

ÍNDICES DE VEGETACIÓN DERIVADOS DE SATÉLITES Y MÉTRICAS RADAR COMO PROXIES DE LA DINÁMICA DEL MICELIO DE *Tuber melanosporum*

Munuera, S.^{1*}, Gómez, C. ¹, Parladé, X. ², Rincón, A. ³, Águeda, B. ¹

¹ iuFOR, EiFAB, University of Valladolid. Soria, Spain.

² Institut de Recerca i Tecnologia Agroalimentàries, Catalunya, Spain.

³ Instituto de Ciencias Agrarias (ICA), Consejo Superior de Investigaciones Científicas (CSIC), Madrid, Spain

* saioa.munuera@uva.es



CONTEXT: THE TUBERLINKS PROJECT



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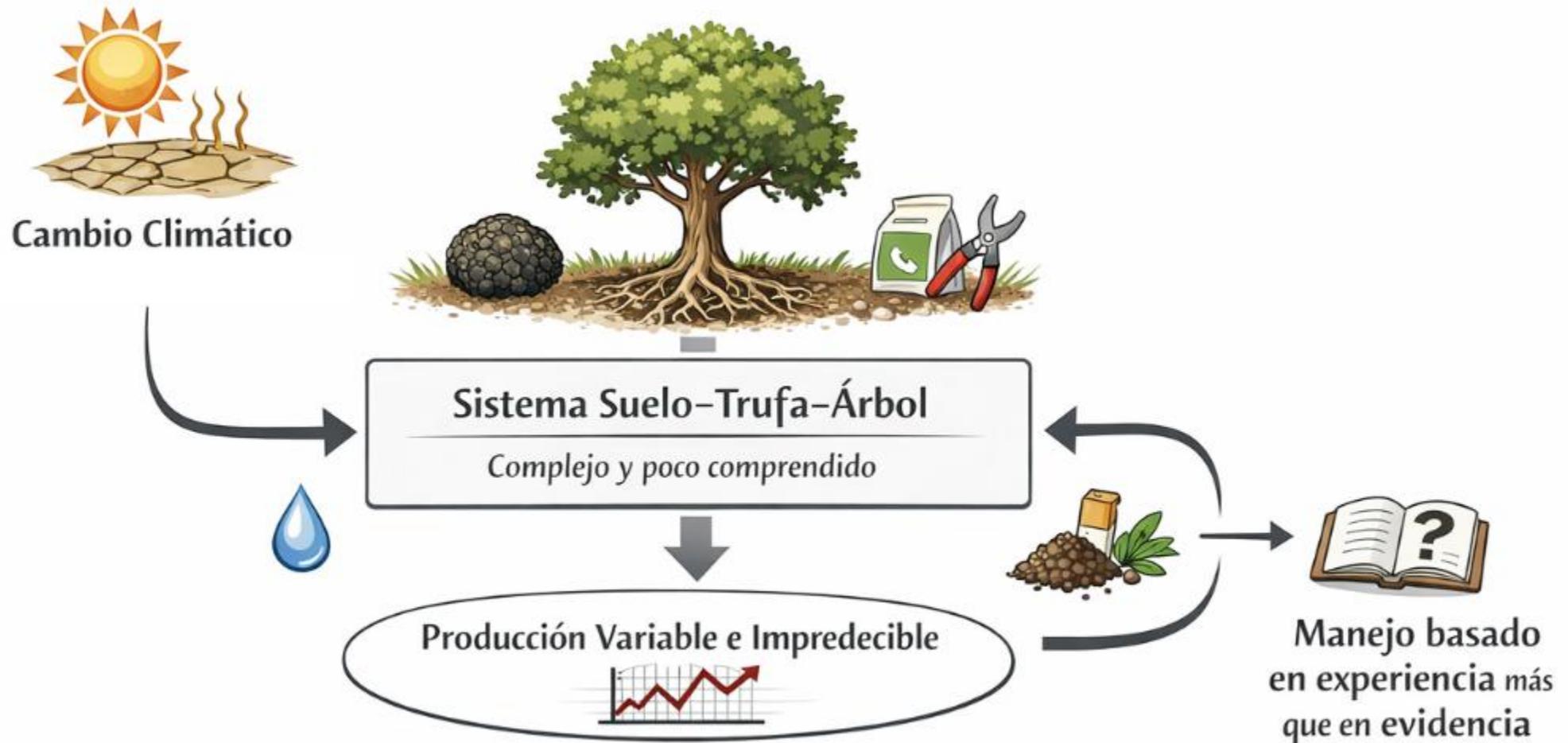


<https://tuberlinks.csic.es/actividades-tuberlinks/>

CONTEXT: THE TUBERLINKS PROJECT



¿Por qué es necesario este proyecto?

