CONFESS

Consistent representation of temporal variations of boundary forcings in reanalyses and seasonal forecasts

WP1 overview

Progress and future work

Objectives of WP1

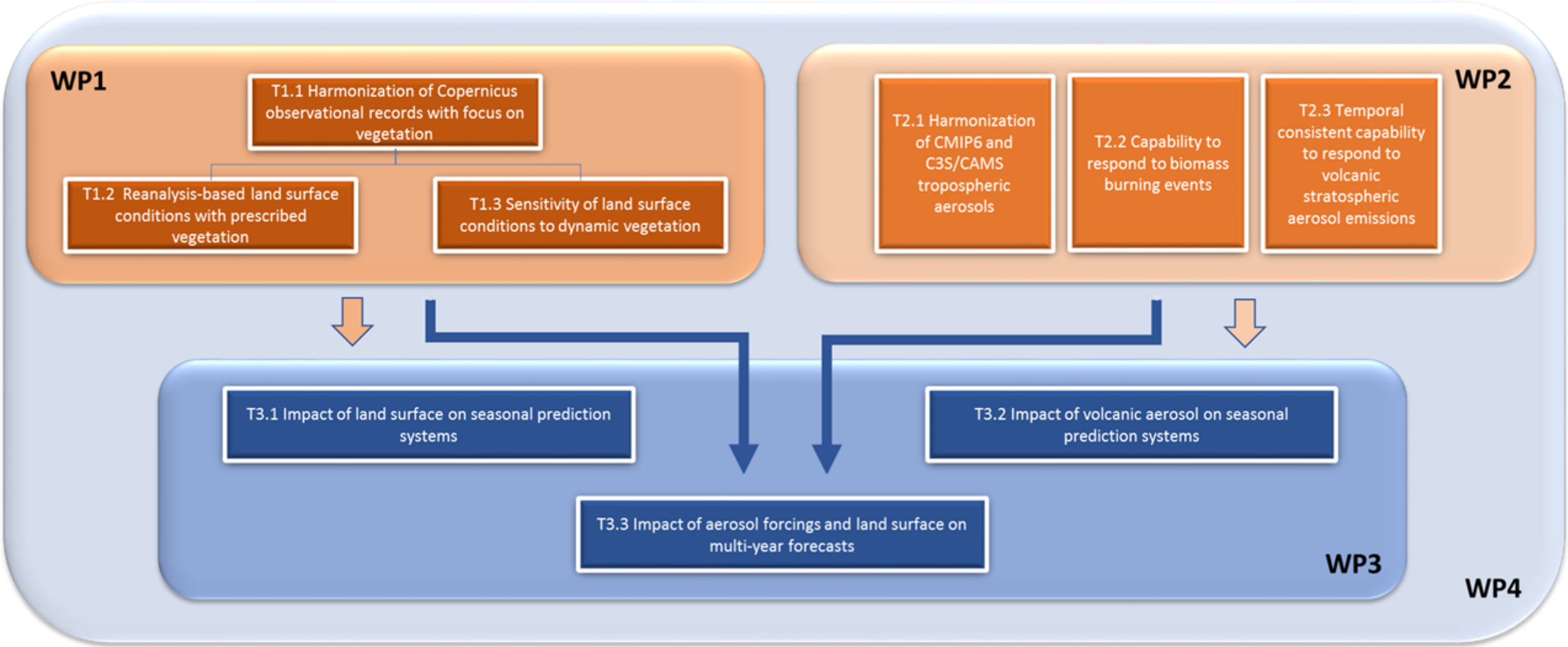
- Produce consistent and harmonized vegetation related dataset of Land Cover, LAI and FCOVER (Task 1.1).

- Produce and assess multi-year land simulations with enhanced vegetation temporal variability (Task 1.2).

