TEMPO - The French national network of phenology observatories

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TEMPO members

TEMPO network was created in **2017**…

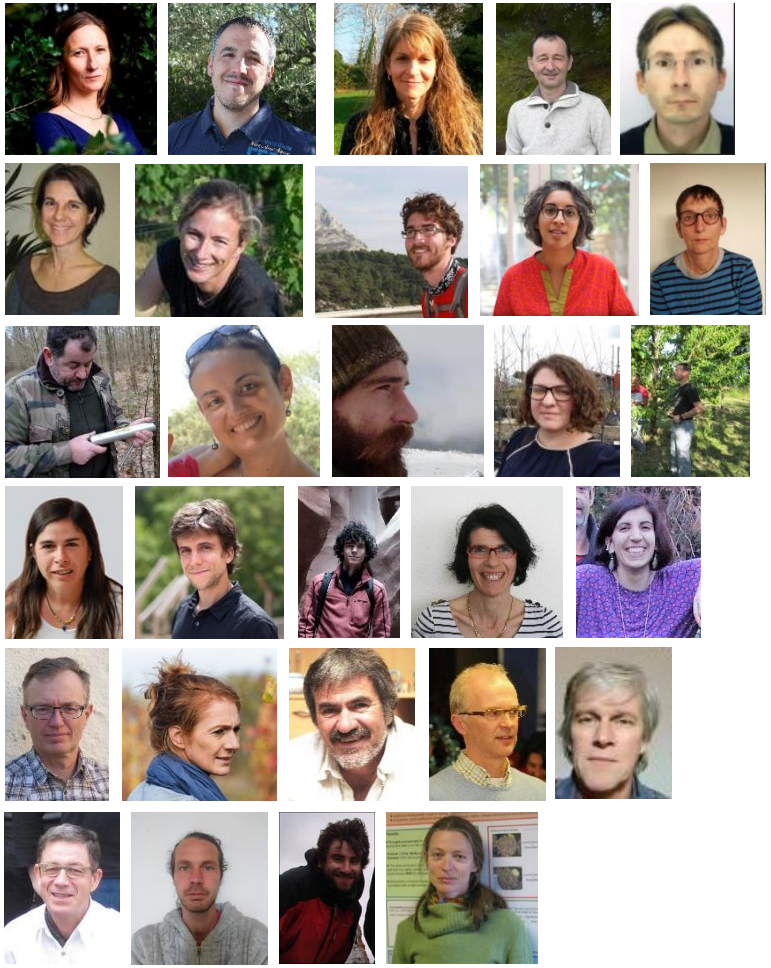
… from the **association of existing** French research **networks** (GDR, PERPHECLIM,…), **citizen sciences programs** (Observatoire des Saisons and Phenoclim CREA) …

