

· TEMPO - The French national network of phenology observatories

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TEMPO members





TEMPO network was created in **2017...**

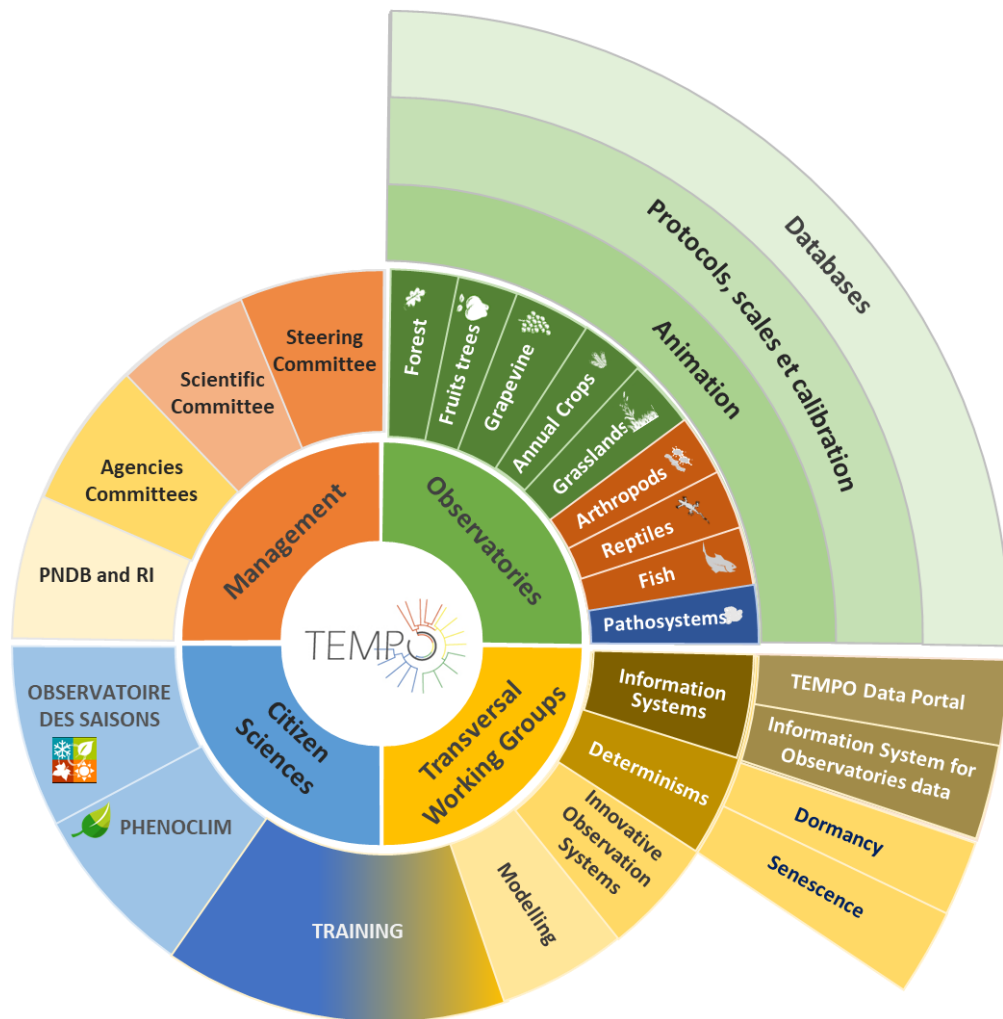
... from the **association of existing** French research **networks** (GDR, PERPHECLIM,...), **citizen sciences programs** (Observatoire des Saisons and Phenoclim CREA) ...
and new scientist and partners working on phenology

TEMPO mission

Create a research infrastructure and community for
documenting, understanding and predicting climate change
impact on living organisms **phenology** and the **consequences** on
systems **productivity** and **populations survival** and **distribution**



Organization



Main activities



Data management and dissemination

Portal, datahub, Dataverse, DMP, National and International



Animation, training and research

Multi-disciplinary, trans-observatory and citizen



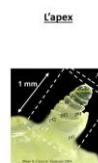
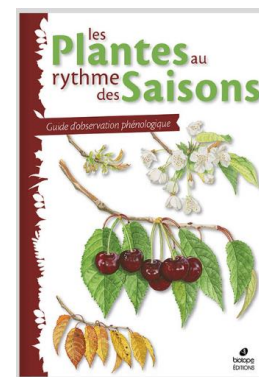
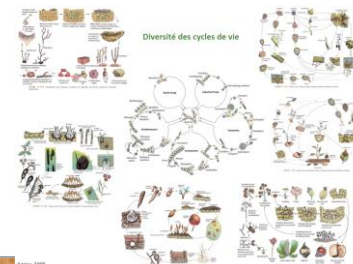
Modeling and Pheno-climatic services

