

# Wireless Sensing in the Sierra Nevada (Granada, Spain)

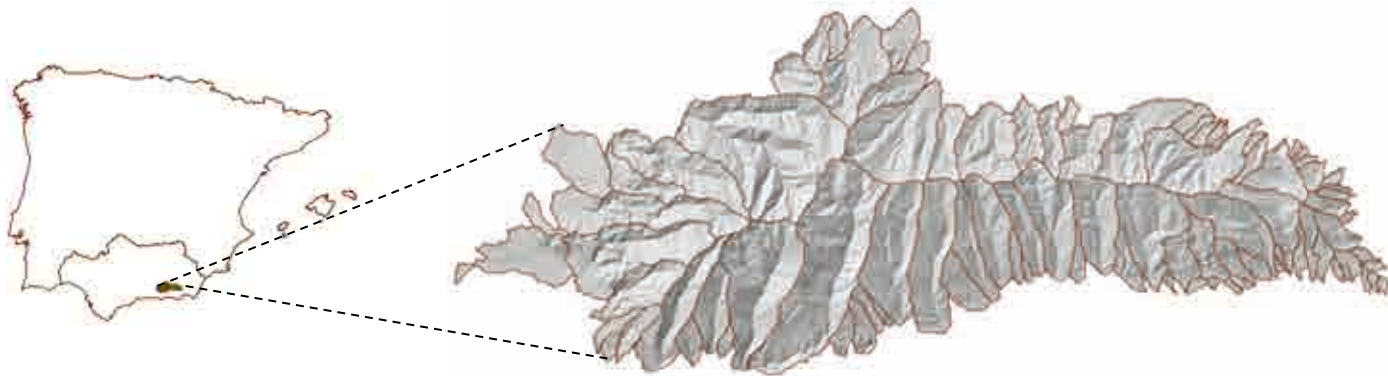


*Francisco Manuel Sánchez Cano*  
*LifeWatch ERIC ICT Core e-Infrastructure Resource Integration Coordinator*  
[\*franciscom.sanchez@lifewatch.eu\*](mailto:franciscom.sanchez@lifewatch.eu)

# Sierra Nevada Global Change Observatory

For the last **15 years** a huge team of enthusiastic people composed of **biologists, ecologists, environmental scientists and engineers** have been working in the Global Observatory of Sierra Nevada.