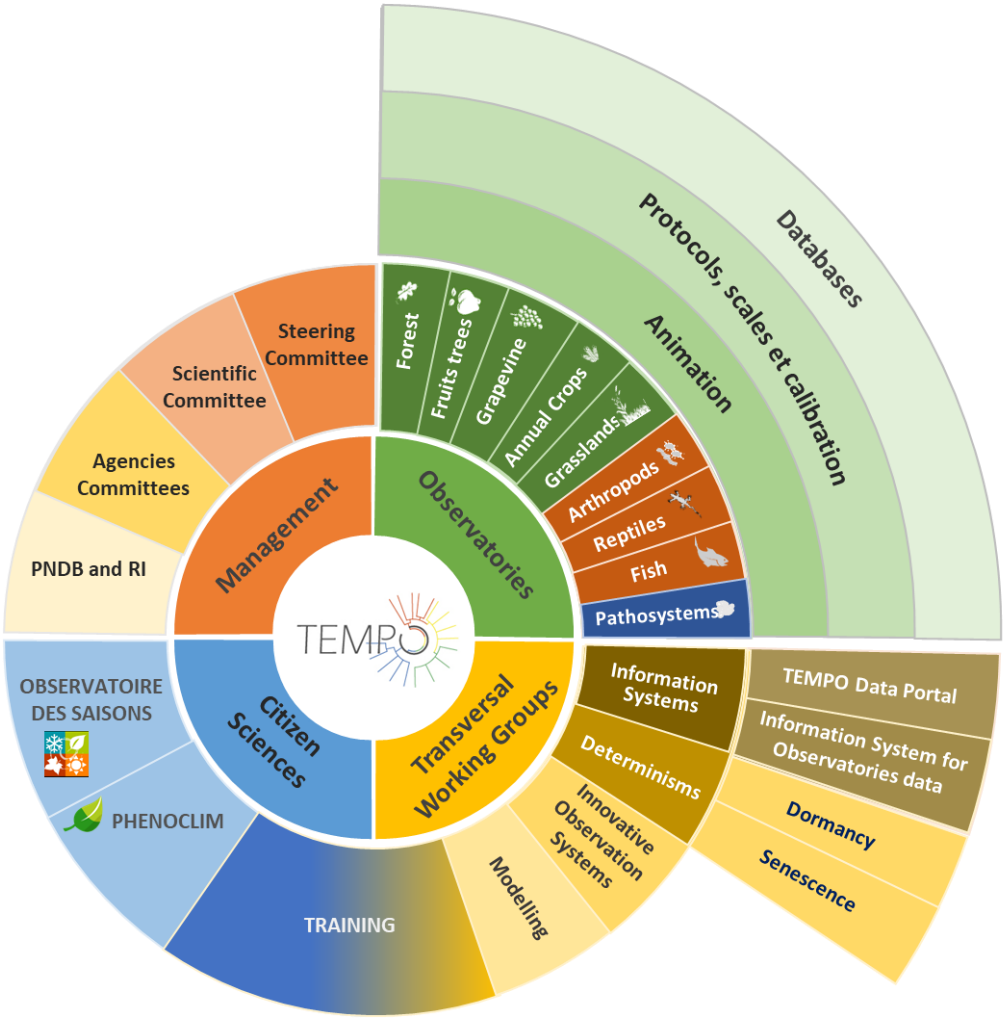
and new scientist and partners working on phenology

