Land Surface Phenology

New validation/intercomparison initiatives

- Intercomparison between the Copernicus product "High resolution Vegetation Phenology and Productivity Parameters" (HR-VPP) and the following "new" ground observational networks in Mediterranean Europe:
  - The phenological network of the meteorological survey of Spain (AEMET)
  - The phenological network of France (INRAE)
  - The phenological network of Catalonia (FENOSCAT)

Progress on CEOS LPV LSP Protocol

- Most chapters now have leads, uneven but tangible progress across the chapters

Chapter	Leads
Plant Phenology and LSP	Gray, Rodriguez Galiano, Dash, Jones
Intrinsic Uncertainty	Pending
LSP Intercomparison	J. Dash
Organism-scale Observations	T. Crimmins, K. Hufkens
Phenocams and Flux Towers	A. Richardson, et al
UAVs Observations	E. Berra

Land Surface Phenology

"Fine scale vegetation phenology with UAV" in second round of revisions

Structure of the chapter:
1. Introduction
       1.1 Studies on UAV-borne remote sensing of phenology
2. Site Selection
       2.1 Accessibility and safety
       2.2 Regulations
       2.3 Representativeness
3 UAV data collection
       3.1 Type of sensors
       3.2 Flight plan and image overlap
       3.3 When to fly
       3.4 Frequency of data collection (temporal resolution) and temporal length
       3.5 Spatial resolution
       3.6 Geolocation accuracy of the time series data
4 UAV data processing
       4.1 Reconstruction of UAV orthomosaics via SfM-based software
5 Validating satellite LSP with UAV LSP
       5.1 Validating UAV LSP
       5.2 Validating satellite LSP: from individual tree to landscape level
              5.2.1 Tree crown delineation

Land Surface Phenology

Former Cal/Val of High resolution Phenology product (HR-VPP) mainly focused in Central Europe
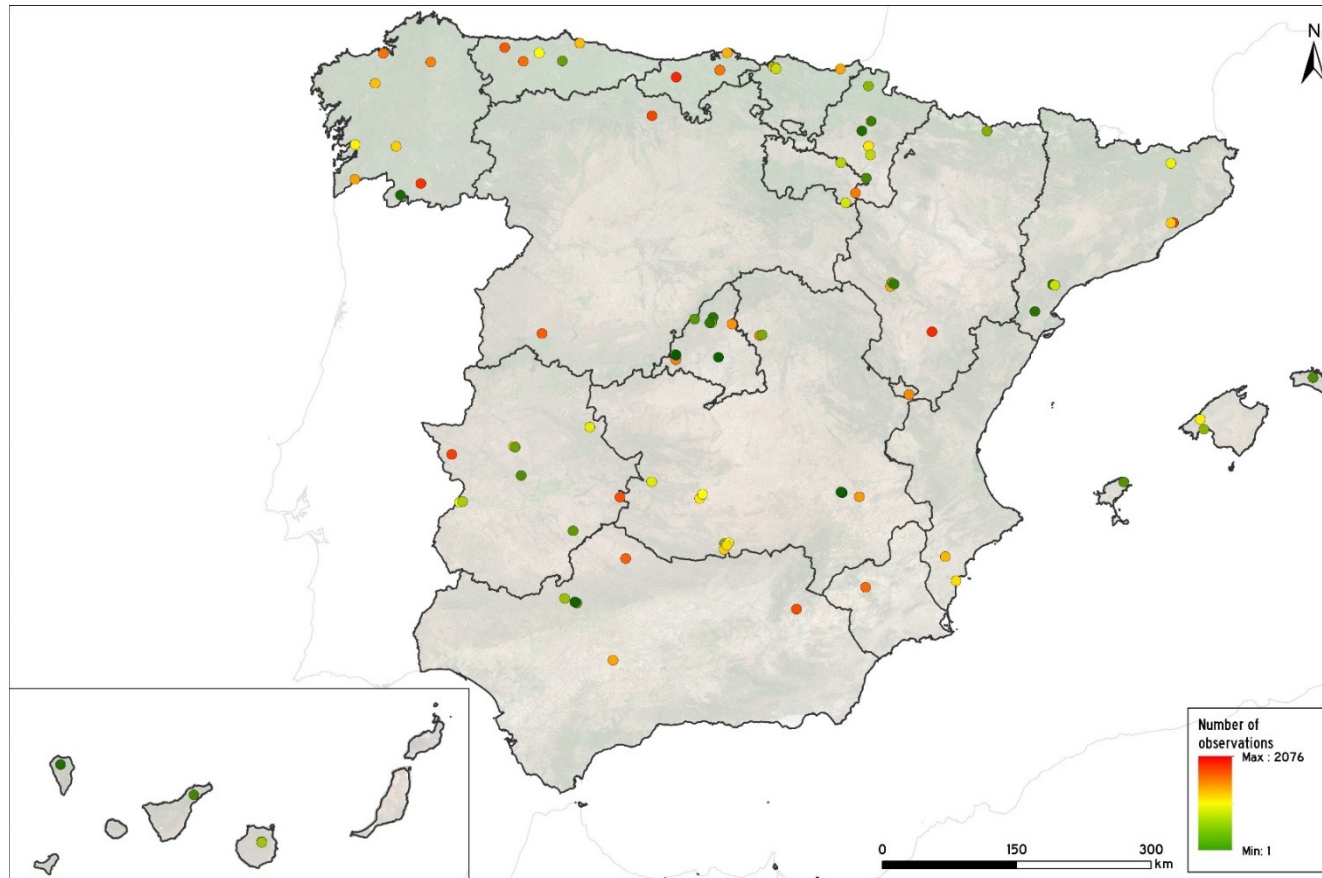
Land Surface Phenology