Development and use of models (developed from acquired data and knowledge)

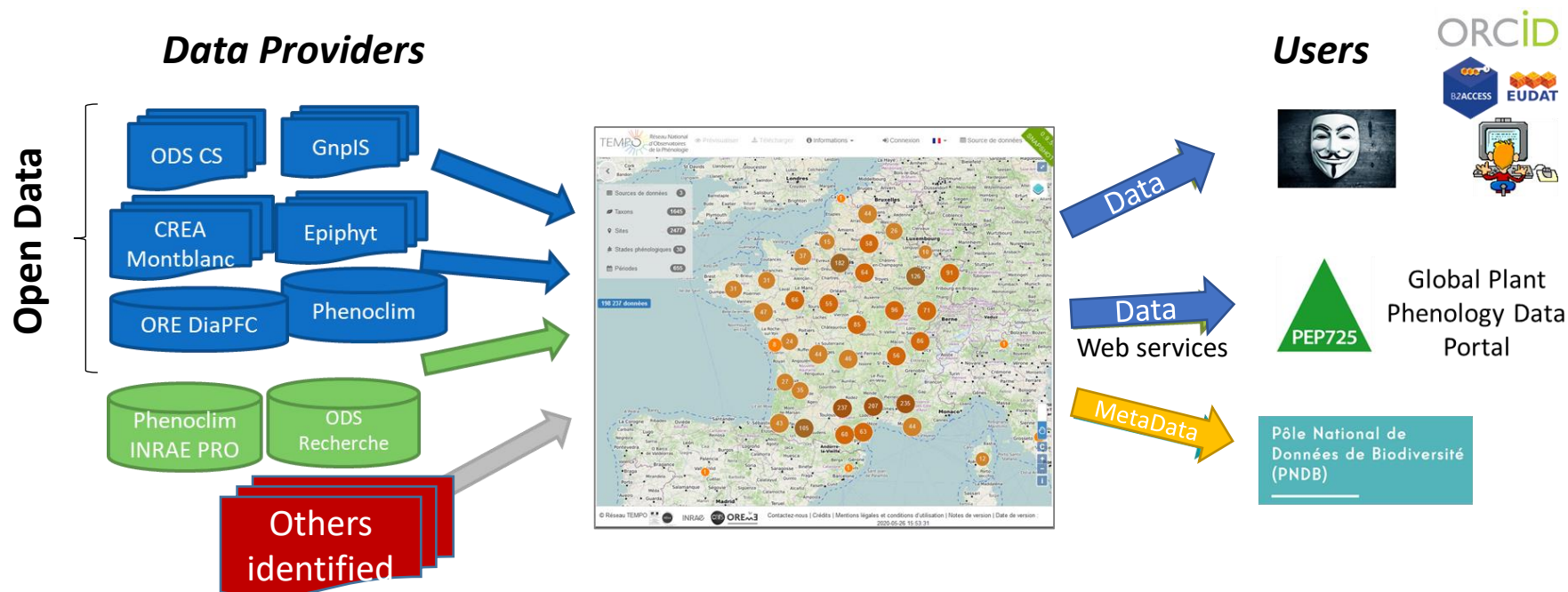


Development of new observation methods

Scales, protocols, inter-calibration, innovative tools



TEMPO Data Portal <https://data.pheno.fr>



Research data + Citizen Science Data + Professional Data

- > 2.48 M of data (+0.28 M)
- 2660 taxa (+600 taxa)
- 11775 sites (+800 sites)
- 660 years (1349-2022)



Data management and dissemination



Data Hub and Dataverse

TEMPO Dataverse

The screenshot shows the TEMPO Dataverse website. At the top, there's a navigation bar with links like 'Recherche', 'À propos', 'Guide d'utilisation', 'Support', 'Français', 'S'inscrire', and 'Se connecter'. Below this, the TEMPO logo and name are displayed, along with the text 'Dépôt de données de TEMPO - Réseau National d'Observatoires de la Phénologie'. A search bar is present with the text 'Chercher dans ce dataverse...'. On the left, there's a sidebar with filters for 'Dataverses (0)', 'Datasets (7)', and 'Fichiers (35)'. The main content area shows a list of datasets, including 'Phenological data of 26 varieties of apple, apricot, cherry trees and peach trees in a French orchard of Loire Valley since 2016' and 'Phenological data of 28 apple tree varieties and 4 pear tree varieties in a French orchard of Loire Valley since 2004'.