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





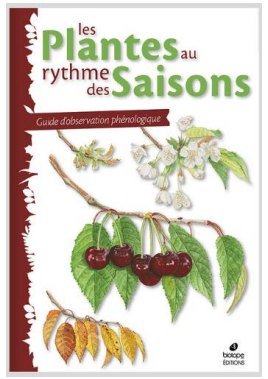
Main activities

Data management and dissemination

Portal, datahub, Dataverse, DMP, National and International

Animation, training and research

Multi-disciplinary, trans-observatory and citizen

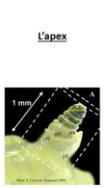


Modeling and Pheno-climatic services

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

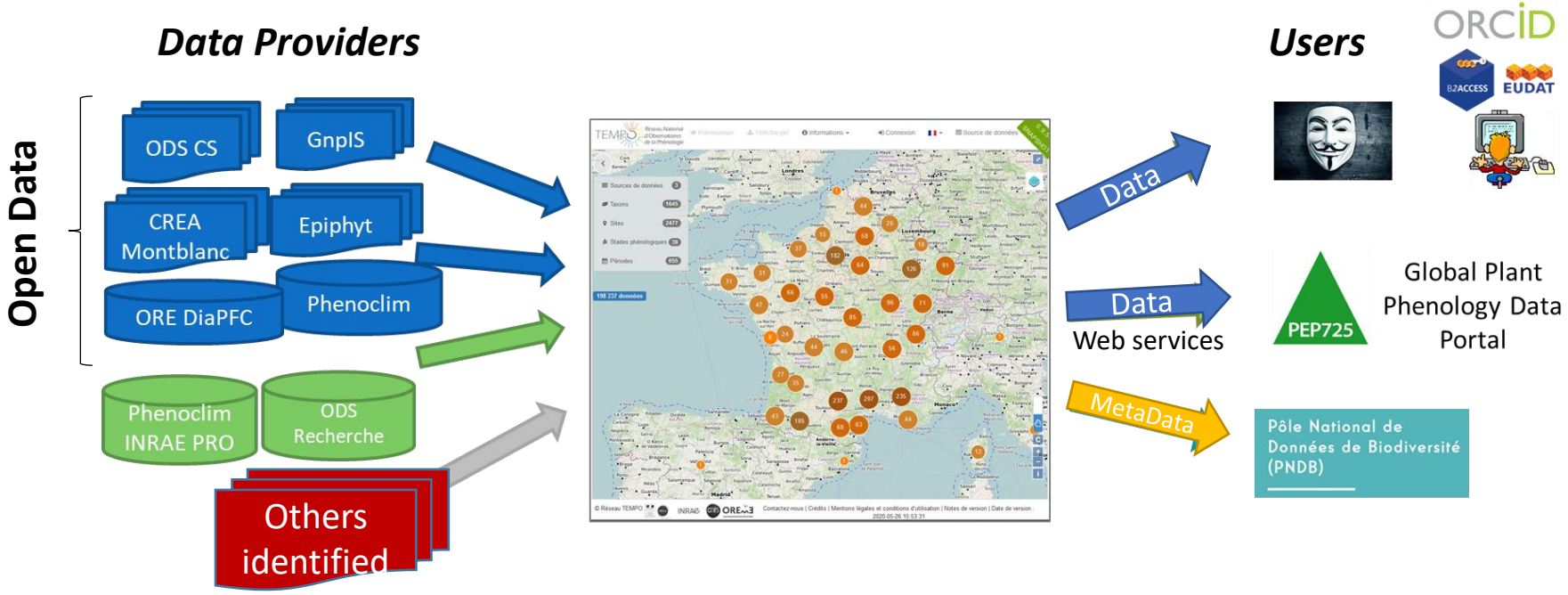
Development of new observation methods

Scales, protocols, inter-calibration, innovative tools



Data management and dissemination

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



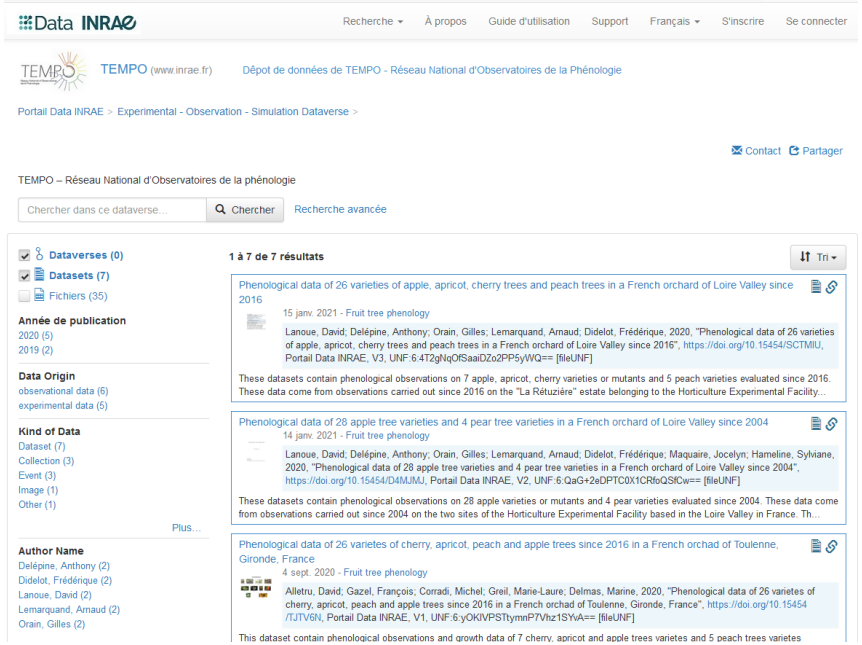
Research data + Citizen Science Data + Professional Data