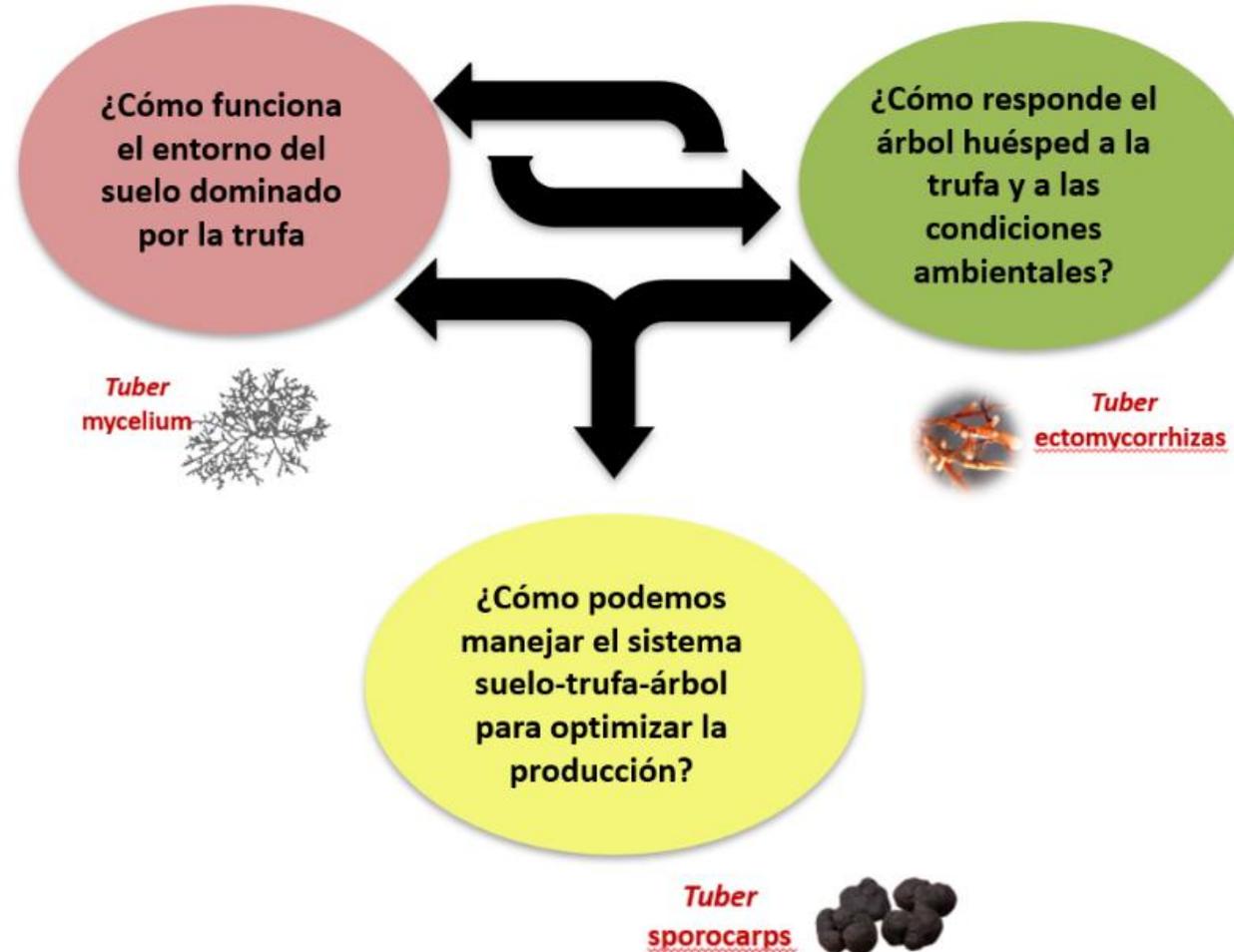


CONTEXT: THE TUBERLINKS PROJECT

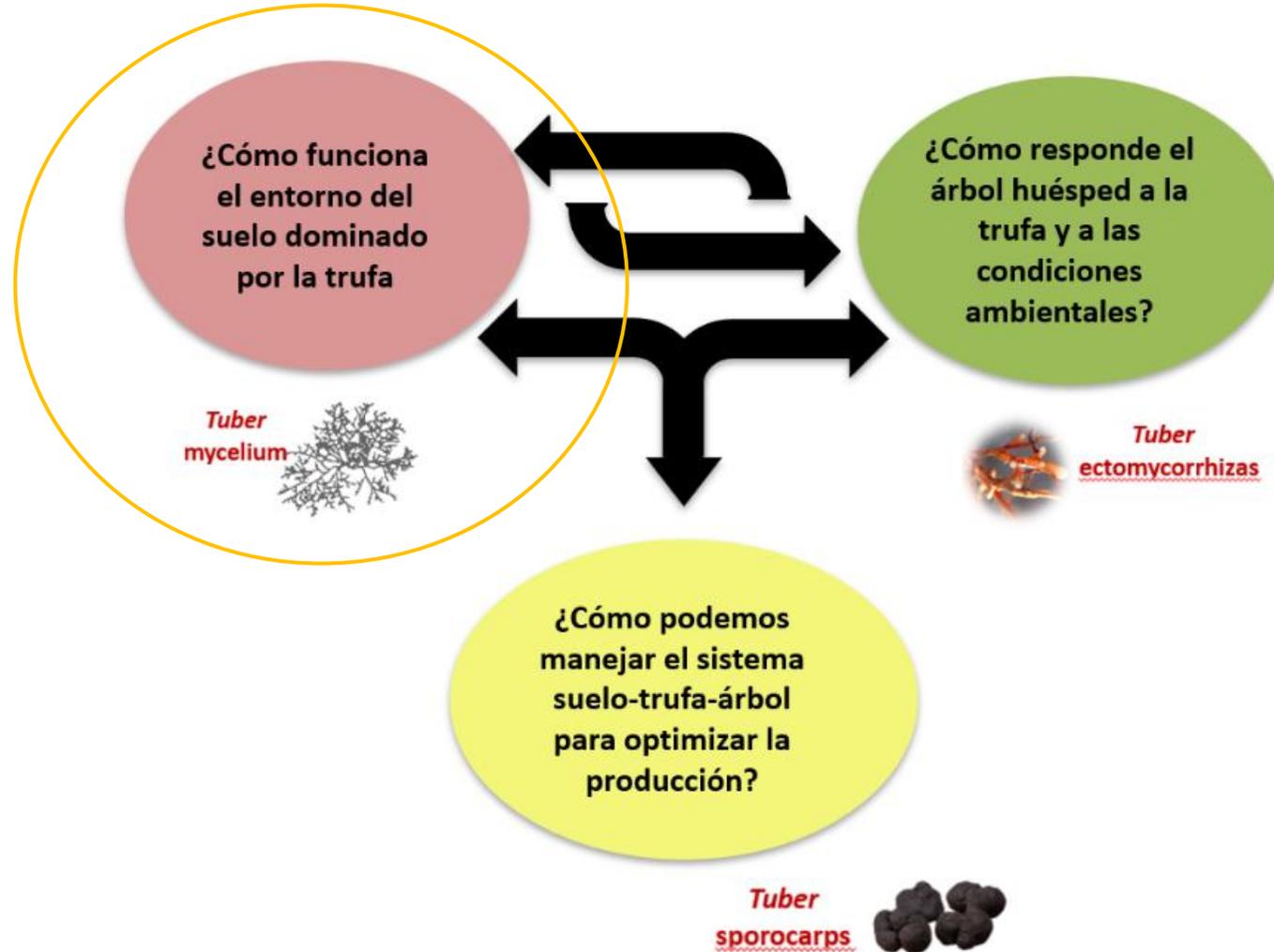


Muestreo de suelo en zonas truferas

CONTEXT: TUBER SOIL