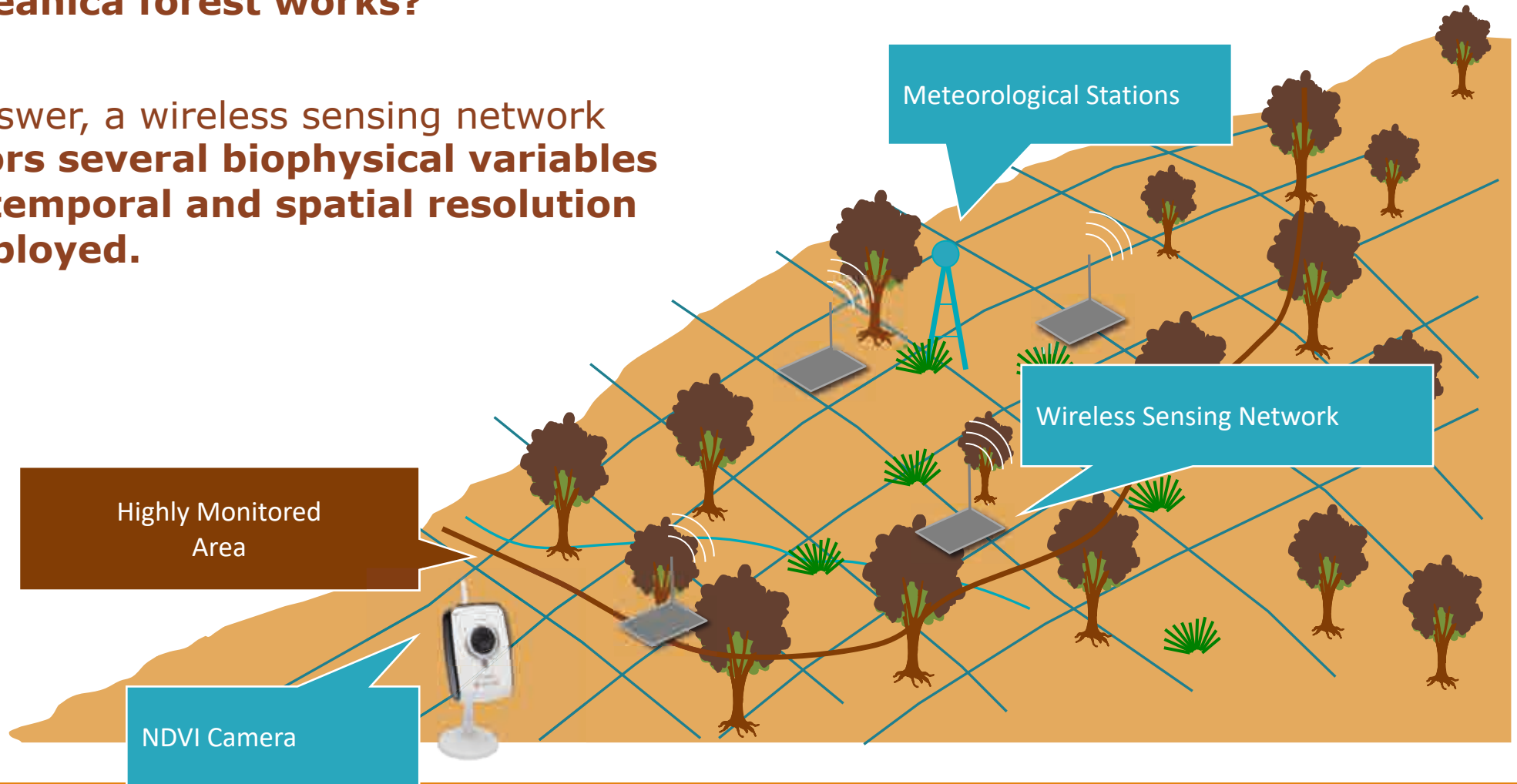
Our goal is to study the impact of climate change in this mountain range.



