

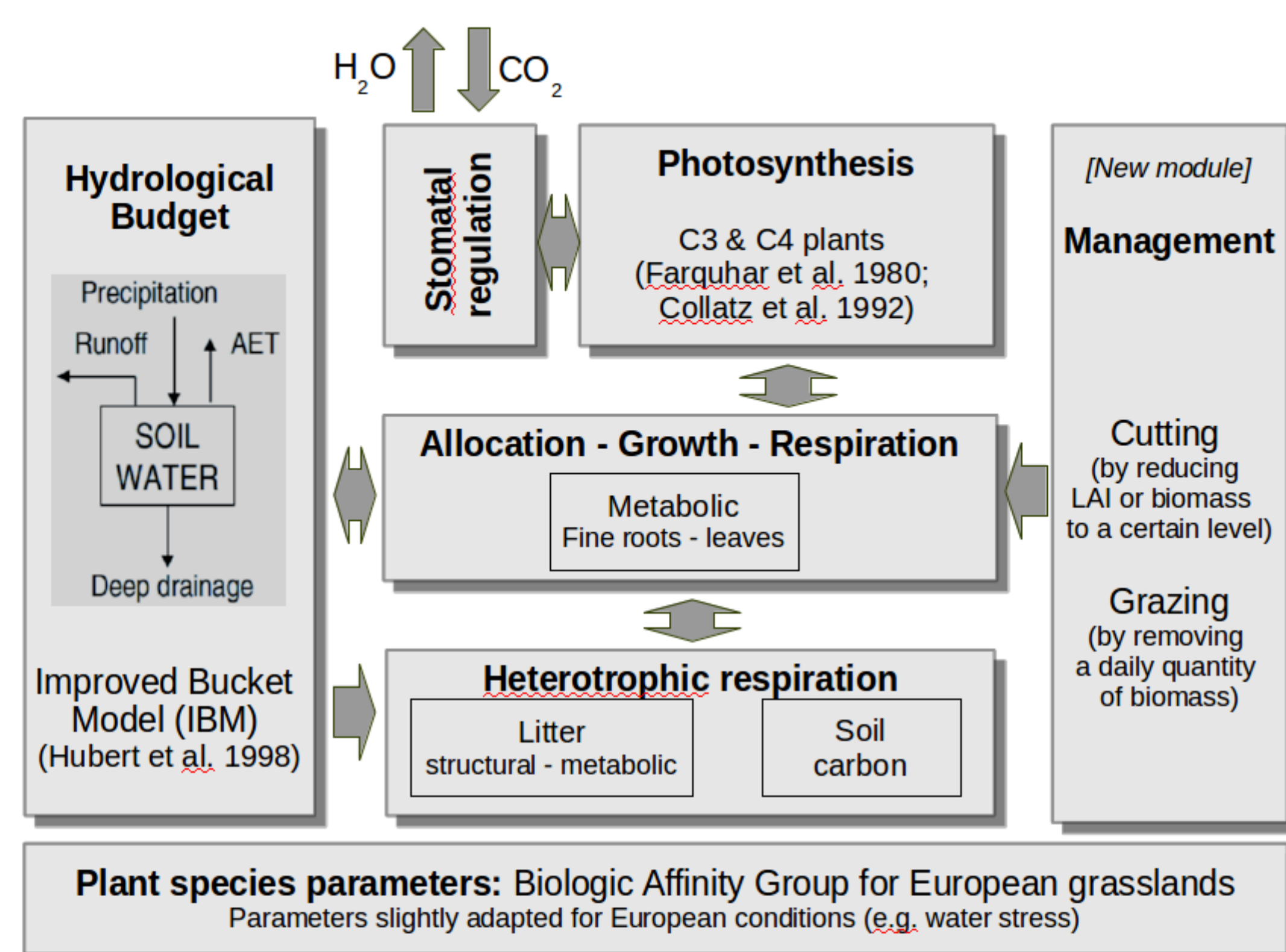
Introduction

CARAIB is a physically-based, mechanistic model that calculates the carbon assimilation of the vegetation as a function of the soil and climatic conditions. Within MACSUR, it was used in model intercomparison exercises for grassland and crop modeling, in the LiveM 2.4 and CropM 4.4 tasks, respectively. Basically, CARAIB is a global vegetation model but we show that it could be adapted for specific grasslands and crops, thanks to its open and physically-based components.

