

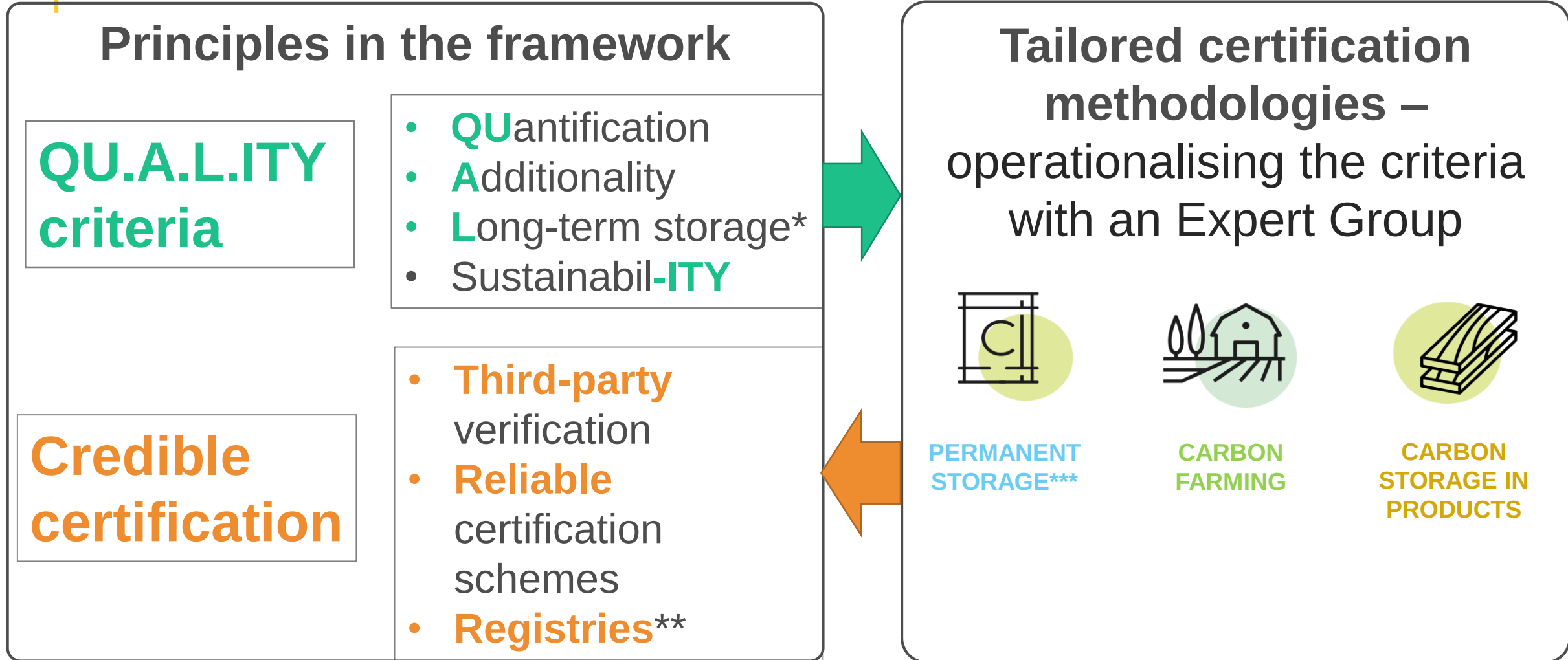
Carbon farming and potential need for EO

Emanuele Lugato, Mirco Migliavacca,
Fernando Fahl, Toni Viskari, Michele Meroni,
Daniele Borio, Samuele Capobianco, Matteo Piccardo,
Alessandro
Cescatti