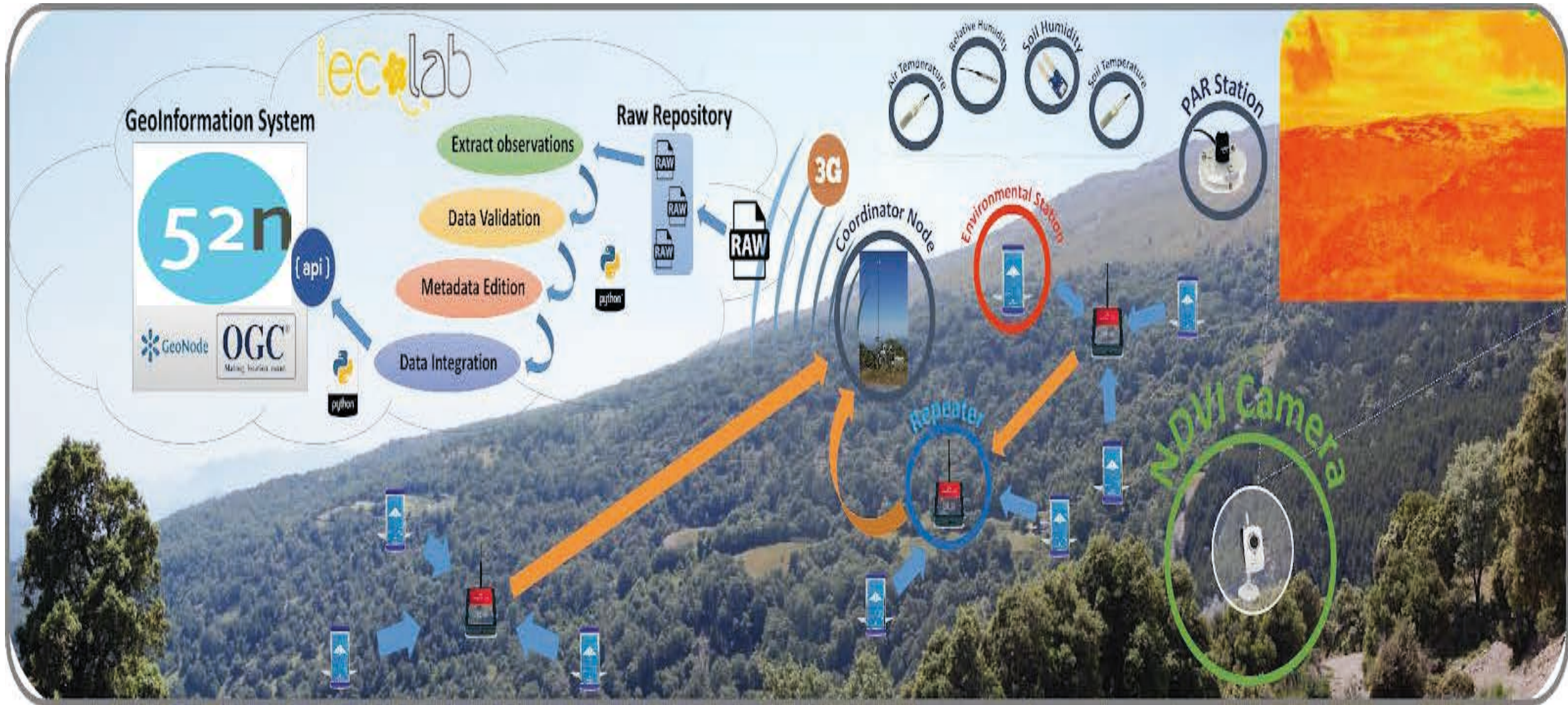
**The Wireless Sensing Platform in the Sierra Nevada** is based on the idea of **developing highly monitored areas** in order to answer specific biological questions.

**What is the link between abiotic factors and the way the ecosystem of a *Quercus pyreanica* forest works?**

To find the answer, a wireless sensing network which **monitors several biophysical variables with a high temporal and spatial resolution** has been deployed.



# Methodology



# Wireless Sensing Network

- **30 stations and 10 repeaters** provide data from **240 sensors**
- The monitored surface covers **25 hectares**
- **The sensors take new measurements every hour**
- **The monitored variables are:**
  - Air Temperature
  - Relative Humidity
  - Soil Temperature
  - Water Volume Content in the Soil