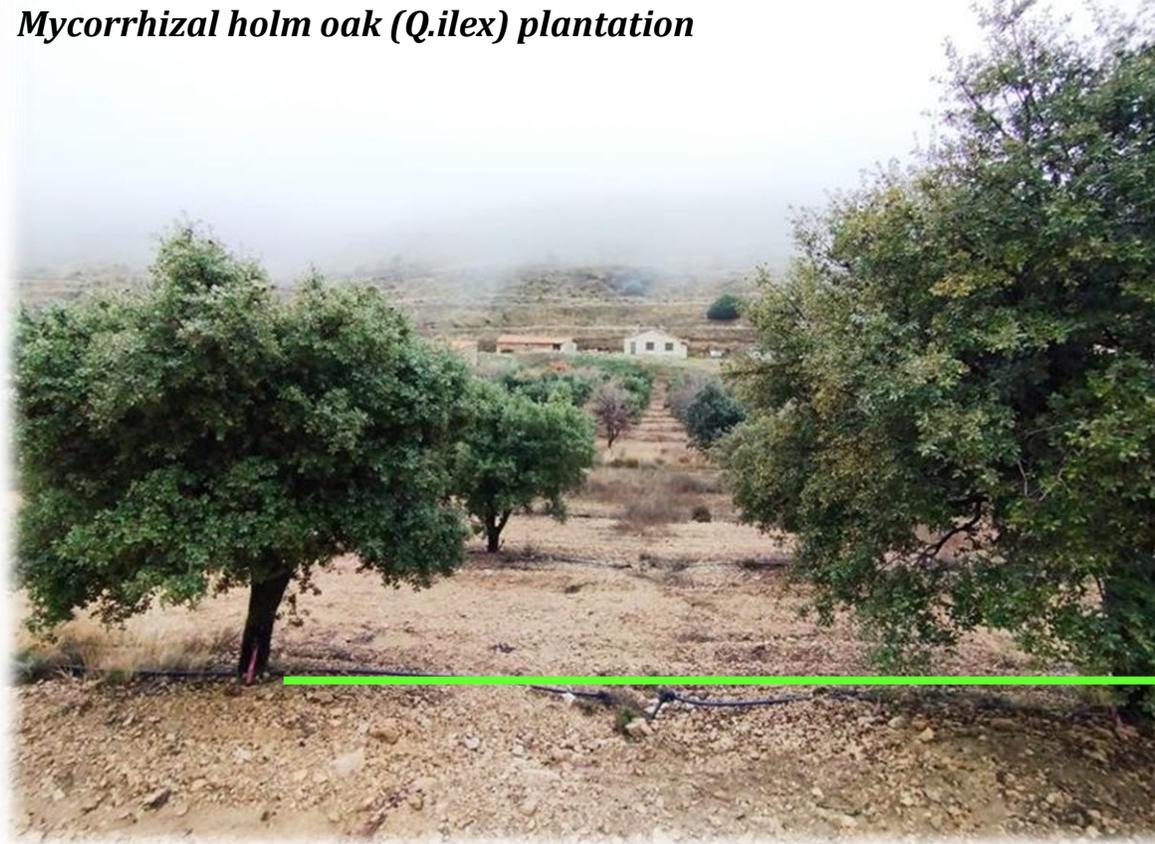
CONTEXT: TUBER SOIL



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Mycorrhizal holm oak (Q.ilex) plantation