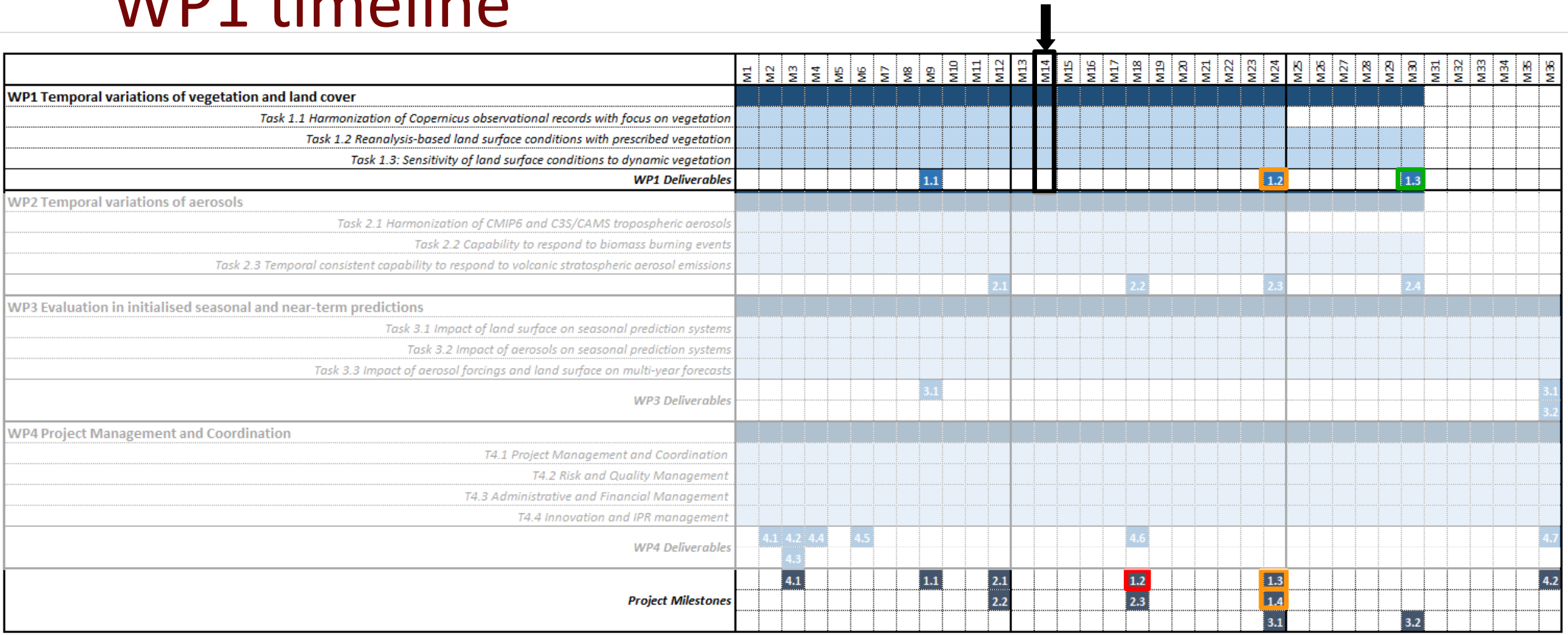
- Produce and assess multi-year land simulations with interactive vegetation (Task 1.3).

- Recommend suitable configurations for coupled simulations to use in reanalysis and seasonal prediction (Task 1.2;Task 1.3)

WP1 within CONFESS



WP1 timeline



WP1 Deliverables and milestones

Deliverables

D1.1: Report on the vegetation dataset of LC and LAI (lead ECMWF) (Month 9)
D1.2: Report on the improved vegetation variability (lead CNR-ISAC) (Month 24)
D1.3: Report on the suitable vegetation modelling configurations (lead Meteo France) (Month 30)