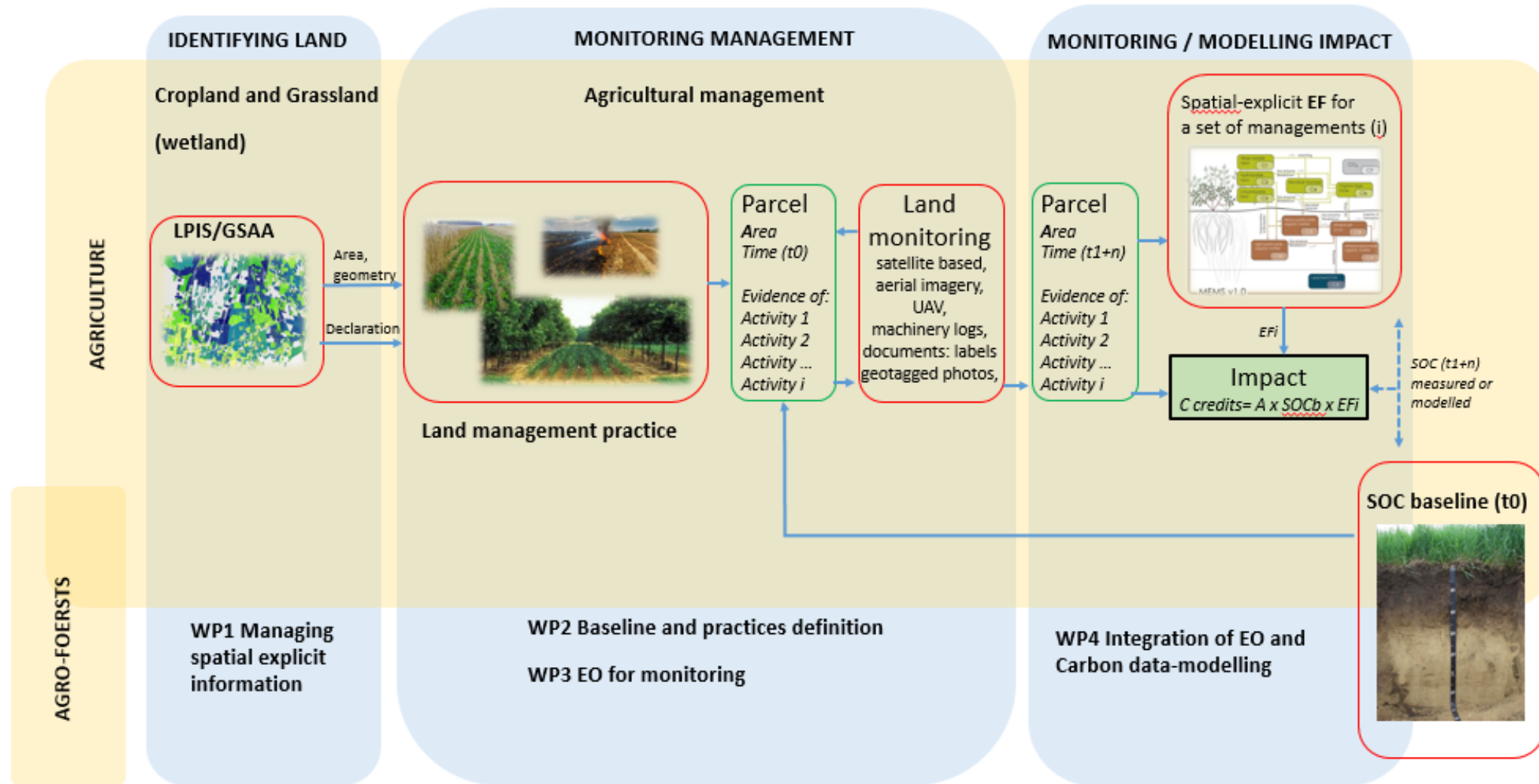
JRC Dir.D



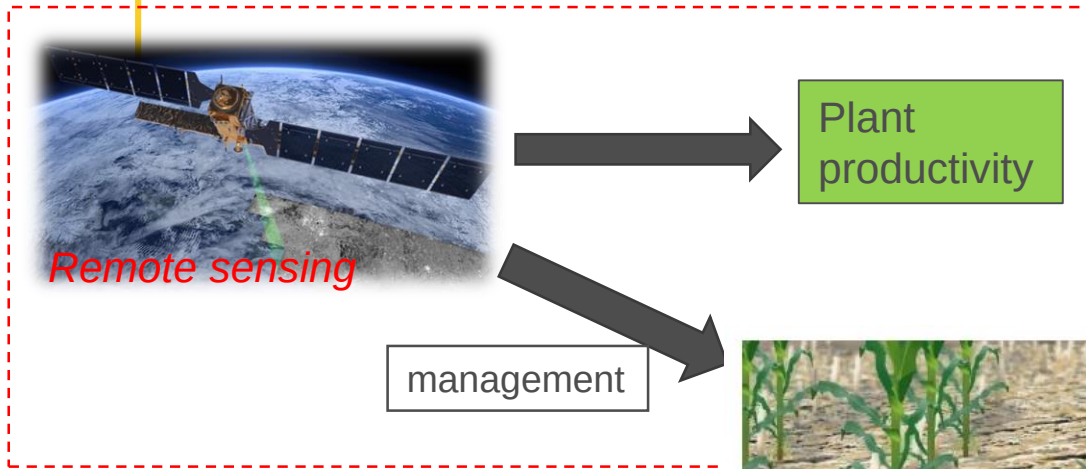
The Carbon Removal Certification Framework



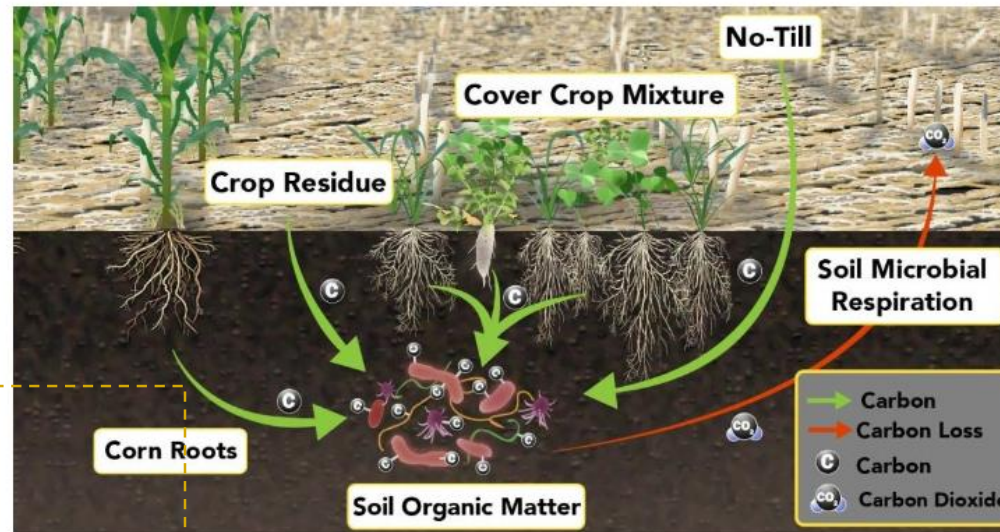
C farming project framework in agriculture



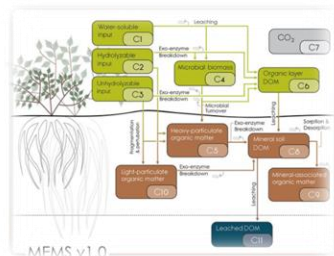
Data assimilation tools



Use and adaptation of existing data and tool (“CbM like”) use for checking CAP compliance