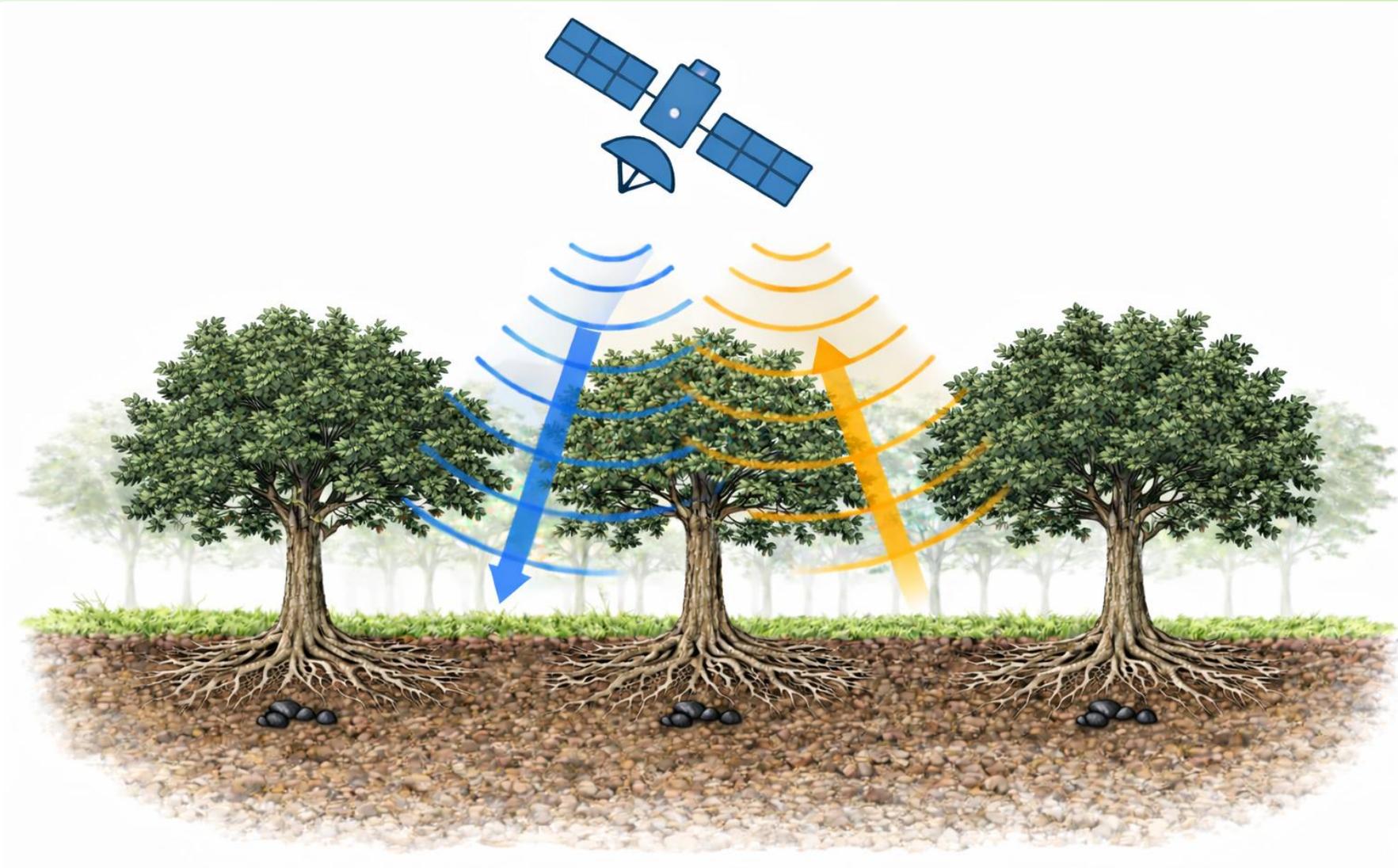
- **Goal** → optimize truffle orchard management by **studying** the **soil-plant-fungus complex**.
- **Context** → Spain is a global leader in **truffle production**. Enhancing cultivation is vital for the **rural bioeconomy**.

CONTEXT: TUBERSOIL



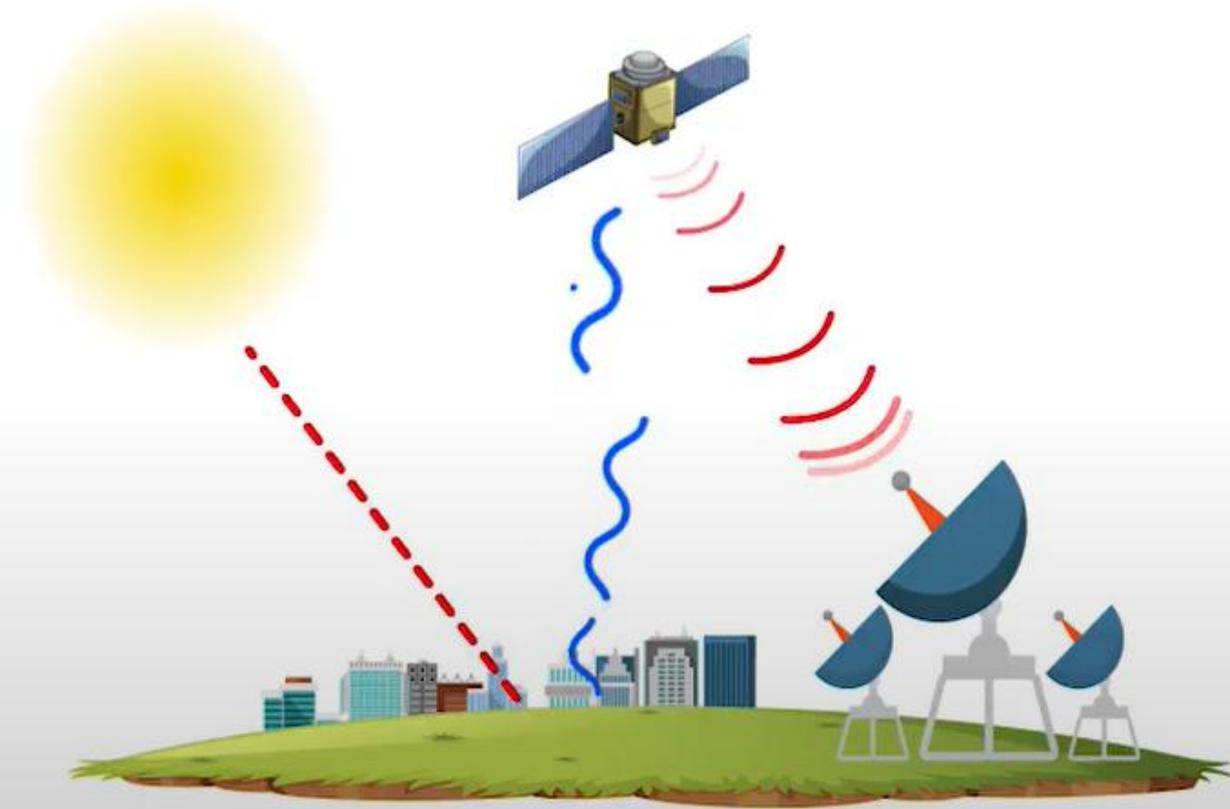
- **Truficultura 4.0** → toma de decisiones agronómicas **basada en datos** de plantaciones truferas.
 - **Herramientas de procesamiento potentes** → explorar **nuevas vías** para optimizar manejo.

CONTEXT: WHY REMOTE SENSING?