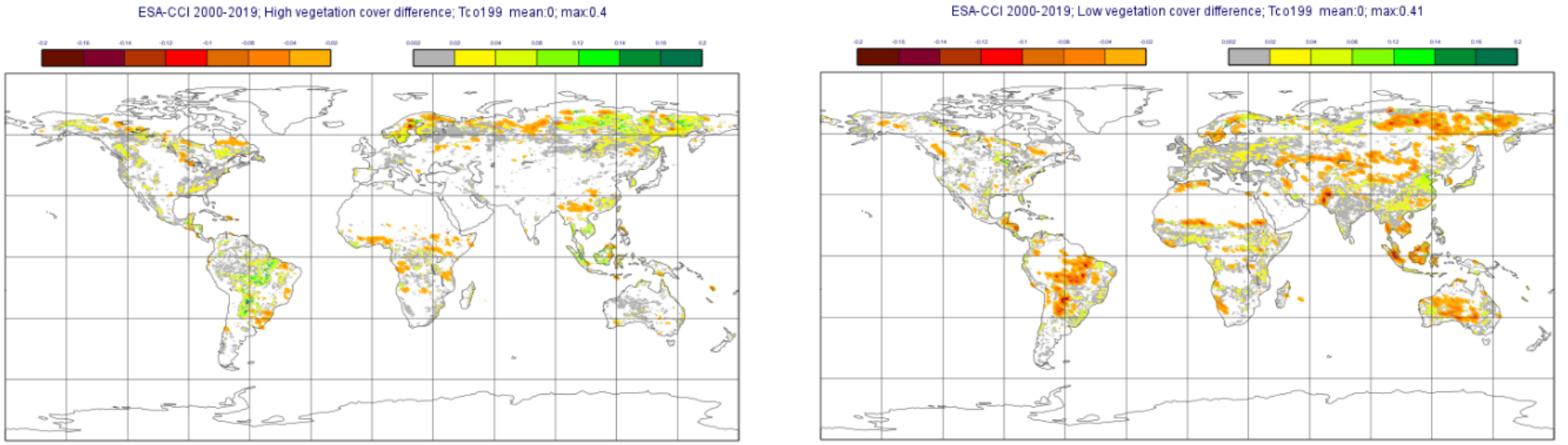
Milestones

M1.1: Release of the long term gap free harmonized LC and LAI data (lead ECMWF) (Month 9)
M1.2: Release of the equilibrated land simulation that considers prescribed vegetation variability based on ERA5 forcing. (lead MeteoFrance) (Month 18 ← End of April 2022)
M1.3: Release of the land simulations including interactive vegetation and land cover effects based on ERA5 forcing. (lead MeteoFrance) (Month 24)
M1.4: Release of the land simulations that include new developments to close the gap between short-term and latest developments in land modelling for long-term climate (Lead CNR-ISAC) (Month 24)

Vegetation dataset of Land Use/Land Cover and Leaf Area Index (Task 1.1)