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

Data management and dissemination

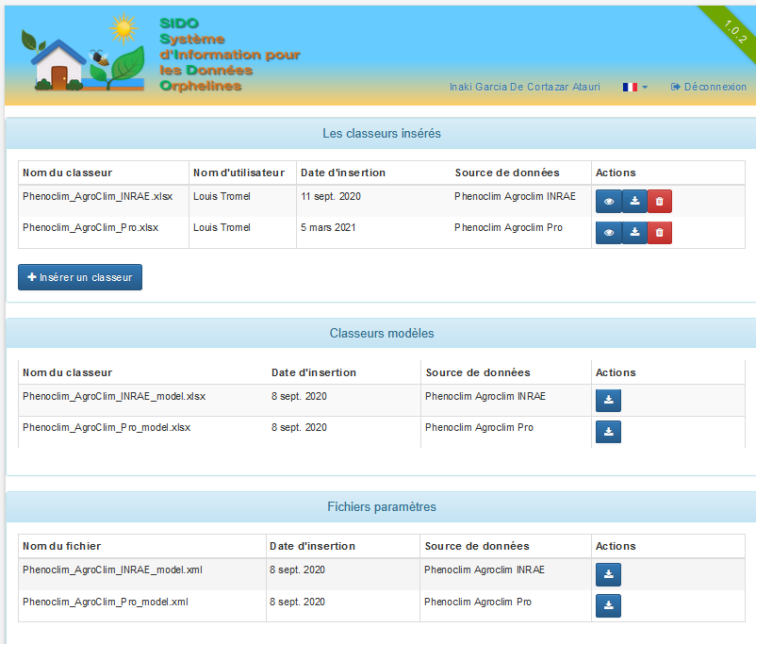
Data Hub and Dataverse

TEMPO Dataverse



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

Orphan Data Information System (SIDO)



https://sido.pheno.fr

- 13 datasets in TEMPO Dataverse
- Link via national Hubs with GBIF - Global Biodiversity Information Facility
- Several on-going papers

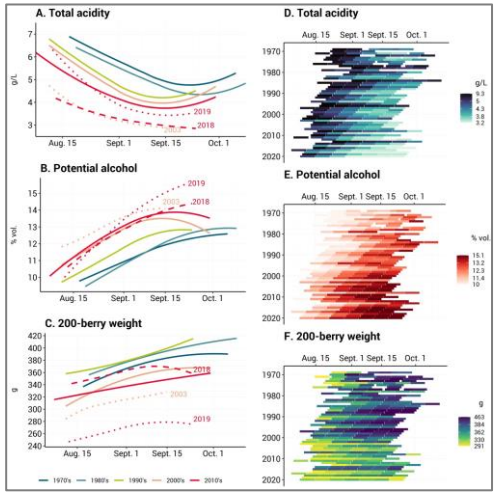
Data management and dissemination

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 caterpilar, ticks...

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



Community building

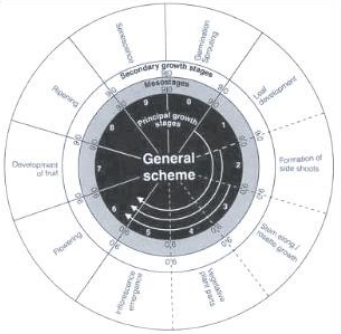
- **Intercalibration & training**

Apple flowering

Mapple budbreak

Grapevine budbreak

- **Harmonising protocoles – Use of common scales**



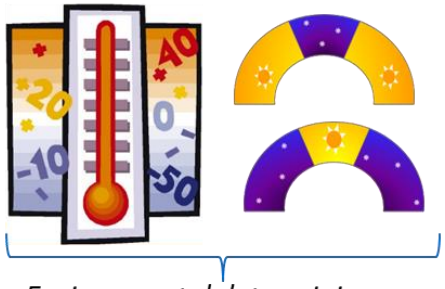
BBCH Scale (Meier, 2001)

