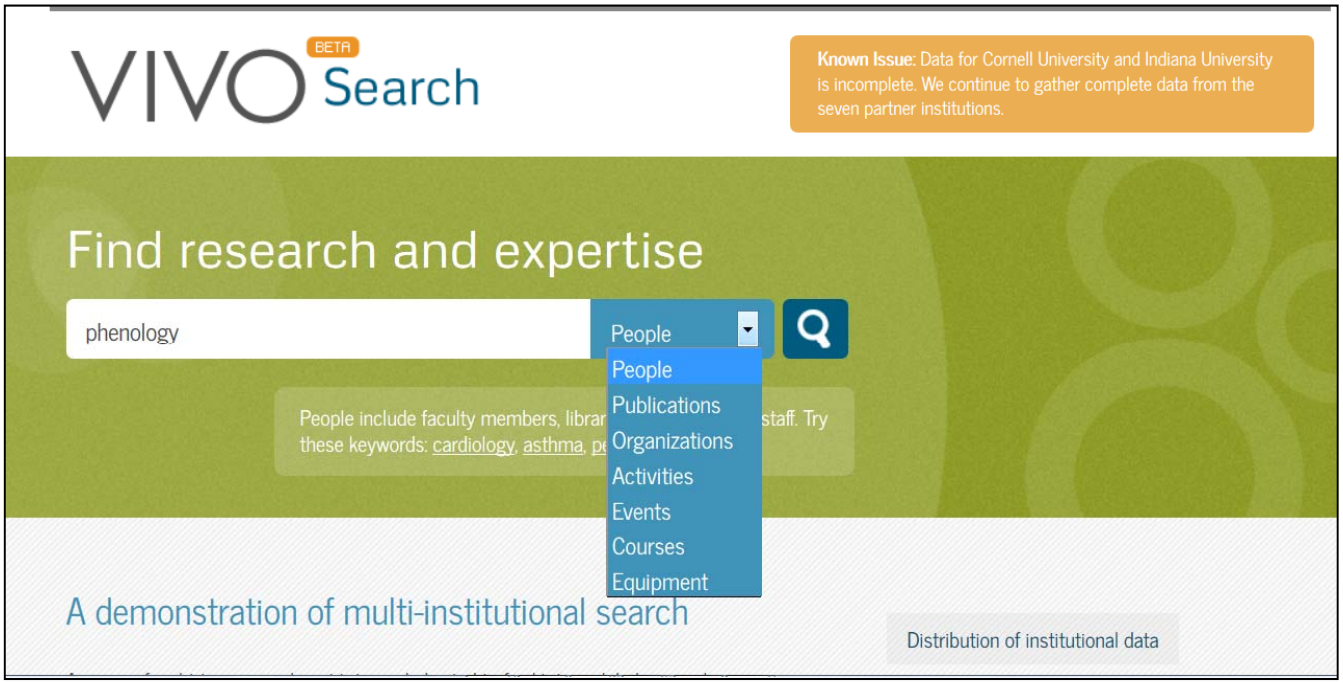


How to support a VCoP

- How to start a Virtual Community of Practice (VCoP) ?
  - At the meeting organized during EGU General Assembly 2014 in Vienna (Austria), we met Jesús Marco (WP6 responsible and meeting convener, IFCA-CSIC), Fernando Aguilar (IFCA-CSIC), Francisco Bonet, Ramón Pérez, Penélope Serrano (UGr, Observatorio de Sierra Nevada from LifeWatch-ES), Inès Moreau (UCL-Earth&Life Institute, LifeWatch-BE),Lindsay Powers, Hank Loescher, Claire Lunch (NEON), Ladislav Sigut (CzechGlobe, ICOS).
  - Next session at EGU, also WP3 and COOPEUS, and next one at COOPEUS Annual Meeting,
  - At AEMET meeting in Spain: AEMET people and the network of phenology observers, and also pep725
  - At LifeWatch Spain: interest of REDIAM and University of Cordoba (Carmen Galan) and team…
  - At this AGU Fall Meeting, new contacts!
  - Looking to literature: papers on phenology and global change (Global Change papers and references therein)
  - Wide related area: Remote sensing
  - Interest from Poland: phenocam installed