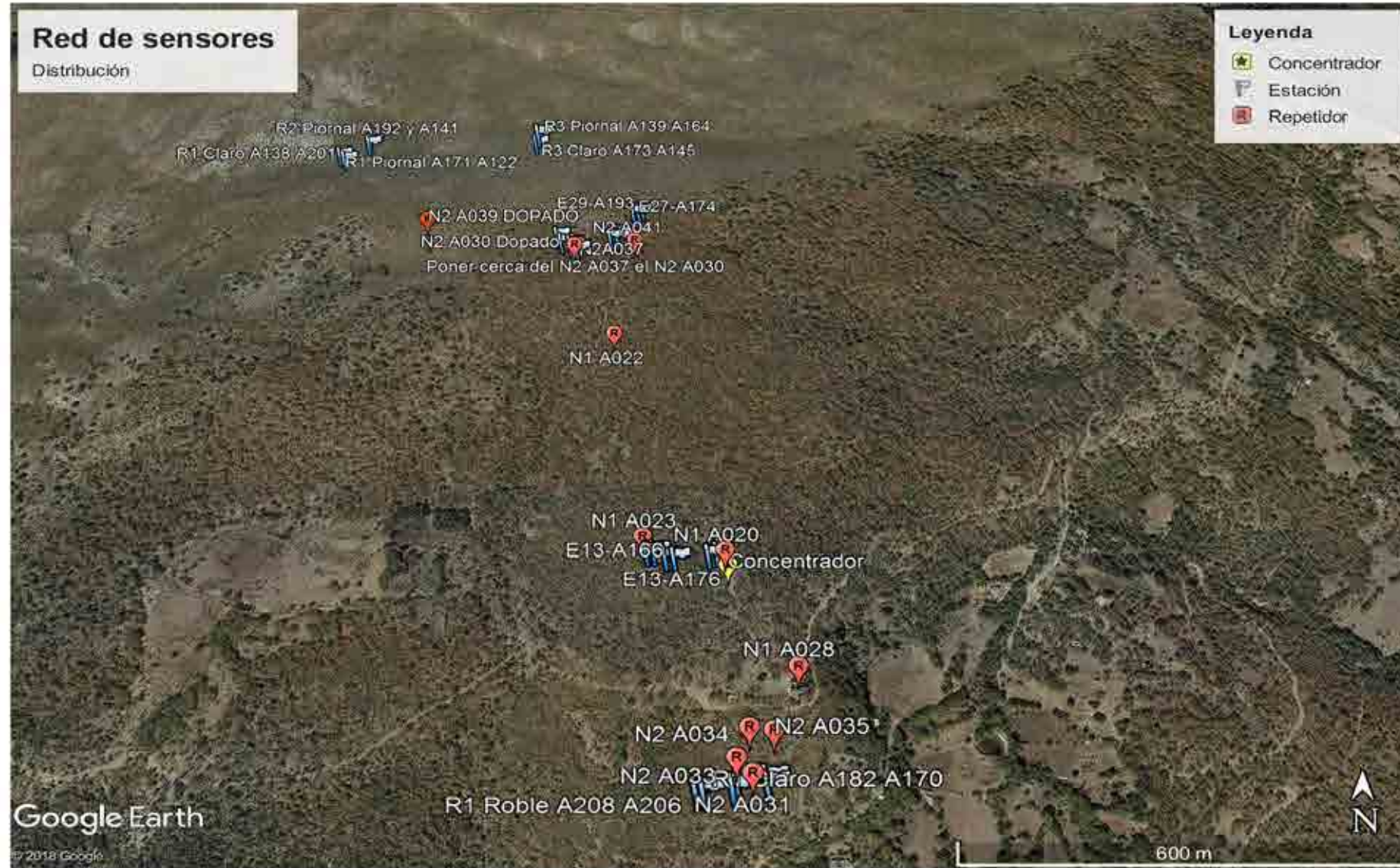


# Distribution of the Wireless Sensing Network

- Four heights along an altitudinal altitude gradient:
  - 1600 m.a.s.l.
  - 1750 m.a.s.l.
  - 1900 m.a.s.l. (treeline)
  - 2000 m.a.s.l.
- At each height the following types of habitats are studied:
  - Oak forest
  - Forest glade
  - Padded brushwood
- There are different microhabitats within each habitat:
  - Below rocks
  - Below fallen leaves
  - Below padded brushwood
  - Uncovered surfaces