New validation for HR-VPP in Mediterranean Europe using PEP725 and three new observational phenological datasets: AEMET (Spain), TEMPO (France), FENOSCAT (Catalonia)
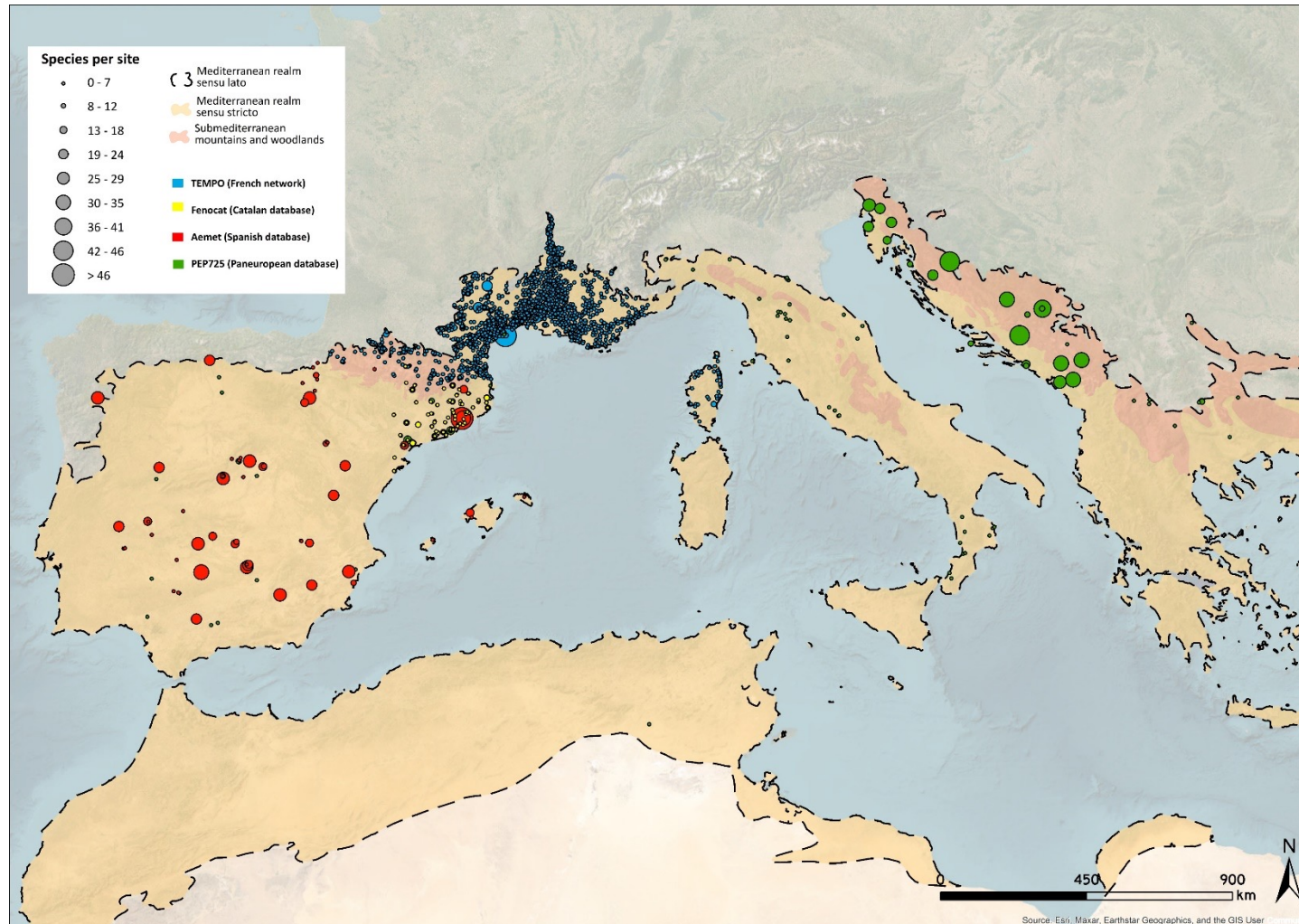
Rodriguez-Galiano et al. 2023 (In Prep.)