Task 1.1 progress

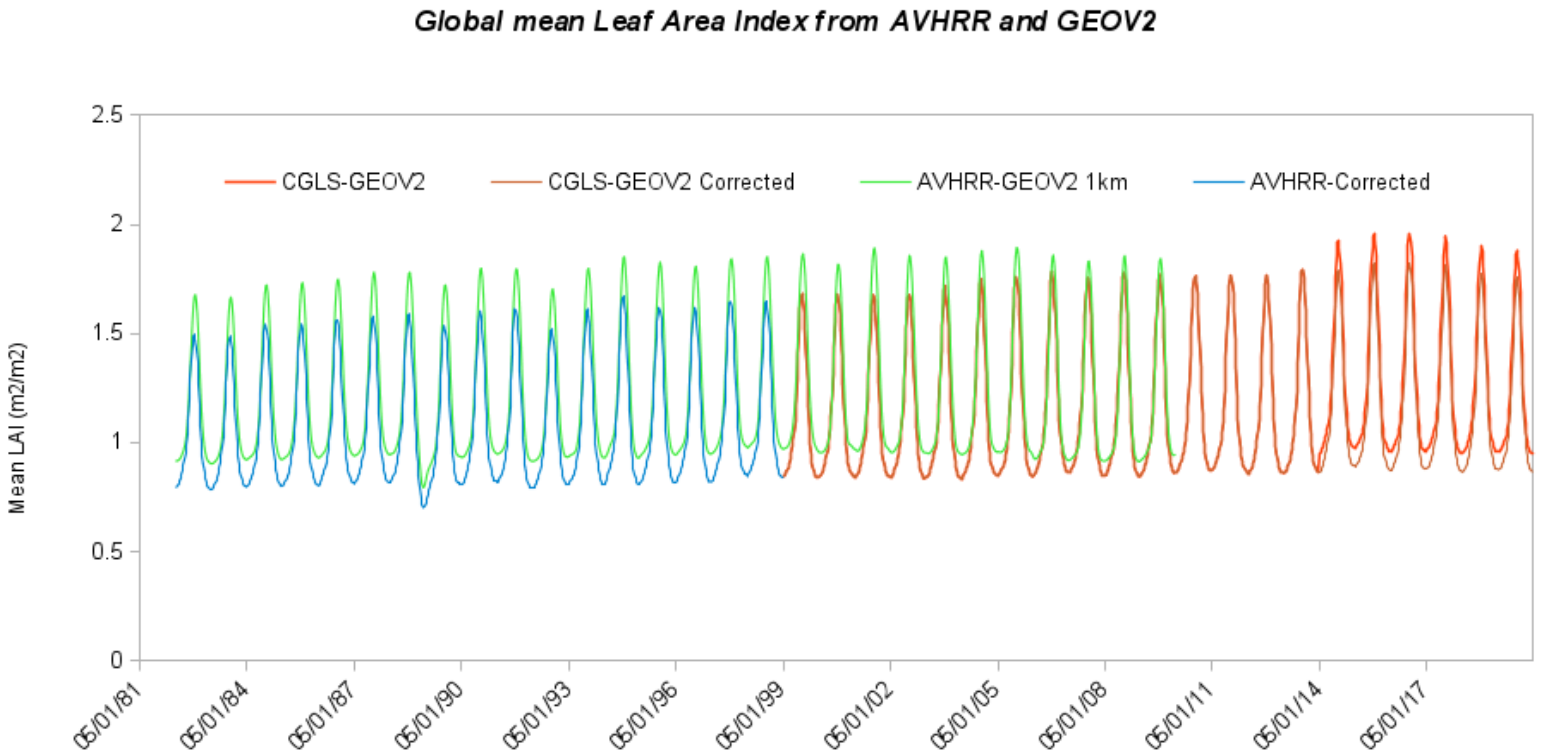
- ECMWF retrieved, harmonized and shared ESA-CCI LU/LC data and CGLS LAI
- ESA-CCI LU/LC translated into IFS-BATS classification and adapted to the target resolution



Vegetation cover differences between 2000 minus 2019 (right) for low vegetation and (left) for high vegetation covers.