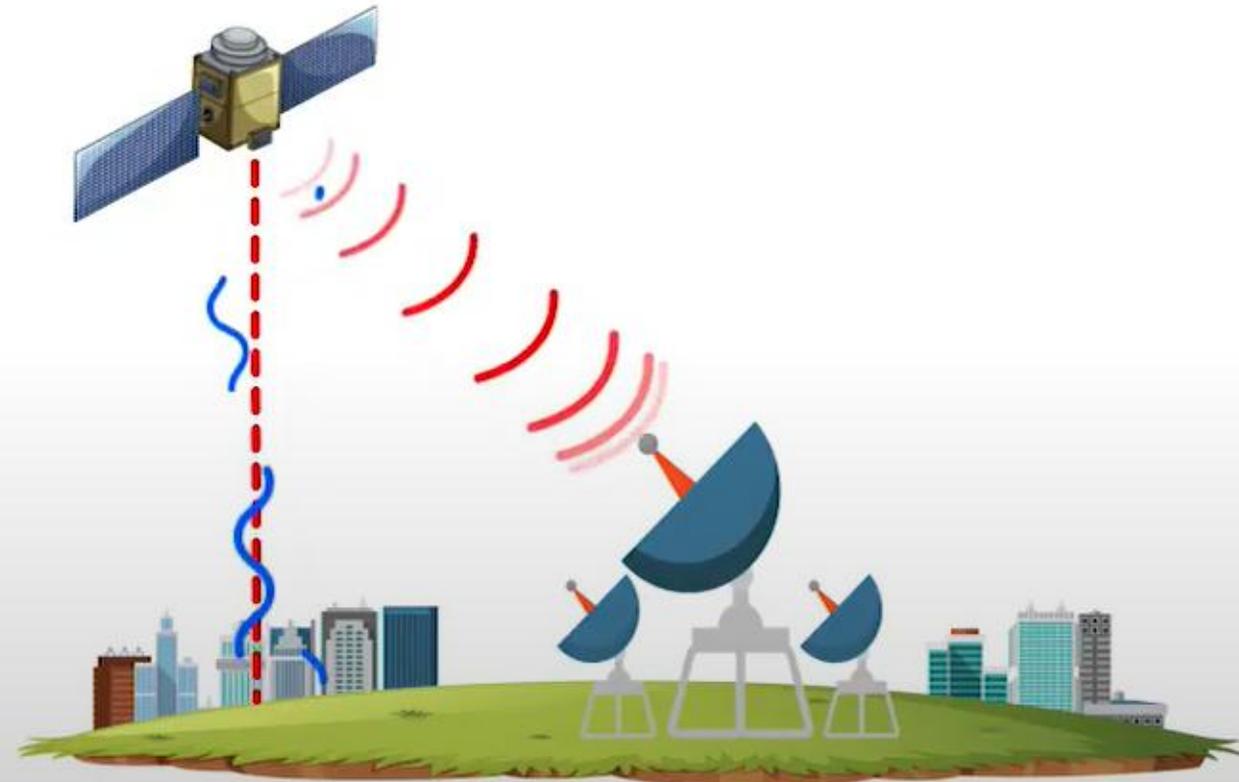
- **Integration of remote sensing → never been explored before.**

CONTEXT: WHY REMOTE SENSING?



- **Sensor pasivo**

- Registra reflectancia en bandas **visibles, NIR y SWIR**
- Sensible a **pigmentación, vigor y estrés vegetal**