Land Surface Phenology

Preliminary results on the validation of HR-VPP with the phenological network of Spain (AEMET)

"New" observational network in Spain managed by the Spaniard Meteorological Survey (AEMET)
- 35,092 observations
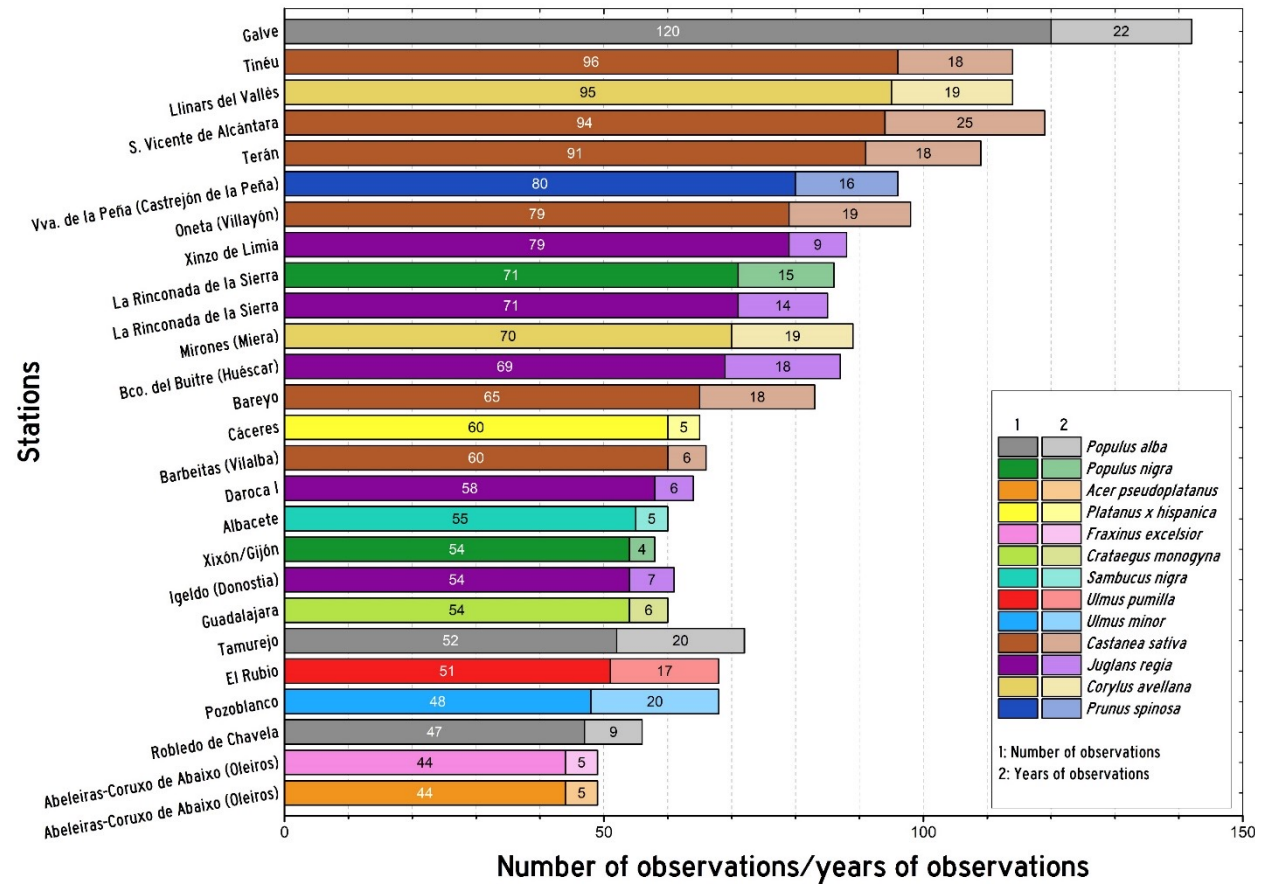- 92 stations, 96 species (31 croplands)
- Temporal coverage: 1990-2020