Infographic by Matt Rellafor



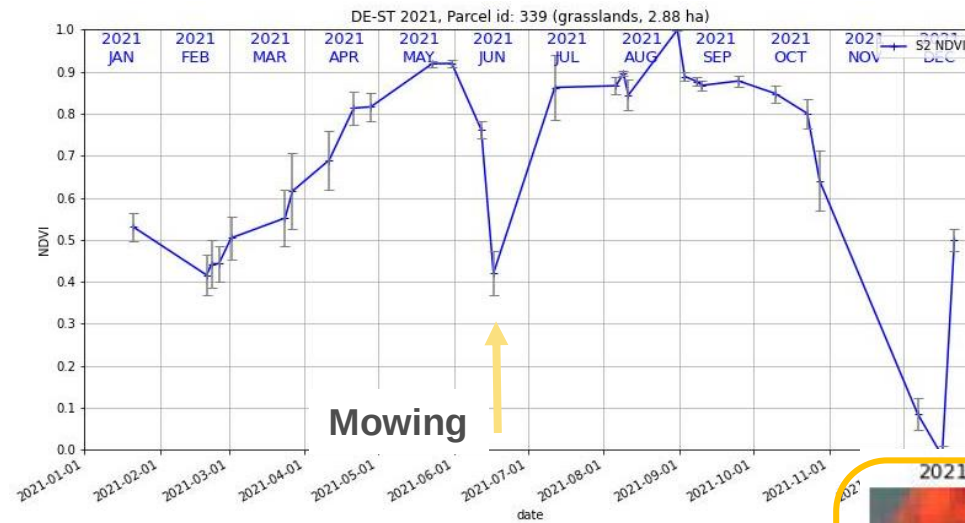
MEMS model

Process-based C model

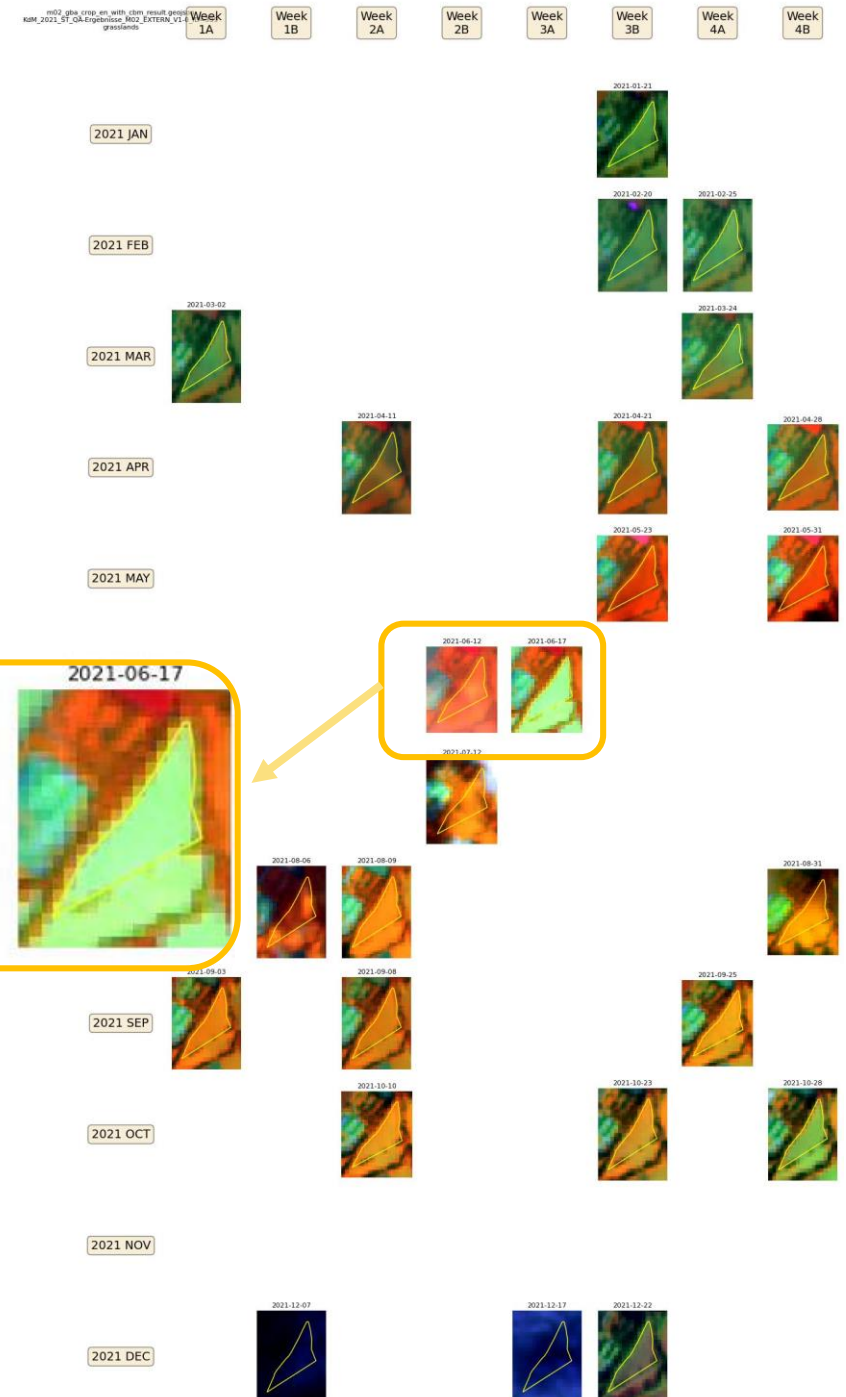
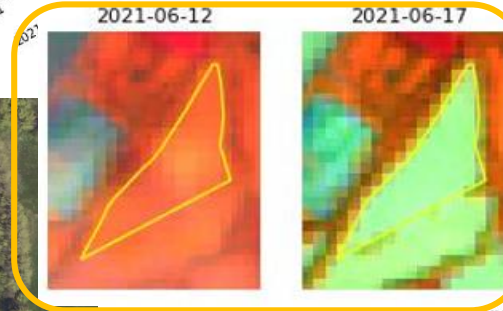
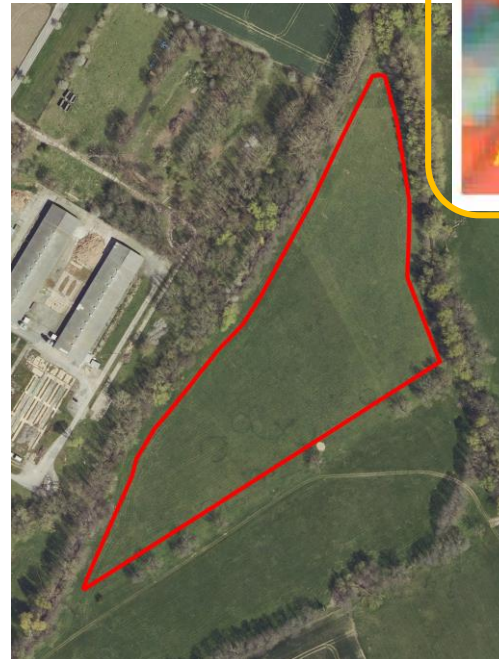
- quality C input
- quantity C input
- change in soil conditions

Detection: mowing

Extract data from
01Feb21 to
31Dec21



Crop:
grasslands
Area: 2.88 ha,
Supergroup:



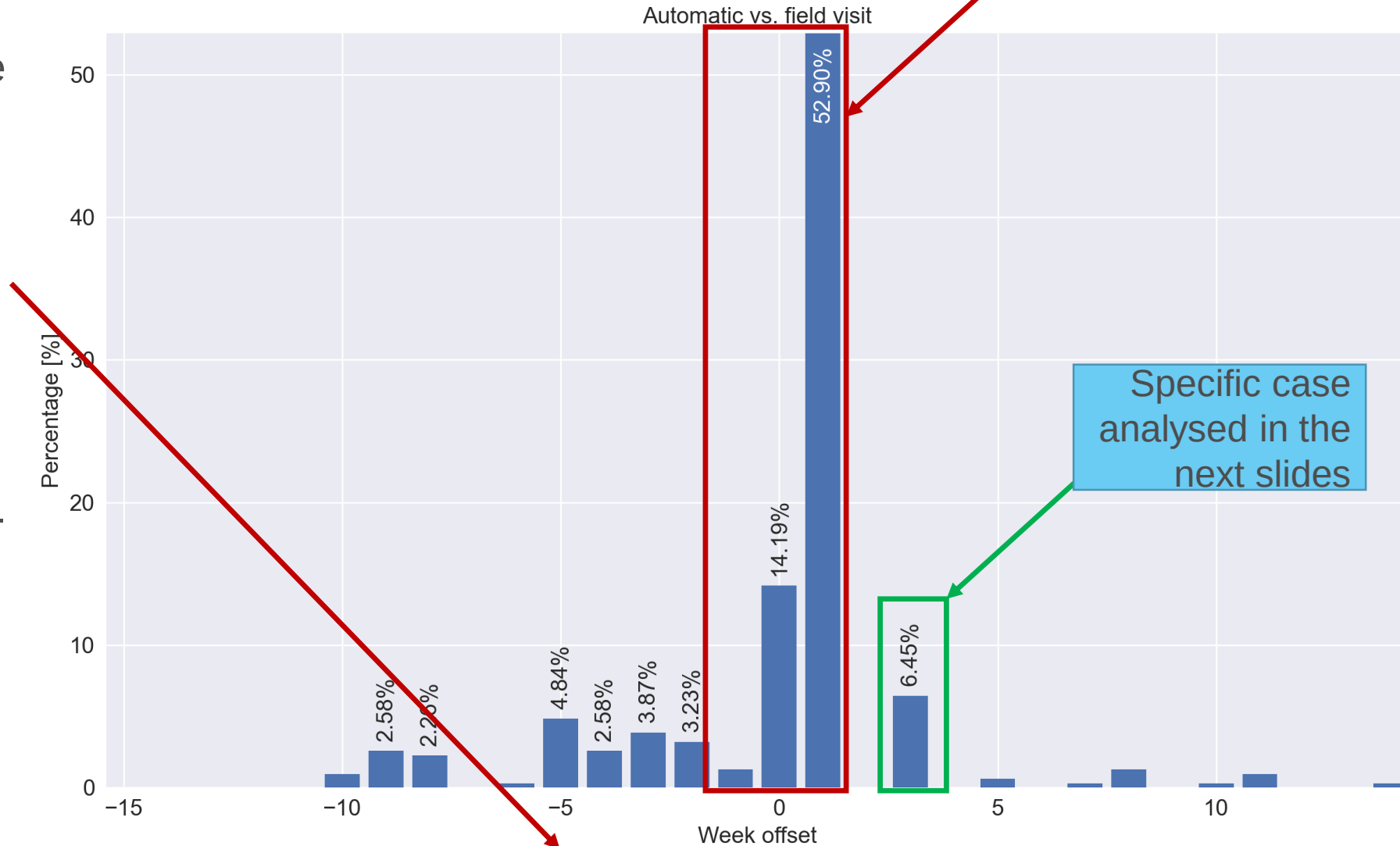
Machine vs. Field Visits

Histogram of the differences in weeks of the estimated mowing dates

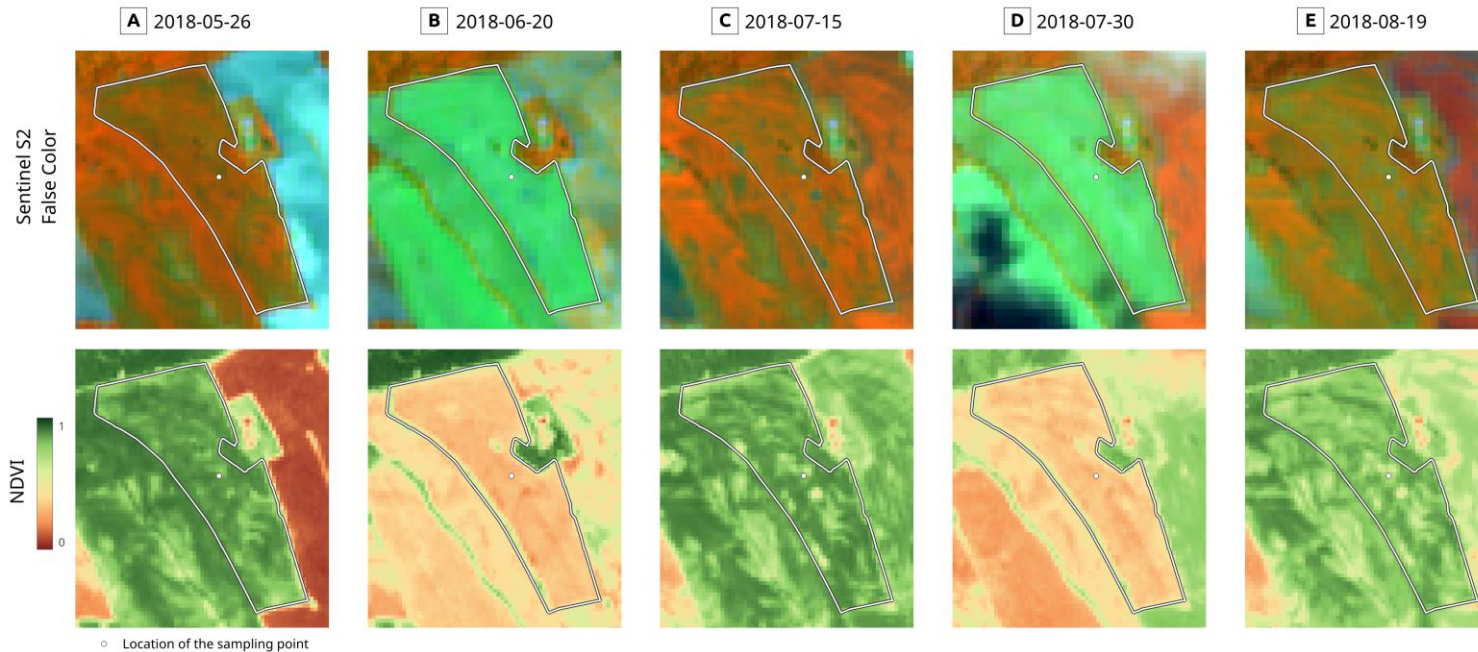
Errors of ± 4 weeks can easily occur in the date estimations due to lack of measurements (clouds, shadows, ...)