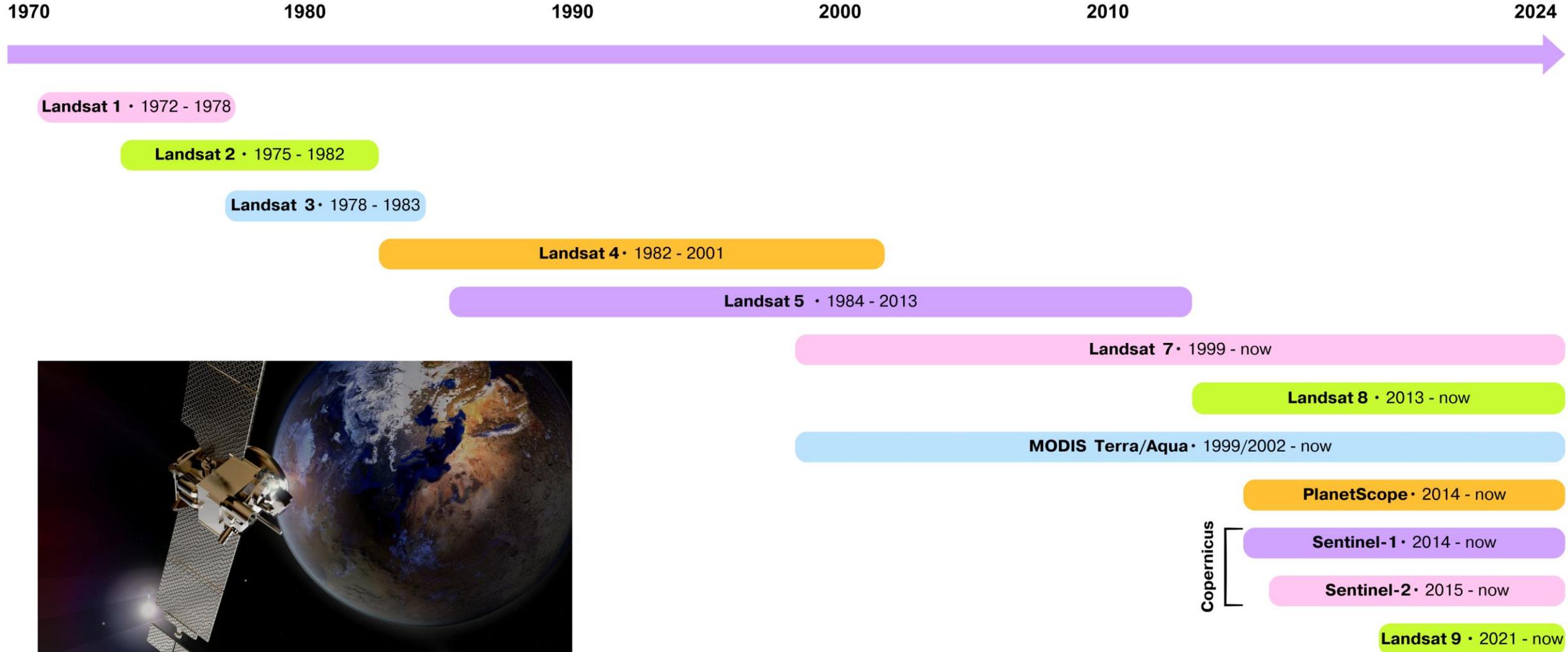


- **Sensor activo (C-band)**

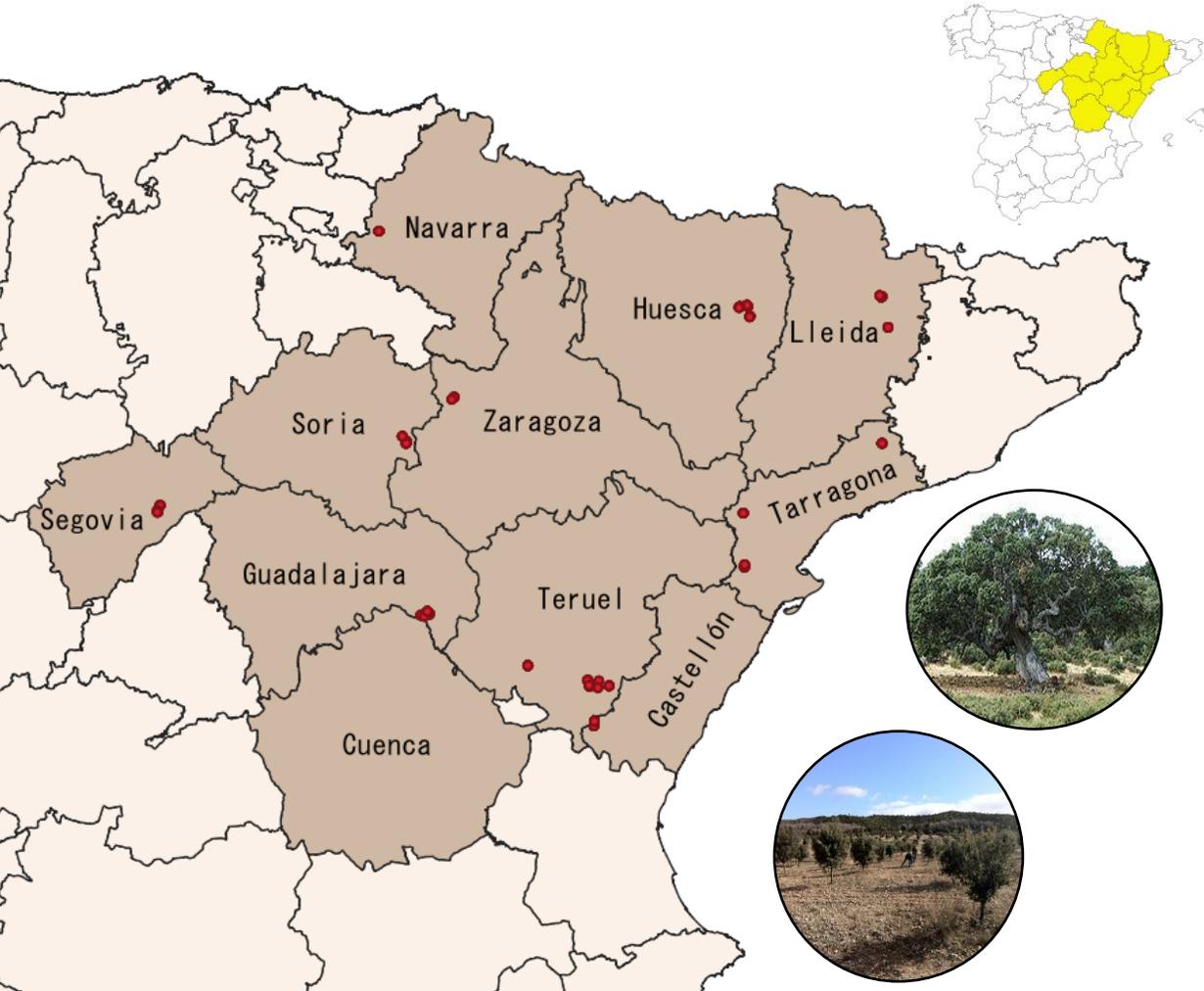
- **Emite su propia señal y mide backscatter**
- Sensible a **estructura, rugosidad y humedad del suelo**