Rodriguez-Galiano et al. 2023 (In Prep.)
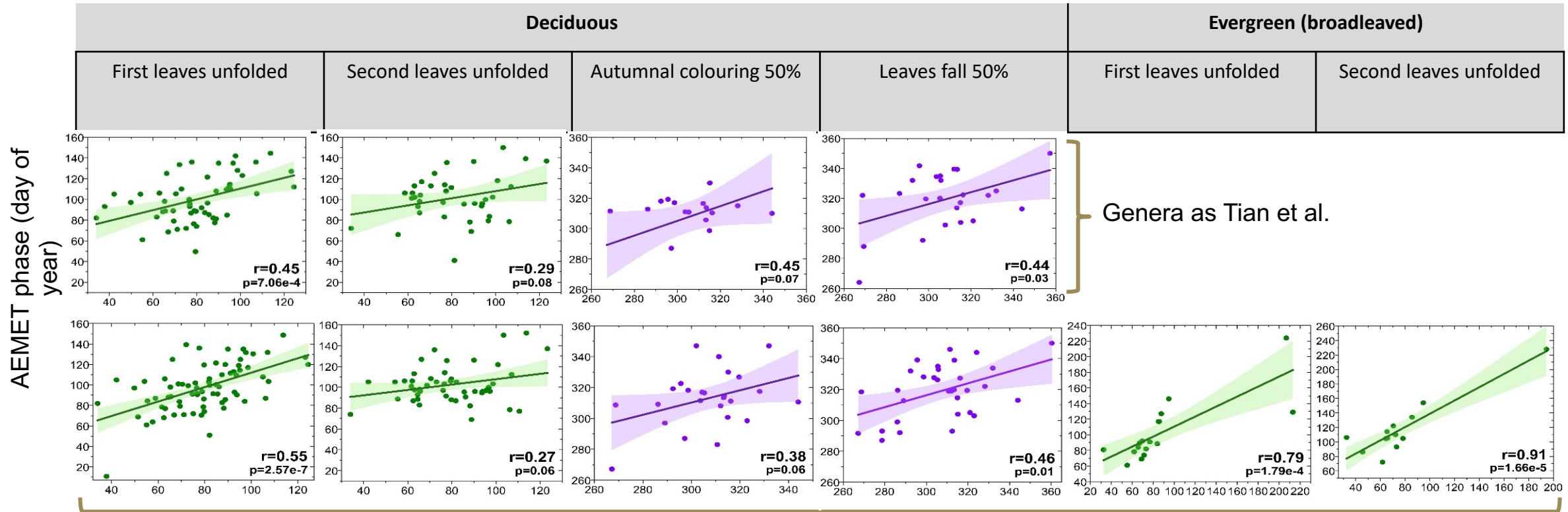
Land Surface Phenology