Residual errors due to miss-detection

Performance influenced by **marker parametrization**
e.g./ **NDVI drop threshold**



Light Use Efficiency Model (GPP and NPP)



MODIS-like approach

$$GPP = \varepsilon * \underline{FPAR} * IPAR$$

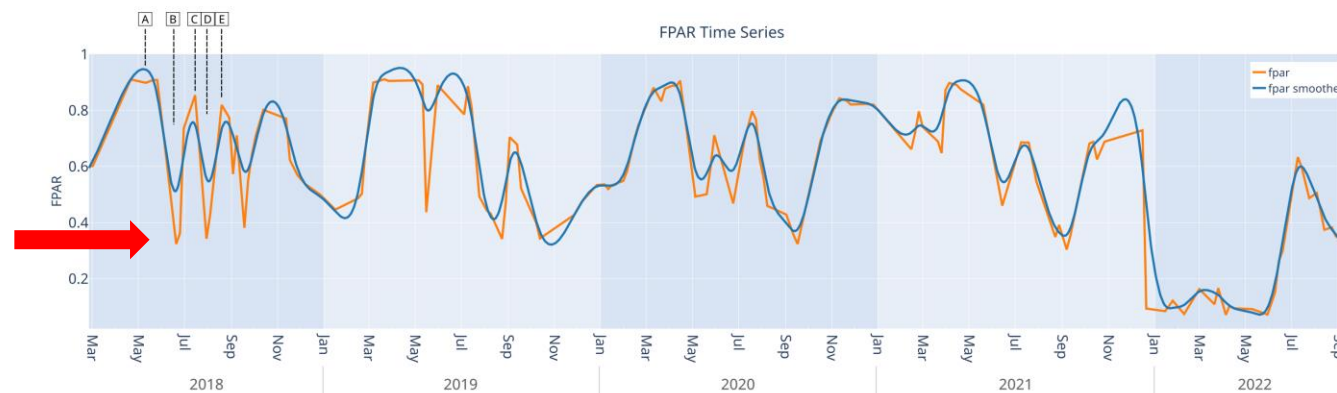
$$\varepsilon = \varepsilon_{\max} * TMIN_scalar * VPD_scalar$$

GPP = Gross Primary Productivity

ε = radiation conversion efficiency

IPAR = Incident photosynthetic radiation

FPAR = fraction of PAR



f(NDVI)