Task 1.1 progress

- Production and release of harmonized 1993-2019 LAI dataset



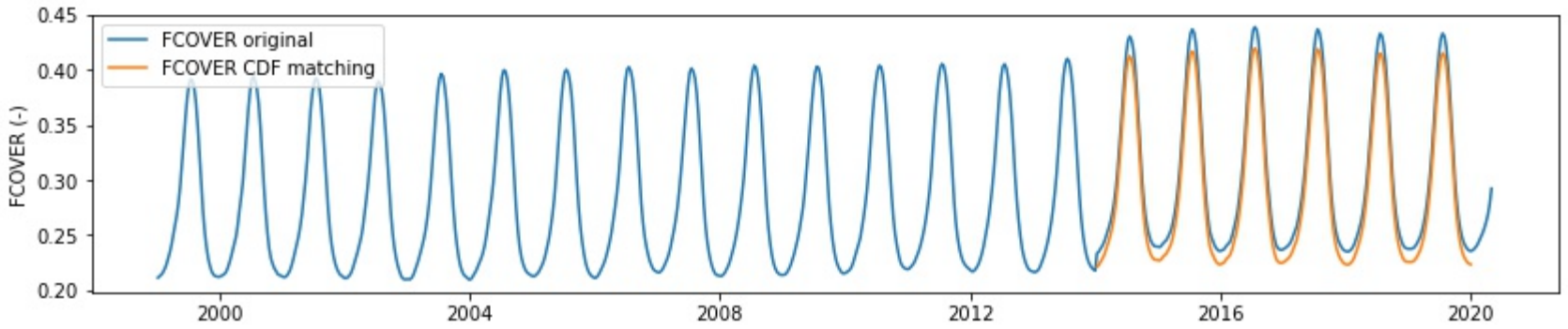
- Upcoming presentation *"Harmonization of Copernicus based LULC and Leaf Area Index data for NWP and Reanalysis applications »*

Task 1.1 progress

- > CNR-ISAC :

- Retrieval of 1999-2019 CGLS FCOVER dataset

- "CDF-matching" harmonization procedure for FCOVER similar to that used for LAI



Fraction of green Vegetation Cover global mean from CGLS GEOV2 time series (blue) and CGLS GEOV2 CDF corrected (orange).

Task 1.1 next steps

> MF :

- Generation of Land Cover maps derived from LUH2 for SURFEX at the target resolution

Reanalysis-based land surface conditions with prescribed vegetation (Task 1.2)

Task 1.2 progress

No simulations performed with prescribed vegetation so far, but significant preparation work

> All partners have agreed on a list of simulation output data :
https://docs.google.com/spreadsheets/d/1BX544q9NbXuMzBi-JKYyM5-uDLYryiT5GOvY3VBREvc/edit#gid=572339624

> ECMWF :

- implementation of offline and forecast experiments to adapt the model parameters with the new maps
- implementation of the technical infrastructure to ingest the multiannual varying maps

> MF :

- Control 1993-2019 simulation with climatological LAI and fixed LC already carried out
- Disaggregation of the observed 1km LAI dataset by vegetation cover at the model target resolution