Preliminary results on the validation of HR-VPP with the phenological network of Spain (AEMET)

Vegetation group	Genus	CORINE Land Cover Map (cover description and code)
Deciduous broad-leaved trees and shrubs	*Acer* **(121/8)**, *Aesculus* **(125/10)**, *Alnus* **(61/10)**, *Betula* **(115/11)**, Castanea (202/17), *Celtis* (7/3), Corylus (135/12), Crataegus (208/19), *Fagus* **(47/5)**, *Fraxinus* **(197/18)**, Juglans (318/29), Morus (67/9), *Pistacia* (33/4), Platanus (175/17), *Populus* **(403/25)**, *Prunus* (63/6), *Pyrus* (14/3), *Quercus* **(238/22)**, *Robinia* **(111/10)**, *Rosa* (144/13), *Salix* **(117/14)**, *Sambucus* **(157/17)**, *Syringa* (35/8), *Sorbus* **(50/5)**, *Tilia* **(25/2)**, Ulmus (117/13)	Broad-leaved forest (311), mixed forest (313), transitional woodland-shrub (324), green urban areas (141)
Evergreen coniferous trees	*Juniperus* (10/5), **Pinus (4/2)**,	Coniferous forest (312), mixed forest (313)
Evergreen broad-leaved trees and shrubs	Arbutus (36/8), Cistus (67/14), *Cytisus* (9/1), *Genista* (16/2), Laurus (53/8), *Lavandula* (42/9), Nerium (44/10), Olea (23/25), Pistacia (22/5), Quercus (144/22), Retama (33/8), *Rosmarinus* (23/10), Ulex (15/5)	Broad-leaved forest (311), mixed forest (313), sclerophyllous vegetation (323), transitional woodland-shrub (324)
Crops	*Avena* (113), *Cicer* (20/5), *Citrus* (39/6), *Cydonia* (105/9), *Eriobotrya* (21/3), *Ficus* (163/27), *Hordeum* (162/13), *Malus* (334), *Mespilus* (13), *Olea* (128/25), *Pisum* (9/2), *Prunus* (1211/47), *Punica* (34/6), *Pyrus* (327/27), *Secale* (33/3), *Solanum* (107/15), *Triticum* (214/17), *Vicia* (29/5), *Vitis* (268/22), *Zea* (81/11)	Fruit trees and berry plantations (222), vineyards (221), olive groves (223), annual crops associated with permanent crops (241), complex cultivation patterns (242), land principally occupied by agriculture with significant areas of natural vegetation (243), agro-forestry areas (244), non-irrigated arable land (211), permanently irrigated land (212).