Fuente: MasterGIS

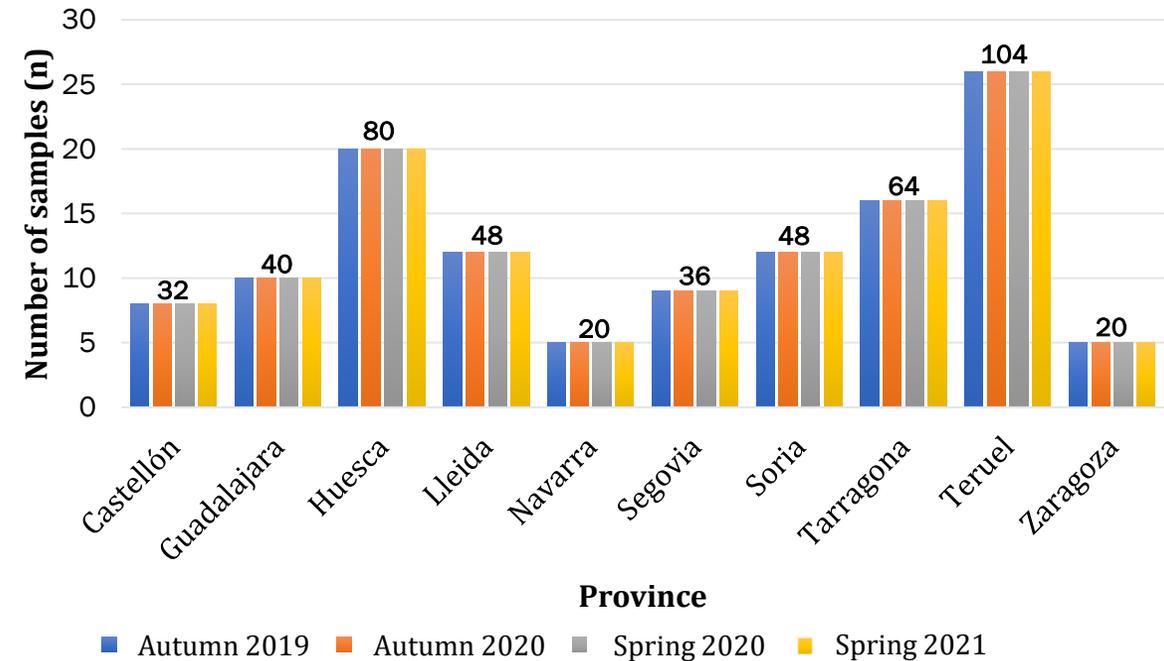
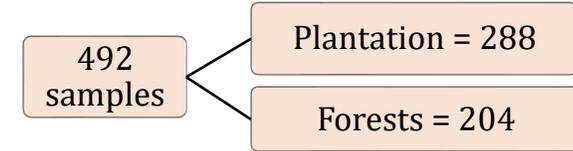
CONTEXT: WHY REMOTE SENSING?



OBJECTIVE & STUDY AREA



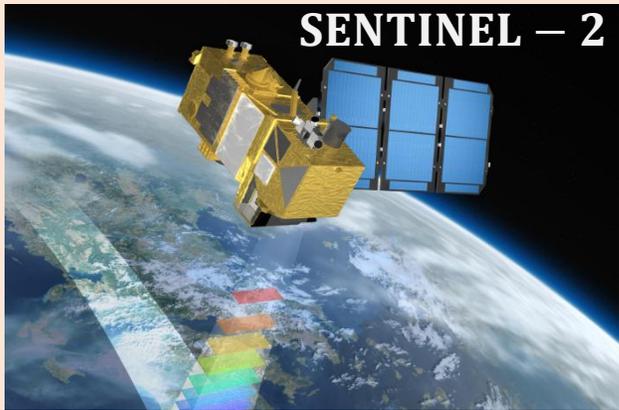
Highly valuable ground truth data!!!



- **Main objective** → Explore **relationships** between remote sensing **optical/radar** metrics and ***T. melanosporum* mycelium** biomass.

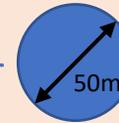
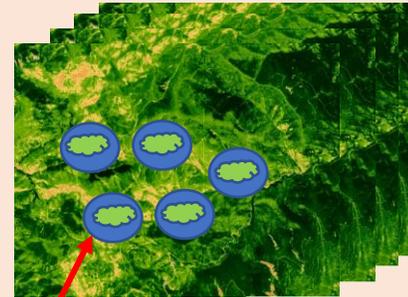


METHODOLOGY: SENSORS AND DATA

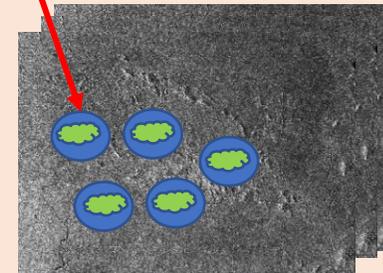


Autumn 2019
Autumn 2020
Spring 2020
Spring 2021

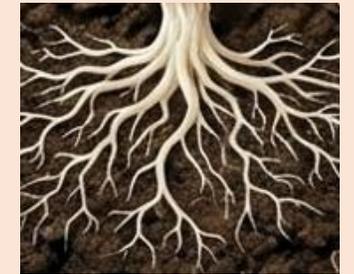
OPTICAL INDICES
(NDVI, NDMI, NDWI)