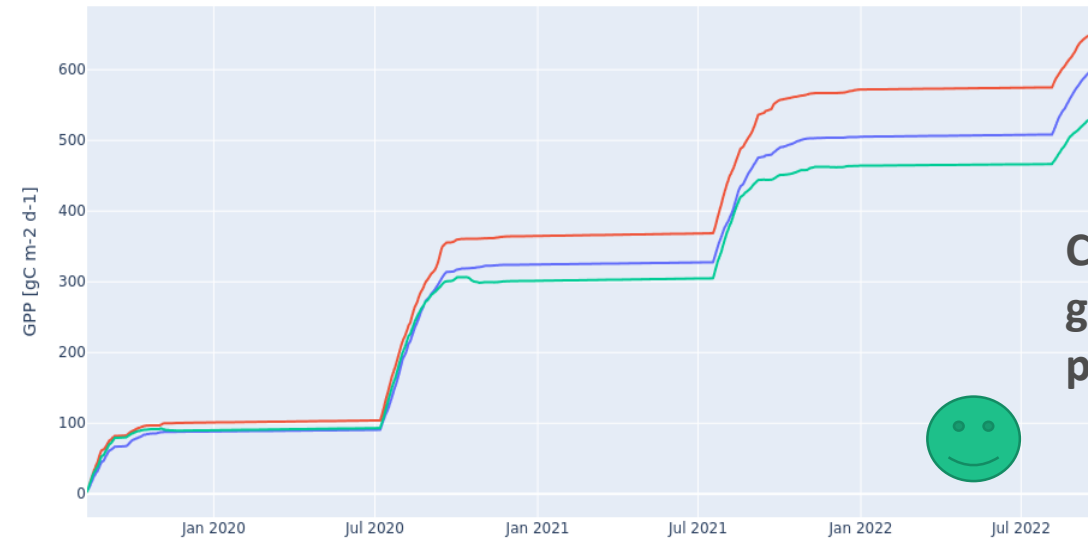
Model validation

Fluxnet stations



FLUXNET Station: IT-Niv

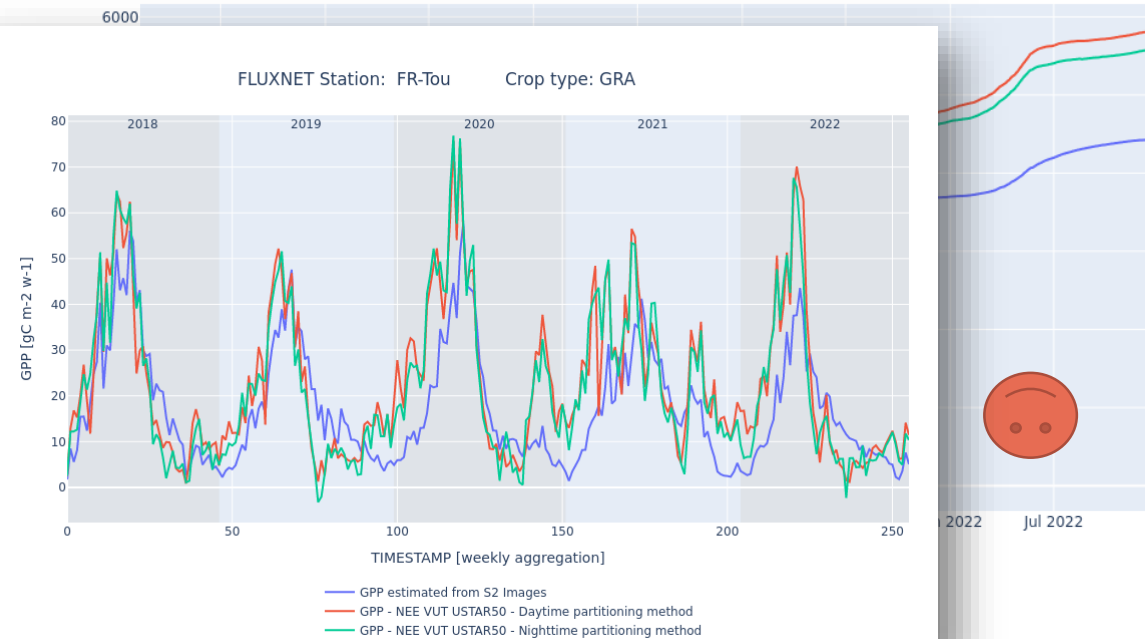
Crop type: GRA



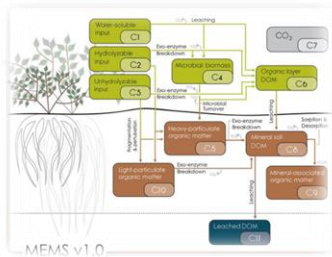
Cumulative
gross
productivity

FLUXNET Station: FR-Tou

Crop type: GRA



Soil C model calibration



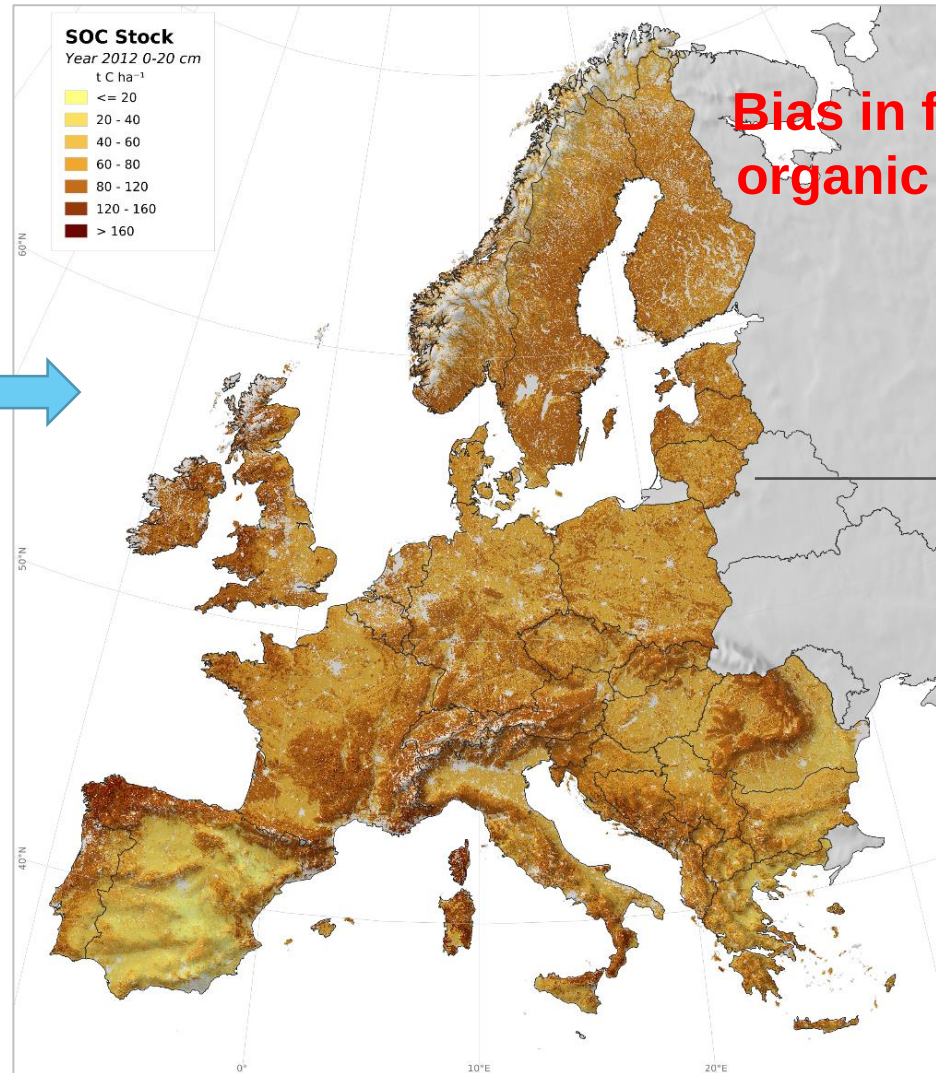
MEMS model



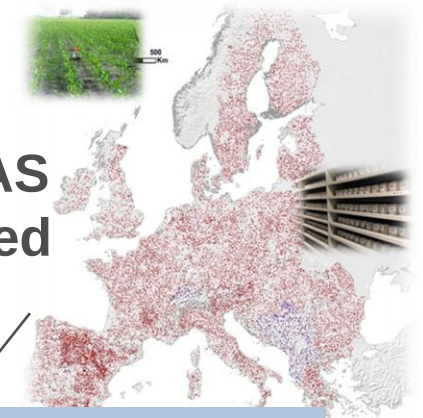
Calibration/validation



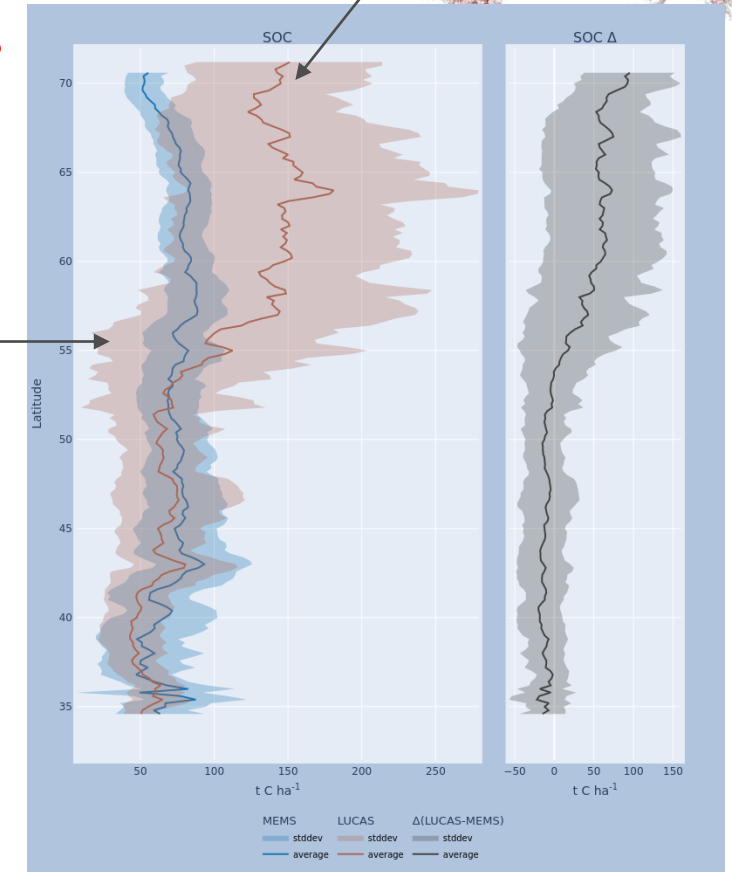
Assimilation



Bias in forest organic soils



LUCAS derived



EO needs for carbon farming for forests