Land Surface Phenology

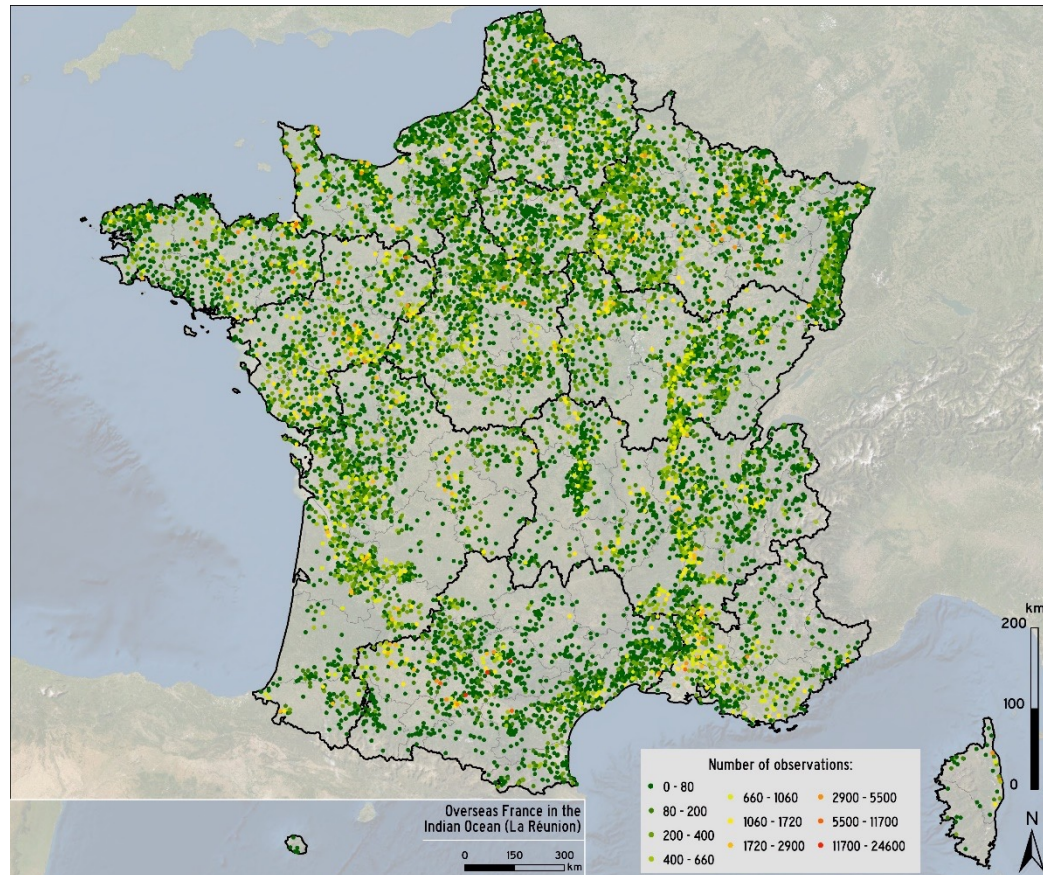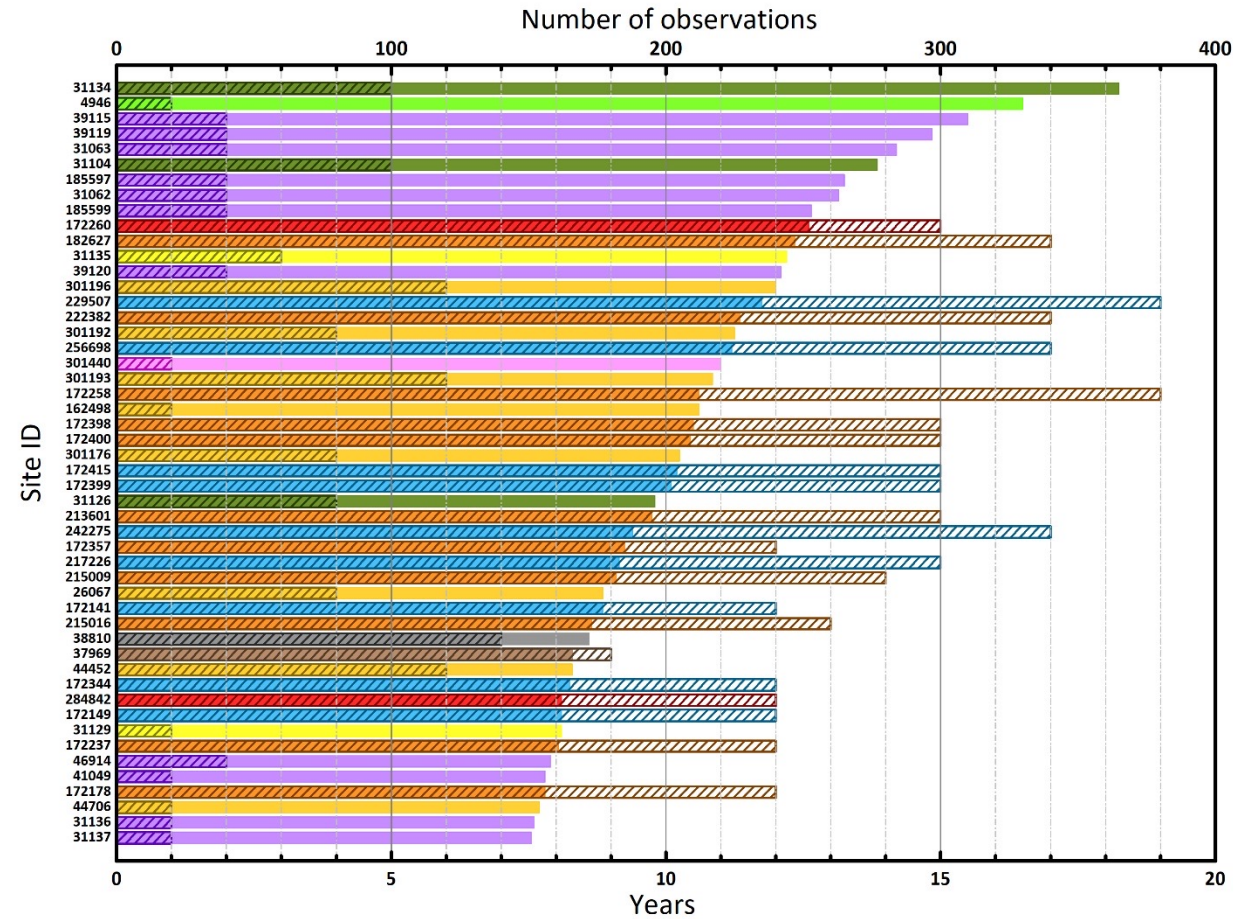## Preliminary results on the validation of HR-VPP with the phenological network of Spain (AEMET)