RADAR
Backscatter σ_{VV}^0
 σ_{VH}^0



mg mycelium



METHODOLOGY: GEOGRAPHIC FACTORS

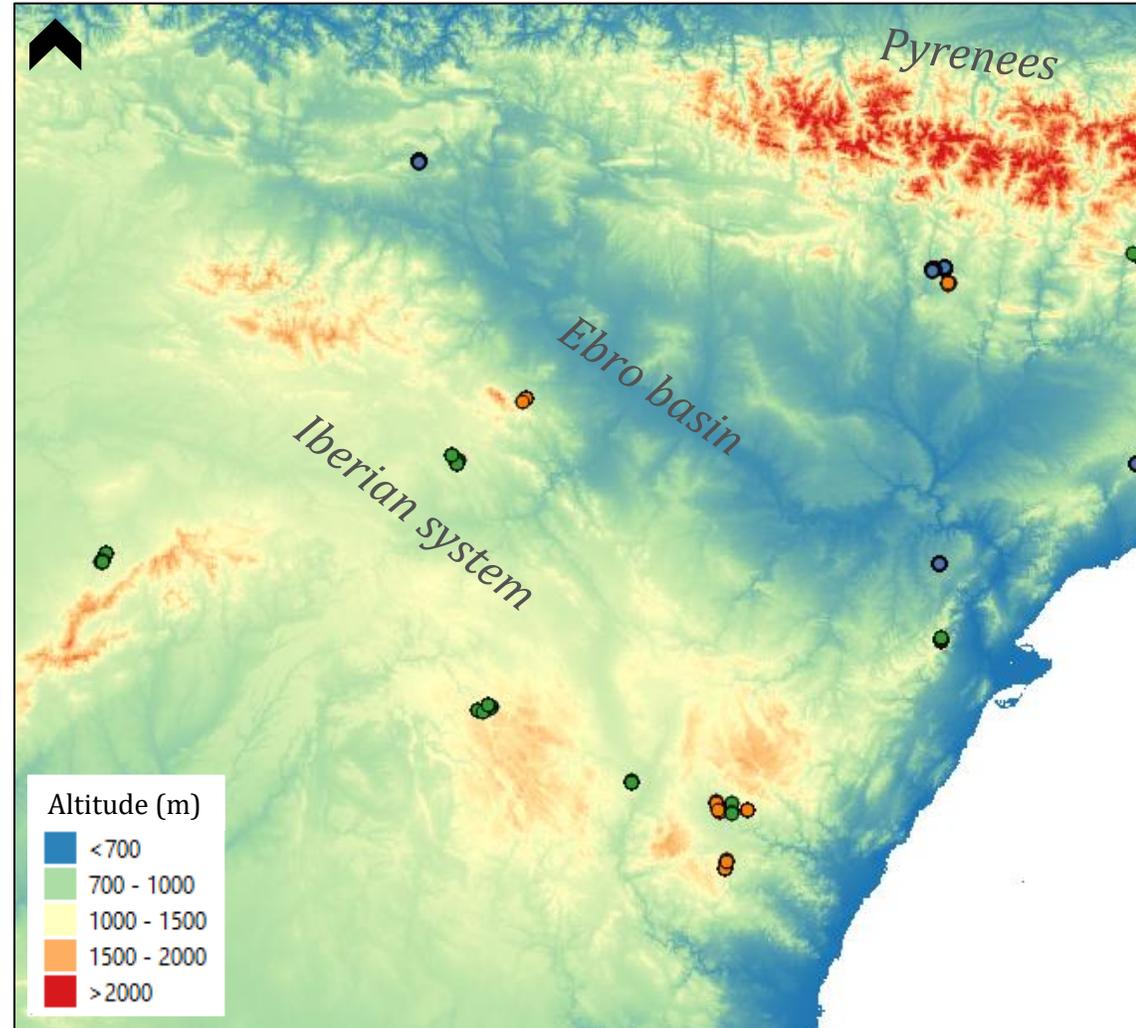
- **CLUSTERS:**

- **Altitude:**

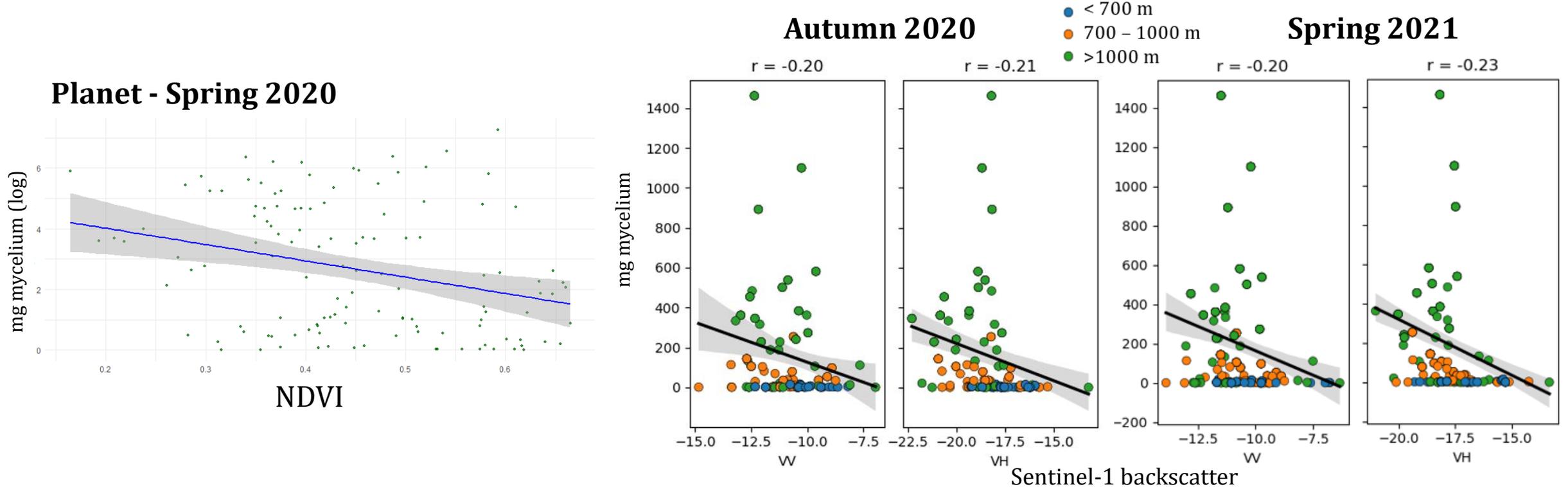
- < 700 m
 - 700 – 1000 m
 - >1000 m

- **Region:**

- Iberian system
 - Ebro basin
 - Pyrenees



RESULTS



- **Planet** → **limited** , significant negative relationship NDVI – mycelium in spring 2020.
- **Optical** → **limited** explanatory power, **except** for **moisture-related indices** (NDWI, NDMI).
- **Radar** → **significant negative relationship** with **mycelium biomass (higher in spring)**.
- **Mycelium biomass increased with altitude, region showed no clear pattern.**

CONCLUSIONS



Radar backscatter **outperformed optical** indices in explaining **mycelium biomass**.



Mycelium biomass showed a **strong altitudinal pattern**.



Radar signals likely capture **soil moisture-related processes** linked to **fungus activity**.



Radar data are a **valuable proxy** for studying belowground biological processes.



¡GRACIAS!

saioa.munuera@uva.es