LiveM (L2.4)

Model

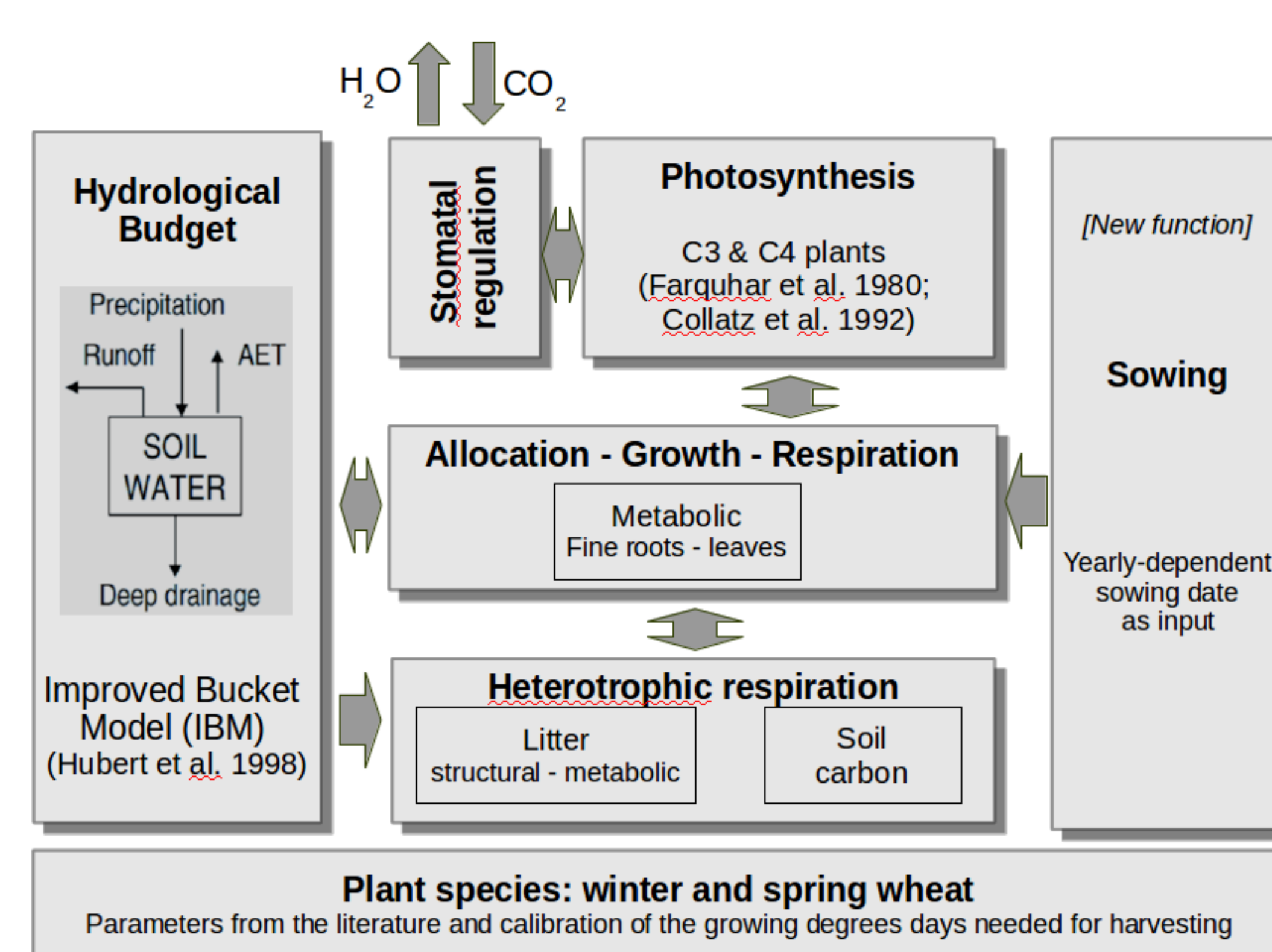
A new module was developed in CARAIB for simulating the cutting or grazing of the grasslands.



CropM (C4.4)

Model

The sowing date function was adapted for simulating the growing of the winter and spring wheat. Calibration of the model by the growing degree-days.