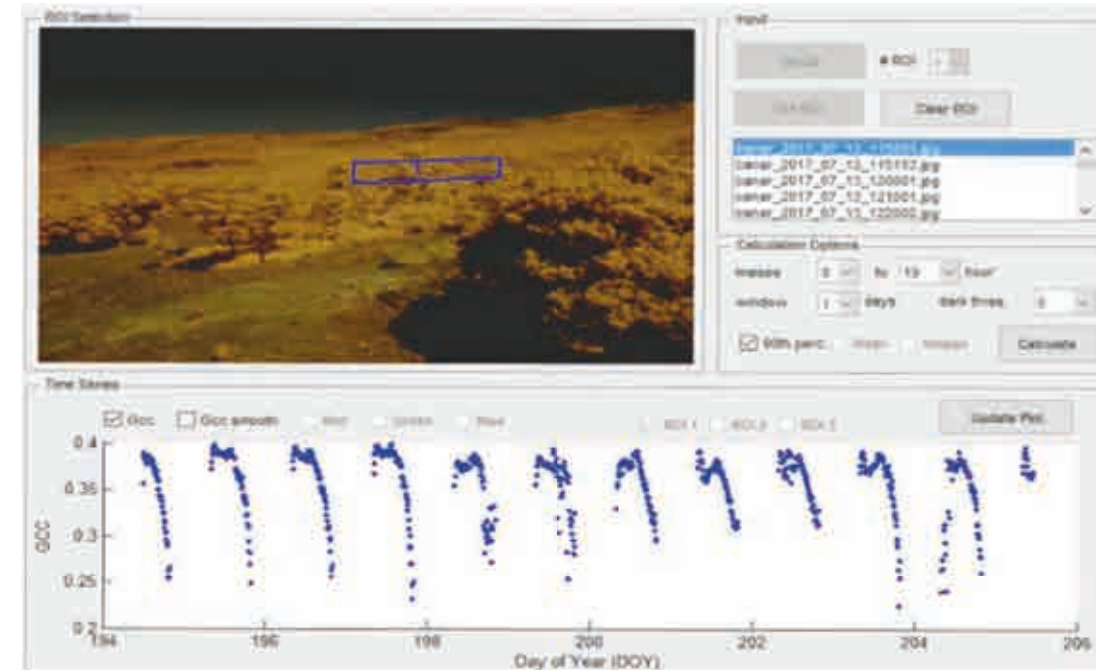


# Wireless Sensing Network Spatial Distribution



# NDVI Camera

- Monitors the same area as the Wireless Sensing Network
- Provides NDVI images every 10 minutes 24/7
- Powered by solar energy
- Custom-made platform
  - Low cost Hardware (Raspberry Pi)
  - Programmed with Open Source Software
  - Phenocam Software for image analysis