<https://data.inrae.fr/dataverse/TEMPO>

Orphan Data Information System (SIDO)

The screenshot shows the SIDO website. At the top, there's a header with the SIDO logo and the text 'Système d'Information pour les Données Orphelines'. Below this, there's a section titled 'Les classeurs insérés' which contains a table with columns: 'Nom du classeur', 'Nom d'utilisateur', 'Date d'insertion', 'Source de données', and 'Actions'. The table lists two classes: 'Phenoclim_AgroClim_INRAE.xlsx' and 'Phenoclim_AgroClim_Pro.xlsx'. Below this, there's a section titled 'Classeurs modèles' which contains a similar table with columns: 'Nom du classeur', 'Date d'insertion', 'Source de données', and 'Actions'. The table lists two models: 'Phenoclim_AgroClim_INRAE_model.xlsx' and 'Phenoclim_AgroClim_Pro_model.xlsx'. At the bottom, there's a section titled 'Fichiers paramètres' which contains a table with columns: 'Nom du fichier', 'Date d'insertion', 'Source de données', and 'Actions'. The table lists two files: 'Phenoclim_AgroClim_INRAE_model.xml' and 'Phenoclim_AgroClim_Pro_model.xml'.

<https://sido.pheno.fr>

- 13 datasets in TEMPO Dataverse
- Link via national Hubs with GBIF - [Global Biodiversity Information Facility](https://global.biodiversityinformation.org/)
- Several on-going papers

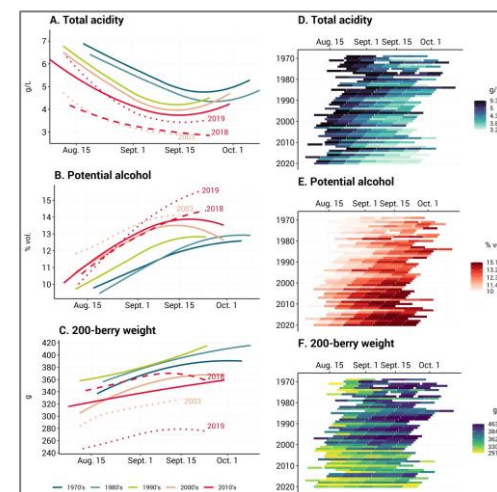
Data rescue

- **Fruit and forest trees**, INRAE Versailles Phenological Observatory 1929 -1970, 4747 observations
- **Forest trees**, Observatory of Saint Maur des Fosses 1875-1947, 180 species, 6187 observations
- **Maize**, INRAE, Variety data since 1937-1991, 100000 data
- **Annual crops**, INRAE, 1990 - 2015
- **Peach** (10 000 data) and **walnut** (10 000), INRAE – Technical PHENOCLIM data
- **Grapevine Grenache**, Institut Rhodanien, 1969 - 2021 Data Paper (Bécart et al., 2022)

And other data: Mont Ventoux dataset, Pine caterpillar, ticks...



<https://data.inrae.fr/dataverse/TEMPO>



- Intercalibration & training



Apple flowering

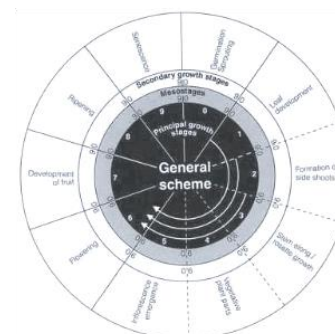
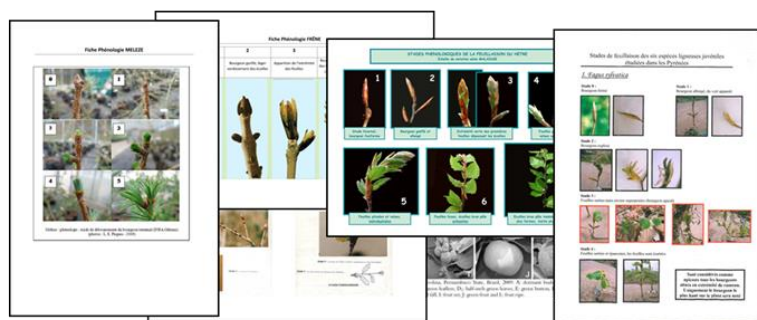