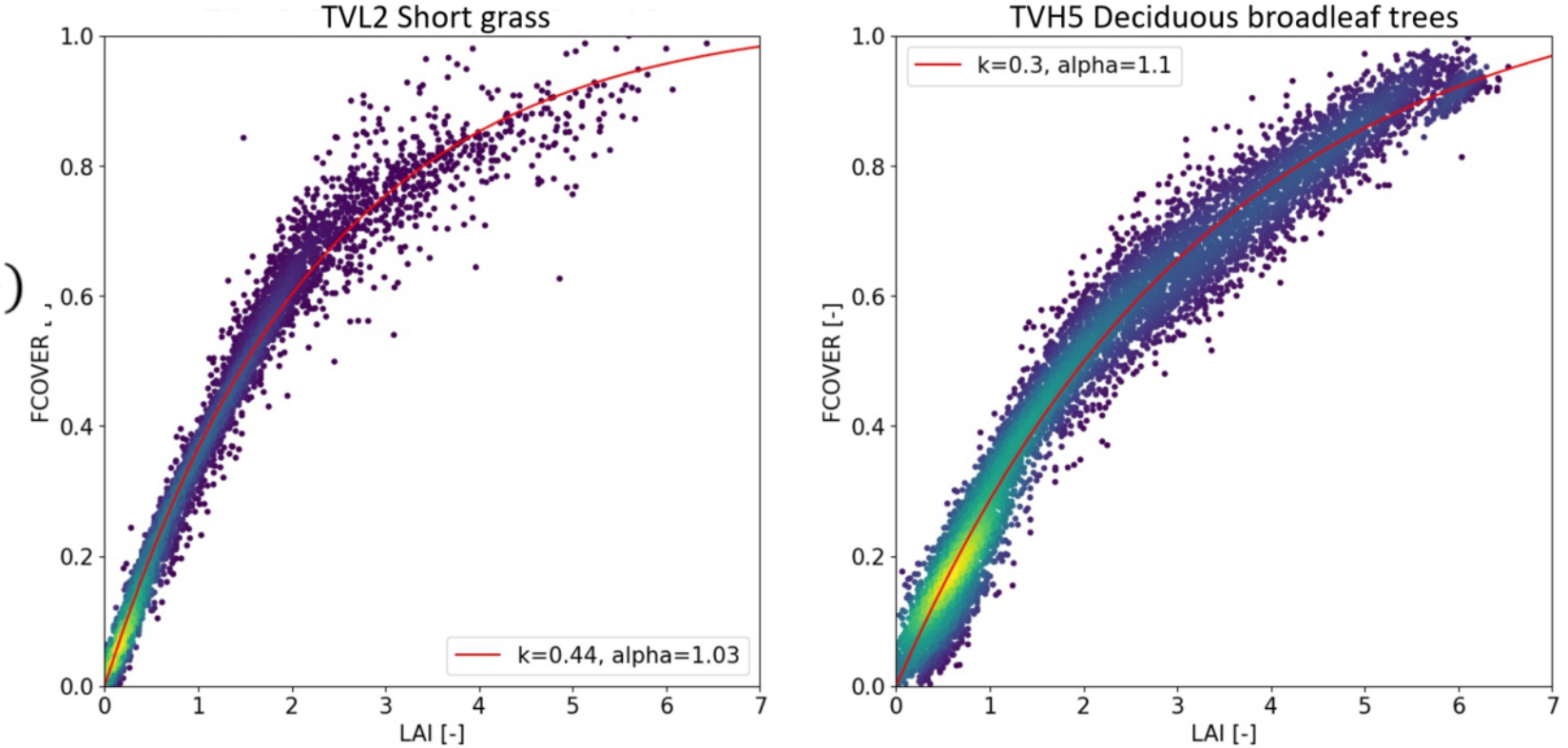
> CNR-ISAC :

- Optimization of the effective cover parameterization based on FCover and LAI and consistent with ESA-CCI

Task 1.2 progress

- Optimization based on observed 1999-2019 CGLS FCover and LAI

$$\mathrm{FCover}_i = \alpha_i(1 - e^{-k_i * \mathrm{LAI}_i})$$



Fitting of LAI and FCover observations for ESA-CCI land cover types TVL2 Short grass (left) and TVH5 Deciduous broadleaf trees (right). The dots represent observations coloured by density and the red line represents the optimized lambert beer relation (Eq. 1)

Task 1.2 next steps

- All 3 partners to perform historical land simulations with prescribed vegetation

- Simulation data to be released by the end of April 2022 (M. 1.2)

Sensitivity of land surface conditions to dynamic vegetation (Task 1.3)

Task 1.3 progress

- 1993-2019 SURFEX-ISBA simulation with dynamic vegetation has been completed

- In this model, interactive LAI derived from biomass (B) evolution due to photosynthetic activity :