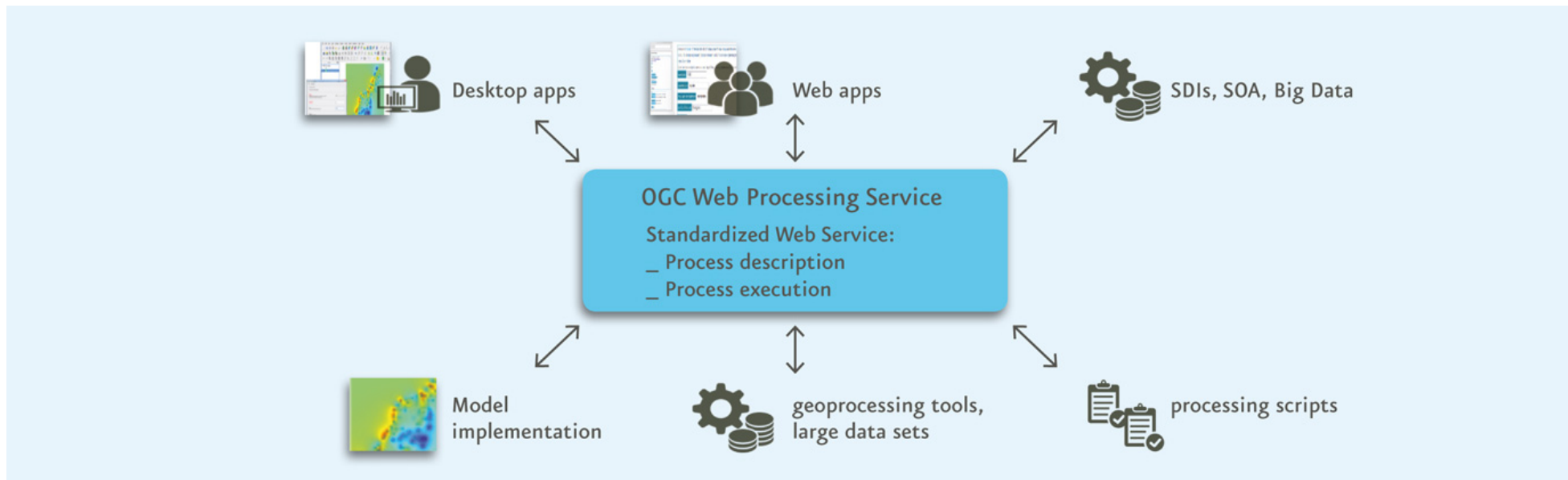


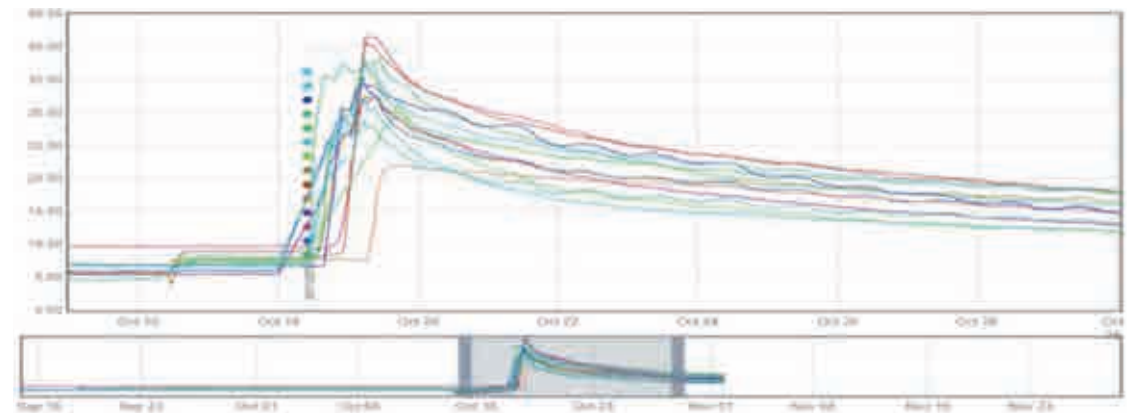
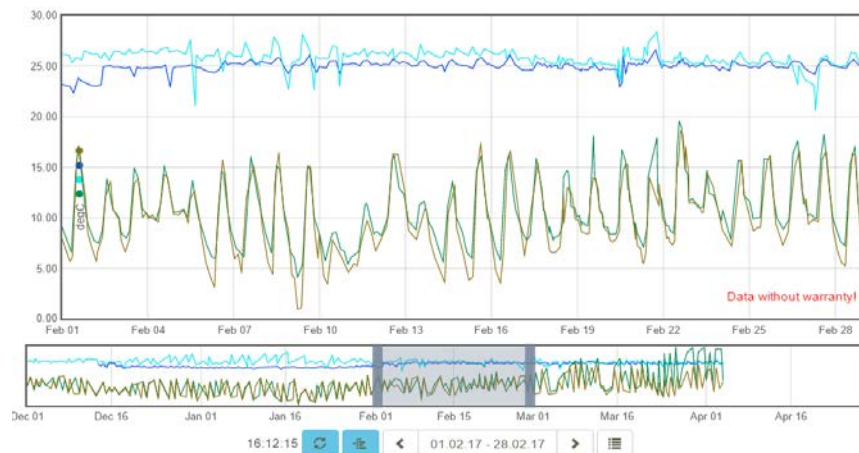
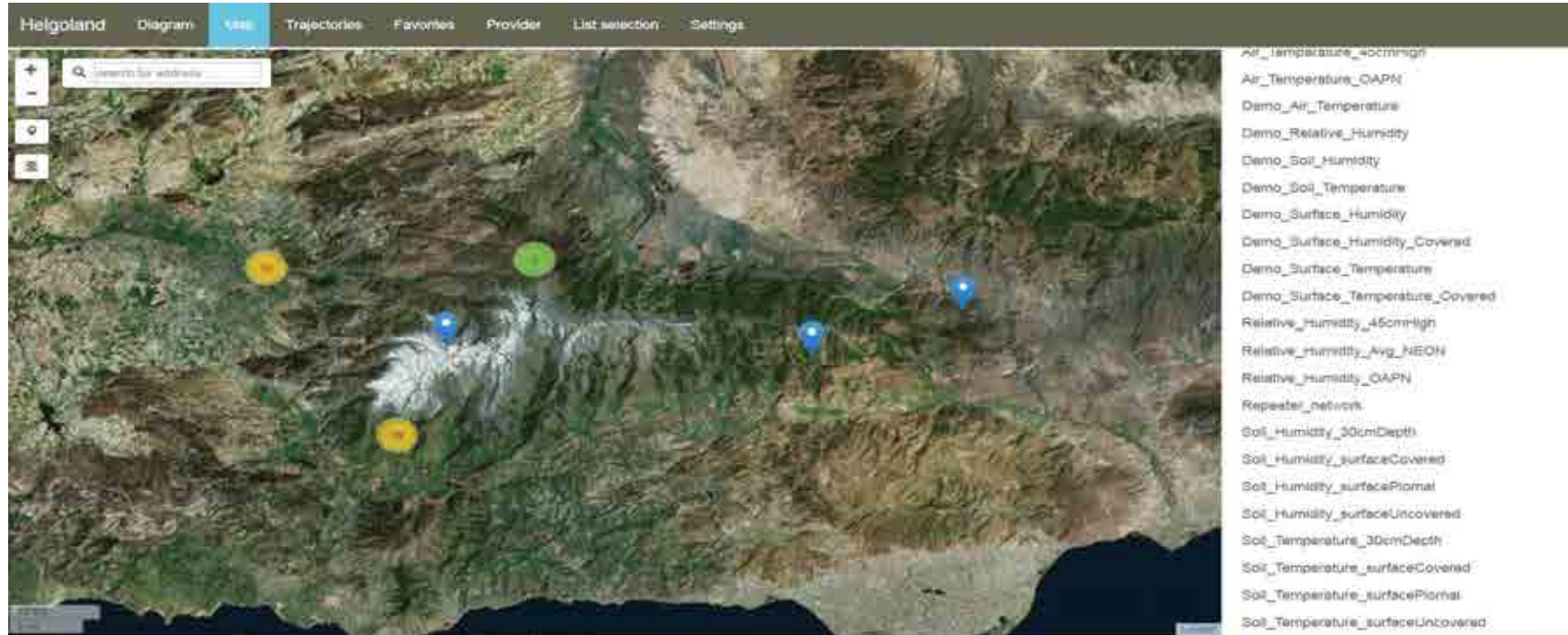
# Open Source Geospatial Data Platform (52 North)



Our Sensor Observation Information System is based on this Initiative, why?

- **Web Data Portal to visualize and extract the data**
- **Standardize** the introduction of new sensors and parameters
- Guarantee the **reliability of the “sensor + observation + timestamp”** trio
- Provides an **API** to interact with the Information System
- **Interoperable** (we are connected to other initiatives, such as GEOSS)





## Next objectives:

- Development of the “LifeWatch ERIC Thematic Centre on (High) Mountain Biodiversity Ecosystem Services”
- Deploy new remote wireless sensing networks:
  - 75 SIGFOX stations on the north slope
  - 600 sensors (8 per station)