Maple budbreak

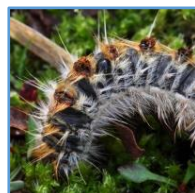
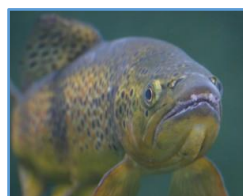


Grapevine budbreak

- Harmonising protocols – Use of common scales



BBCH Scale (Meier, 2001)



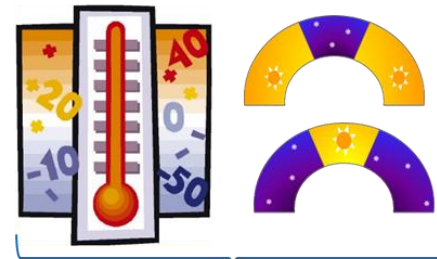
- Opening phenology blackboxes



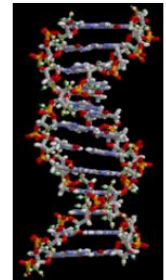
Dormancy



Leaf senescence



Environmental determinisms



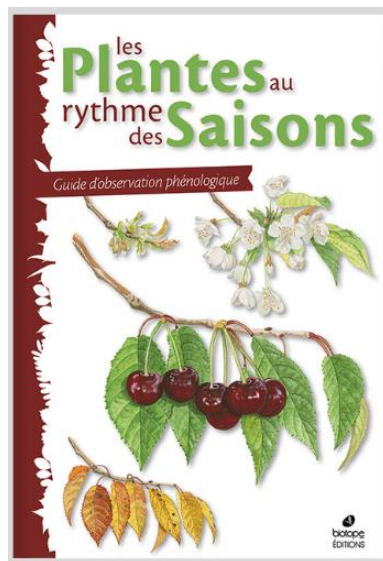
Genetic determinisms

- Sharing knowledge between scientific communities



... and Citizens

Exhibition: « Climat et Biodiversité: c'est chaud! »



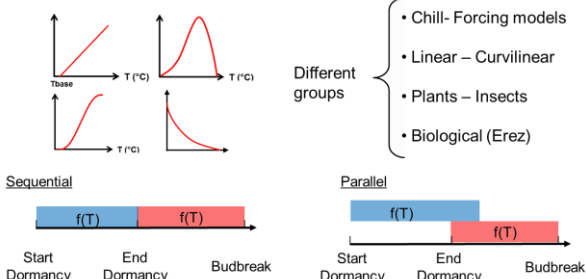
Phenology guide for temperate plants species in French, German and English



Free license exhibition: CC-BY-SA 4.0
Download and free distribution (~ 300)
<https://www.obs-saisons.fr/exhibitions>

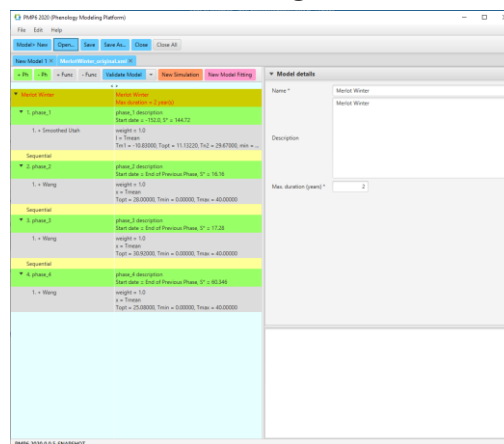


Different types des modèles (phenological process based models)