$$B(t + \Delta t) = B(t) + \Delta B^{+} - \Delta B^{-}$$

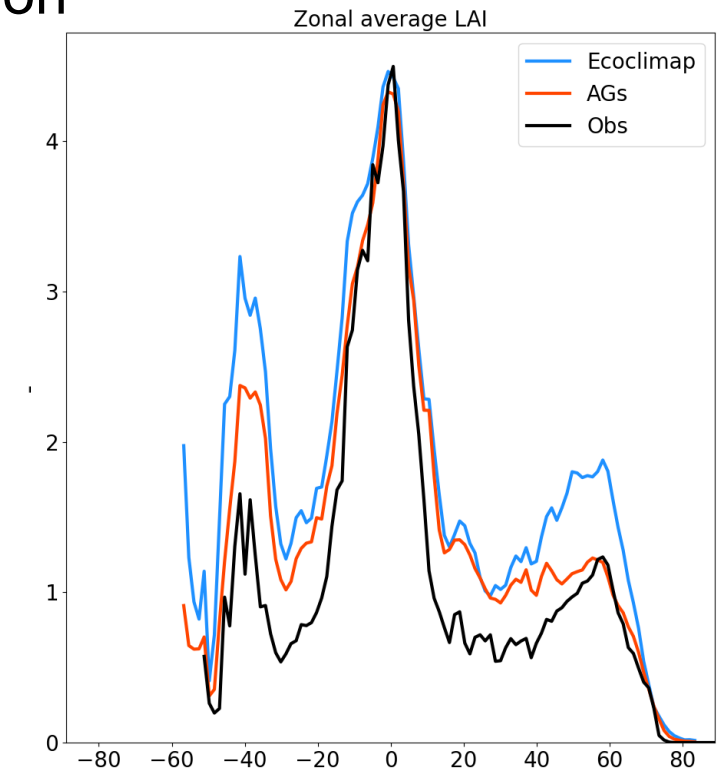
Growth : $\Delta B^{+} = \alpha\, An^{day}\, \Delta t$ (An^{day} is the daily net CO2 assimilation = photosynthesis + respiration, see Delire et al. 2020)

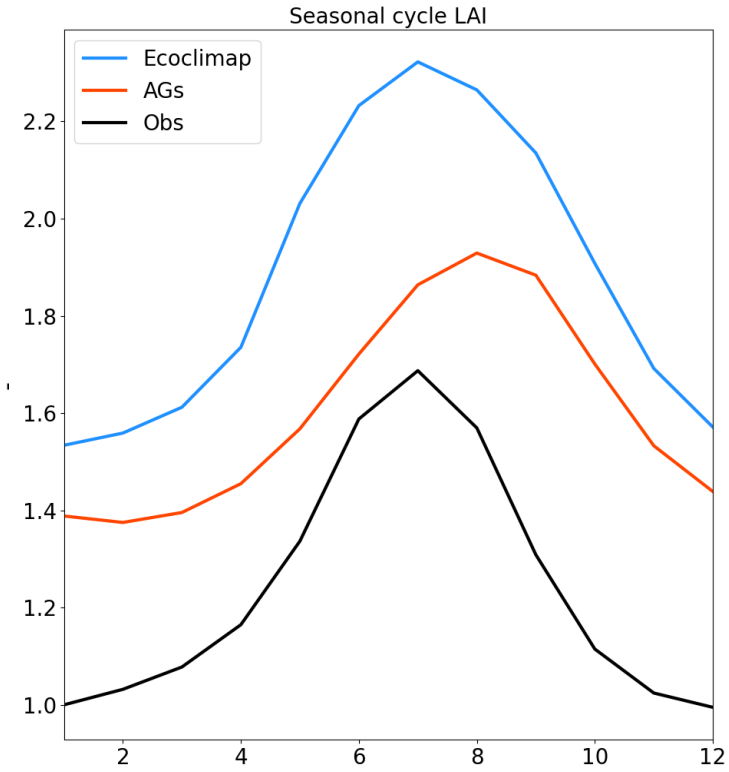
Mortality : $\Delta B^{-} = B(1 - e^{-\Delta t/\tau})$ (τ is a life expectancy term, see Calvet et al, 1998)

And finally : $LAI = B/\alpha_B$ (α_B is assumed constant for a given vegetation type, Gibelin et al 2006)

Task 1.3 progress

- LAI evaluation





- More results in the upcoming presentation

Task 1.3 next steps

- Run a SURFEX simulation with dynamic LAI + yearly evolving Land cover

- All partners to perform historical land simulations with dynamic vegetation

- Simulation data to be released by the end of October 2022 (M.1.3)

WP1 dissemination and outreach

=> see dedicated presentation by Andrea Alessandri

Questions?

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