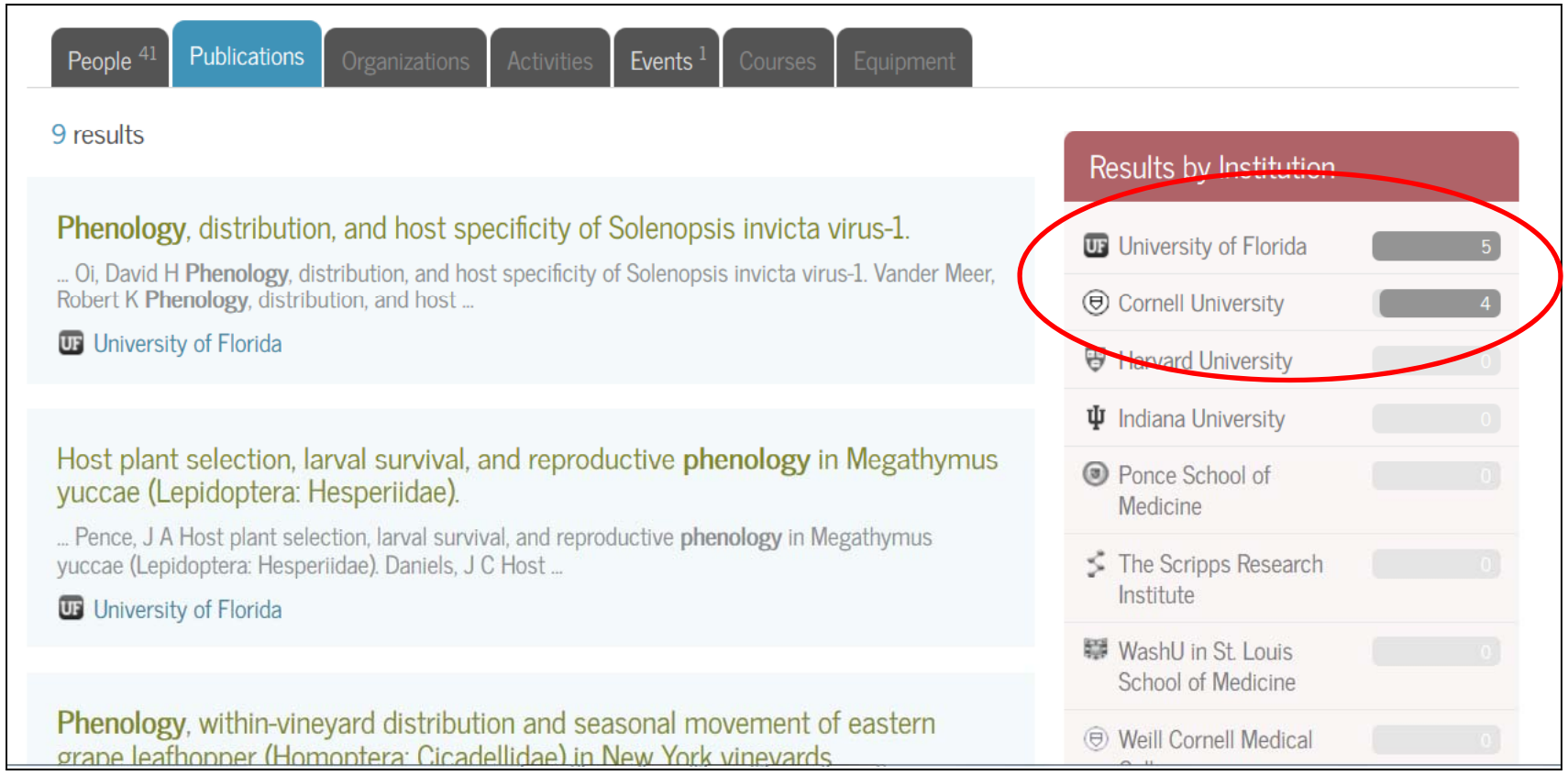
How to support a VCoP (II)

- How to support a "community"? Phenology could be a nice example
  - Understand current community tools
  - Understand potential gaps
- We have started to explore the VIVO Tool:



How to support a VCoP (II)

- We have started to explore the VIVO Tool:



How to support a VCoP (III)

- We have installed a test VIVO node
- We believe it can be a good idea to explore
  - Experts
  - Papers. Projects, Events!
  - Instruments…Models!
  - ONTOLOGIES are needed
  - Then relationships can be created (like researchers using same model)
- We need to confront with other existing tools in EU
  - mostly related to Open Access, like **ORCID**
  - IN CSIC, SPAIN, DIGITAL.CSIC ALLOWS OUR PRODUCTION TO BE OPEN/ONLINE…
- OF COURSE, KEY PROBLEM, WHO FILLS AND UPDATES INFO?
  - WILL TRY PARSING…
  - BUT THIS IS A "CHANGE" OF PARADIGM
- It is likely a very good idea for distributed RI like LW