Rodriguez-Galiano et al. 2023 (In Prep.)

Land Surface Phenology

Preliminary results on the validation of HR-VPP with the phenological network of France (TEMPO)

TEMPO: "New" observational network in France managed by INRAE

- 2,310,850 observations
- 10,945 sites
- 1,150 species and varieties
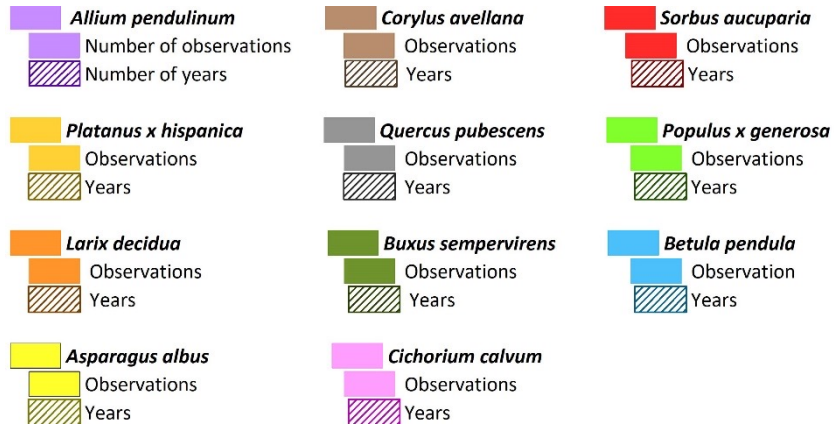- Temporal coverage: jan. 1954-aug. 2022

Rodriguez-Galiano et al. 2023 (In Prep.)

Land Surface Phenology

Preliminary results on the validation of HR-VPP with the phenological network of France (TEMPO)

Land Surface Phenology

Preliminary results on the validation of HR-VPP with the phenological network of France (TEMPO)