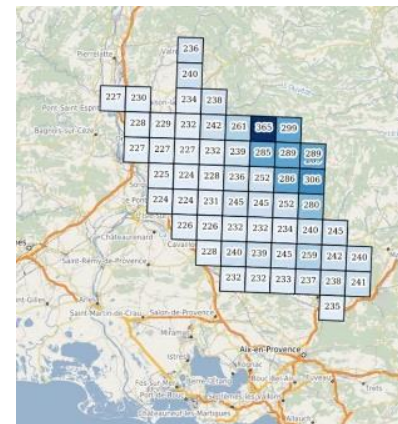


Literature

PMP6

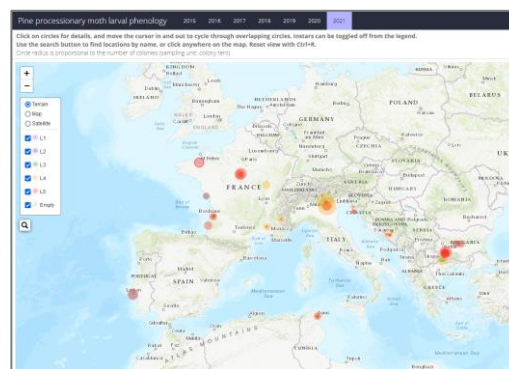


Phenoclimate Services

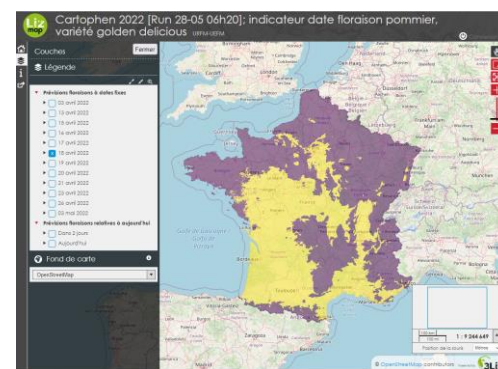


New optimisation algorithms

- **Services adapted to different species** (fruits trees, forest, crops, pests...), **different time-space scales** → **USERS committee**
- **Gitlab TEMPO**
- **Other methods to test and optimize models** : Deep Learning, Bayesian methods



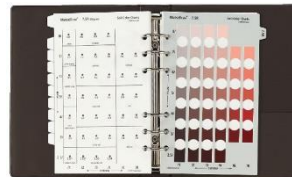
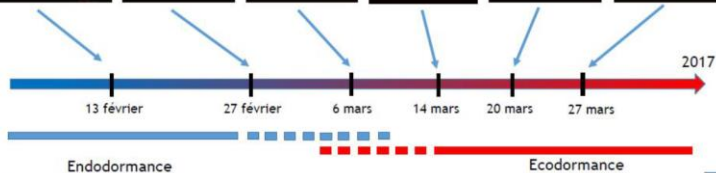
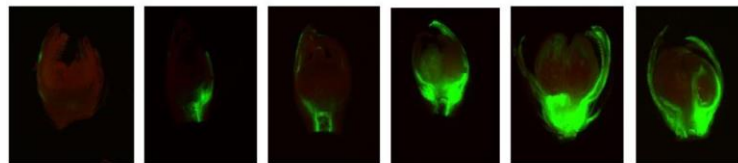
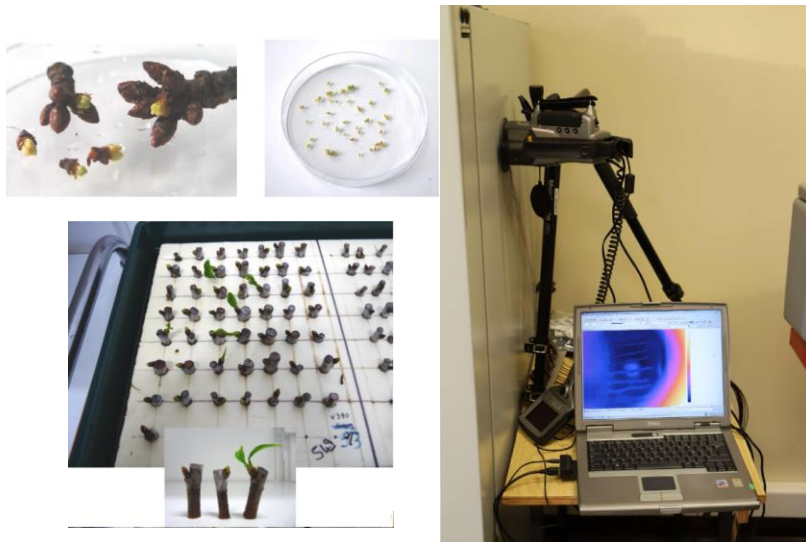
PCLIM



CartoPhen



Testing protocols and new techniques



Brinno®



Cf. Charrier, Wenden, Farrera, Chuine, Volaire...



Conclusion

- **TEMPO is a French network but open to collaborations with other countries**
- **TEMPO is willing to share its data with other information systems (licence constraints)**
- **Interactions between academics and citizen science programs are important for the dynamics of TEMPO**
- **TEMPO future project is to provide bioclimatic services**

Acknowledgments