Community building

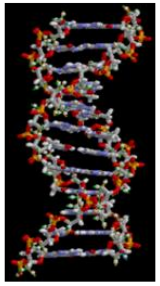
- **Opening phenology blackboxes**

Dormancy

Leaf senescence



Environmental determinisms

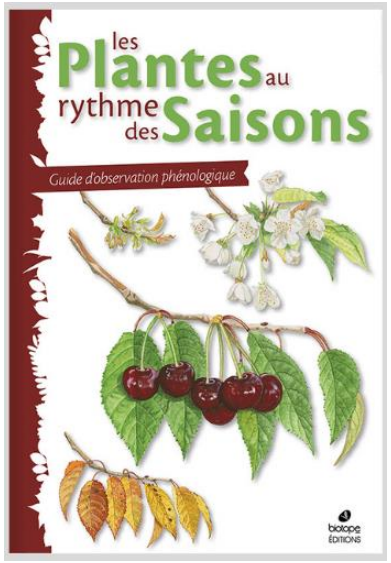


Genetic determinisms

- **Sharing knowledge between scientific communities**

Community building

… and Citizens

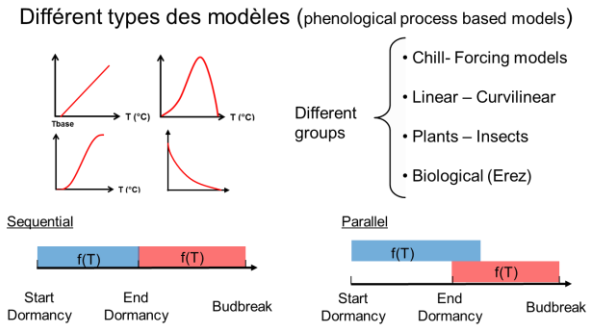


Phenology guide for temperate plants species in French, German and English

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

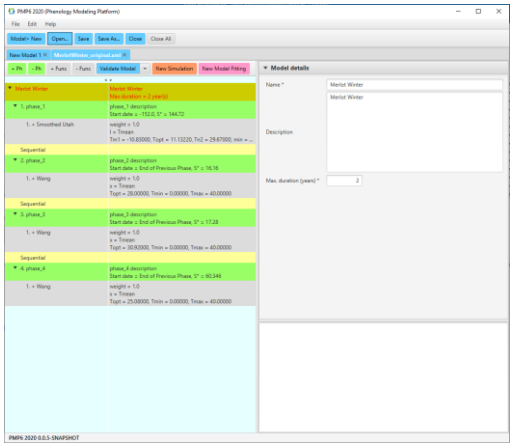
Free license exhibition: CC-BY-SA 4.0
Download and free distribution (~ 300)
https://www.obs-saisons.fr/exhibitions