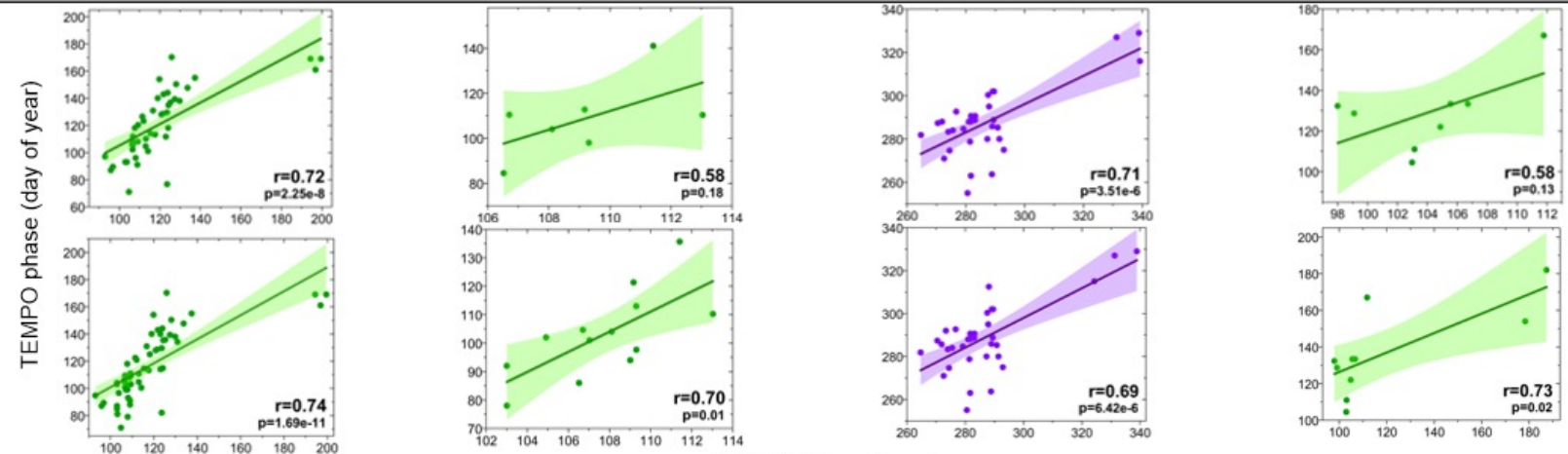|	Deciduous broad-leaved			Evergreen coniferous
	Leaves unfolded (10%)	Leaves undolded (50%)	Automnal coloration/leaf fall 50%	Leaves unfolded (10%)

Mediterranean region
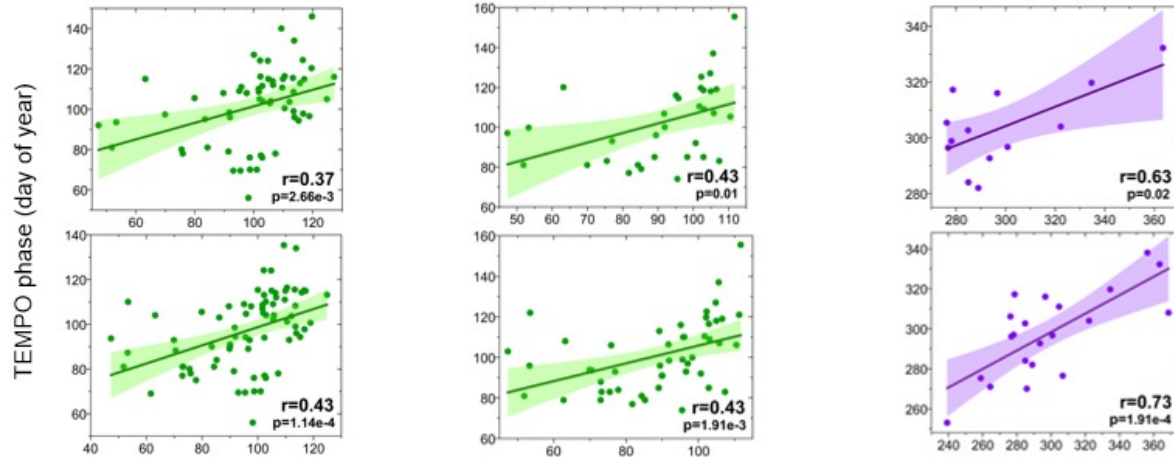
Genera as Tian et al.

New aggregation including new Genera more representative of the Mediterranean landscapes

Submediterranean region

Genera as Tian et al.

New aggregation including new Genera more representative of the Mediterranean landscapes

TEMPO phase (day of year)

HR-VPP (day of year)