Biomass stocks and biomass stock changes maps

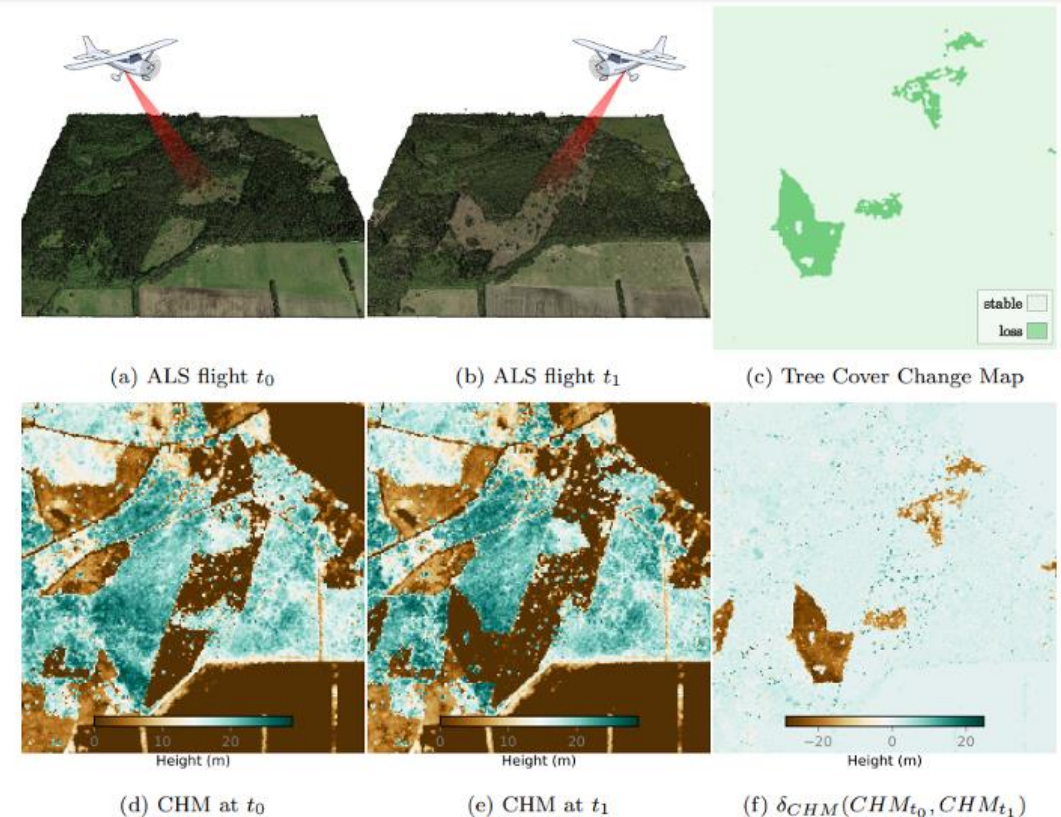
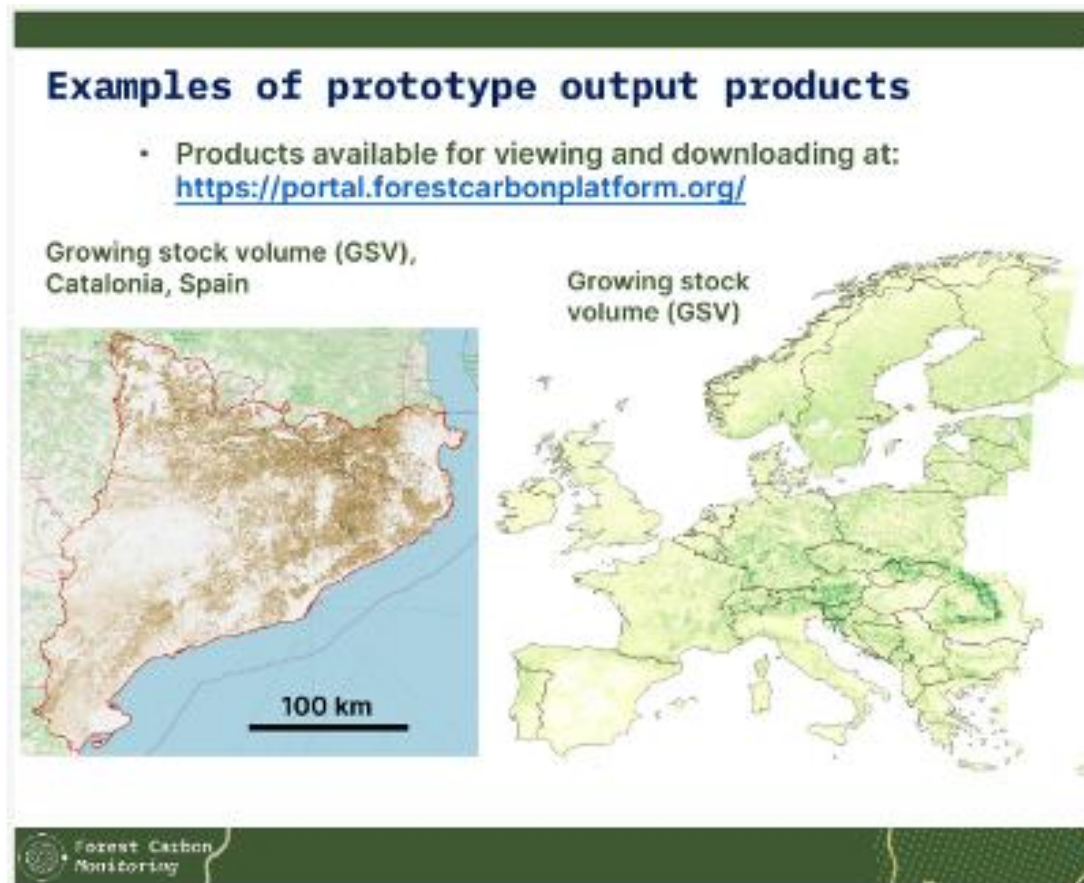
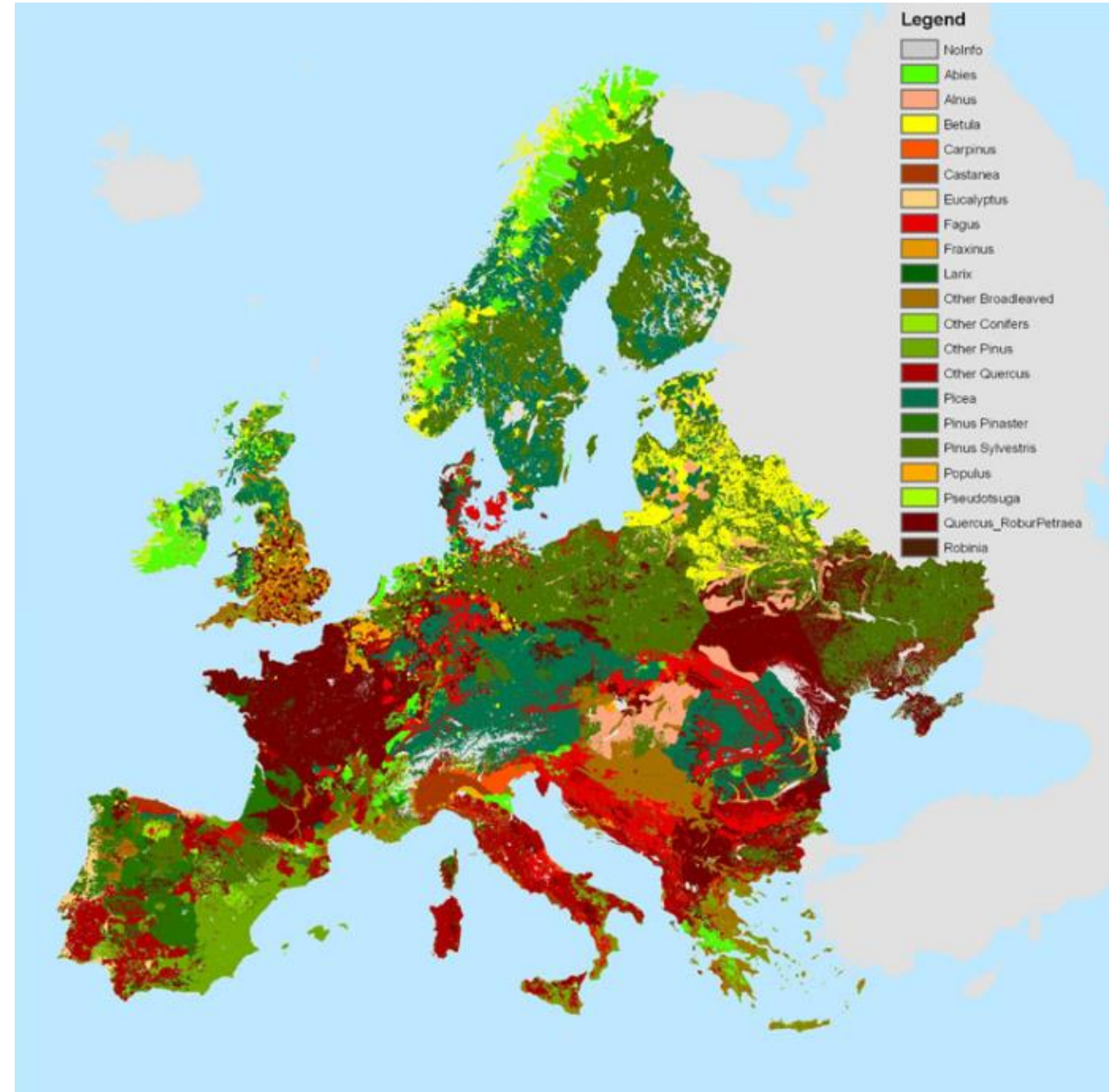
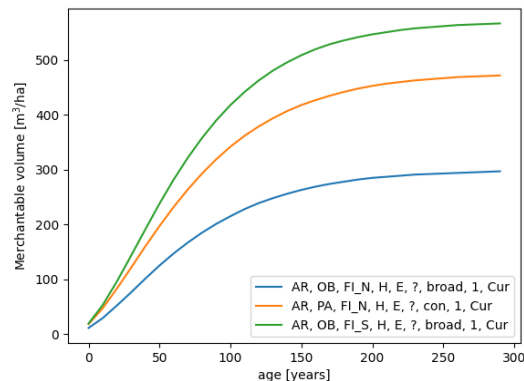


Figure 1: All the processing steps to produce ALS-based Tree Cover Change Map

EO needs for Carbon farming for forests

- Products for monitoring, reporting and verification
- Integration EO into forest growth models
 - Forest age (or time since disturbance) *
 - Disturbance type
 - Copernicus - Forest Type (broad/con) - species
 - Management type and activities



Conclusions

- EO for monitoring activities and biophysical parameters
- JRC advanced research on C hybrid modelling at high-resolution
- Validation upon tools development
- **Many policies but the same biogeochemical cycles!**

Thank you



Emanuele.LUGATO@ec.europa.eu
Mirco.MIGLIAVACCA@ec.europa.eu

© European Union, 2024

Unless otherwise noted the reuse of this presentation is authorised under the [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/) license. For any use or reproduction of elements that are not owned by the EU, permission may need to be sought directly from the respective right holders.