Modeling and Pheno-climatic services



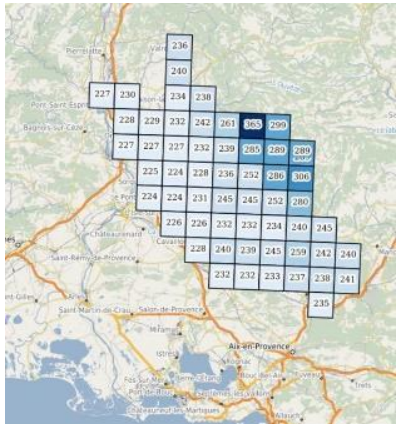
Literature

PMP6

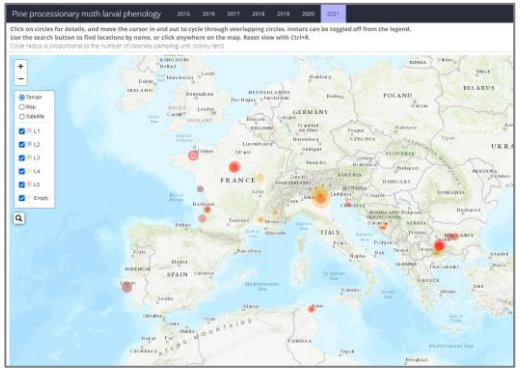


New optimisation algorithms

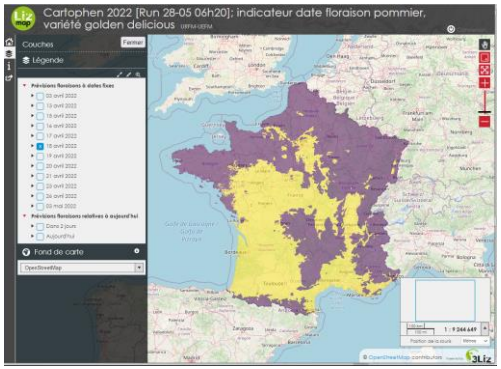
Phenoclimate Services



- **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

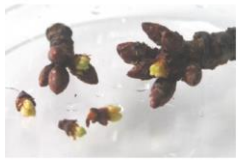


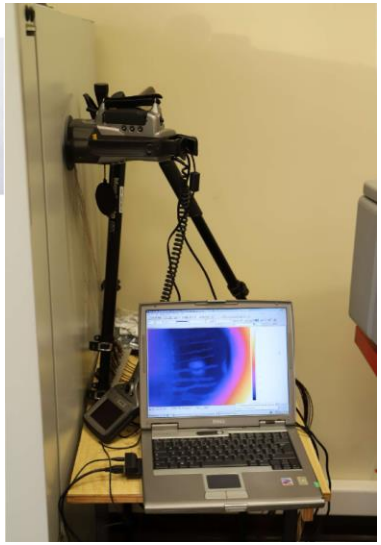
CartoPhen

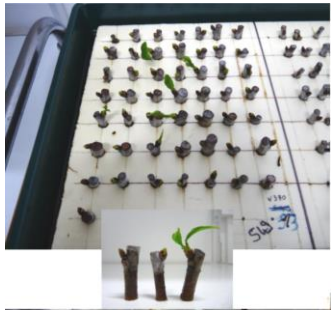
Development of new observation methods

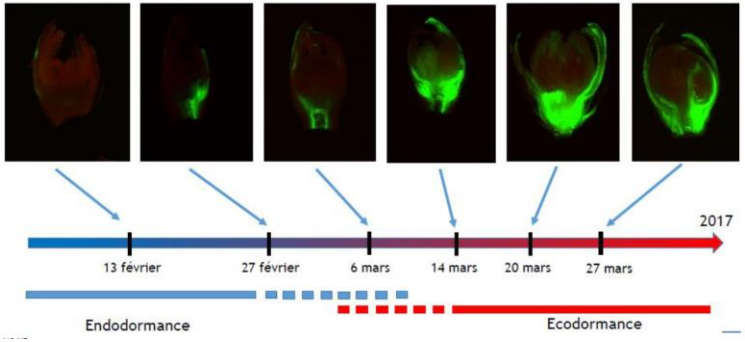
Testing protocoles and new techniques

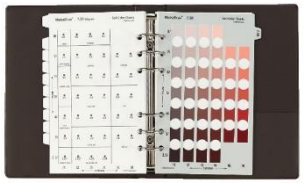
DIVAE











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**

Acknowlegments

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DE L'ENSEIGNEMENT SUPÉRIEUR, DE LA RECHERCHE ET DE L'INNOVATION

AllEnvi
Alliance nationale de recherche pour l'Environnement

PNDB
Pôle National de Données de Biodiversité

INRAE

cnrs
dépasser les frontières

Tela Botanica

CREA
-MONT-BLANC-