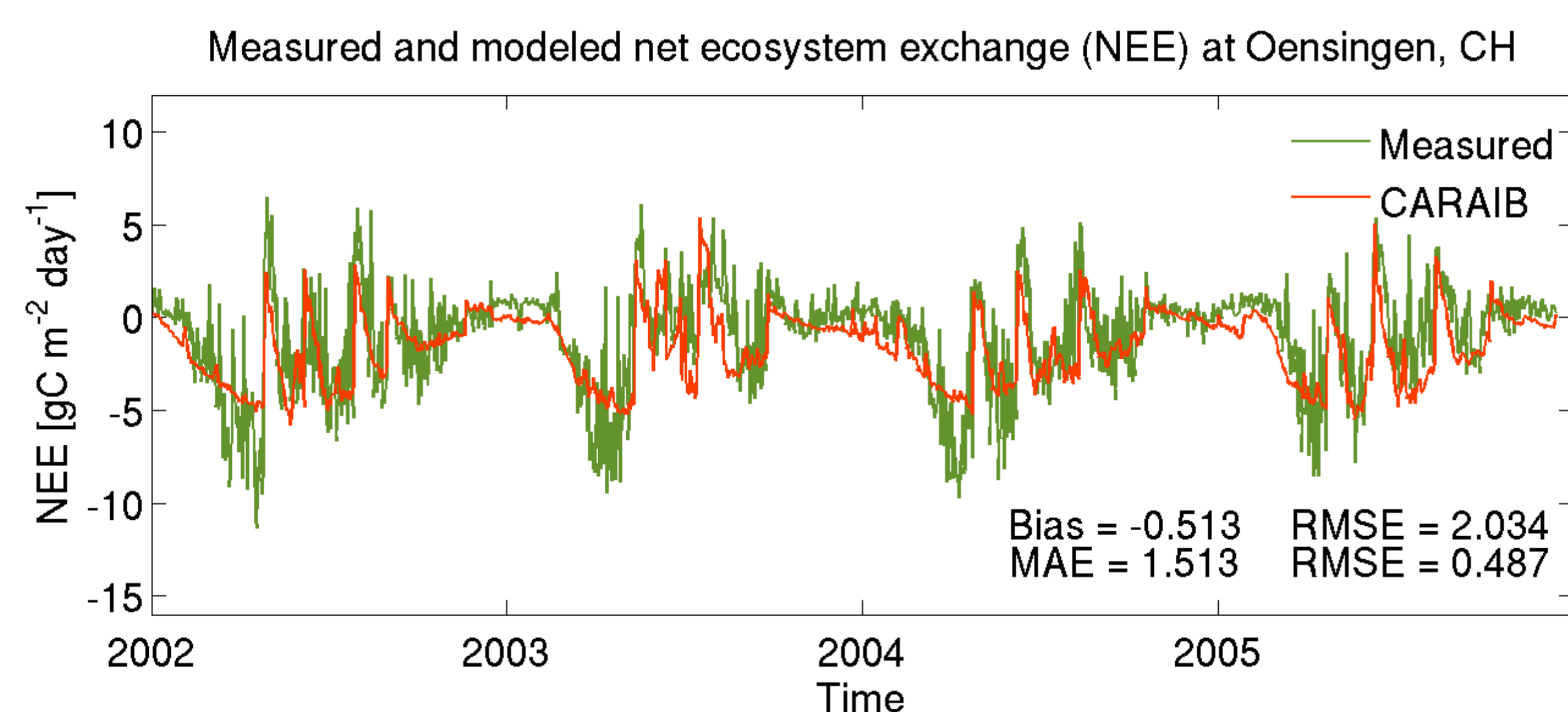


Blind runs

- Blind simulations WITHOUT model calibration.
- Local parametrization with soil and plant parameters.
- Real climatic and management data as inputs.
- 11 simulations conducted at 9 European sites.
- Part of MACSUR L2.4 – 10 grasslands models involved.
- Task lead by Gianni Bellocchi & Shaoxiu Ma (INRA, FR)

Results of blind runs

Measured data were given only AFTER blind runs data were sent back to L2.4 task leaders.



	Bias	MAE	RMSE	R ²
NEE [gC m ⁻² day ⁻¹]	-0.513	1.513	2.034	0.487
GPP [gC m ⁻² day ⁻¹]	-0.307	1.778	2.392	0.737
RECO [gC m ⁻² day ⁻¹]	-0.820	1.171	1.615	0.805
ET [mm day ⁻¹]	-0.107	0.652	0.910	0.549
SWC [m ³ m ⁻³]	-0.012	0.055	0.068	0.573
ST [°C]	0.690	2.516	3.408	0.917

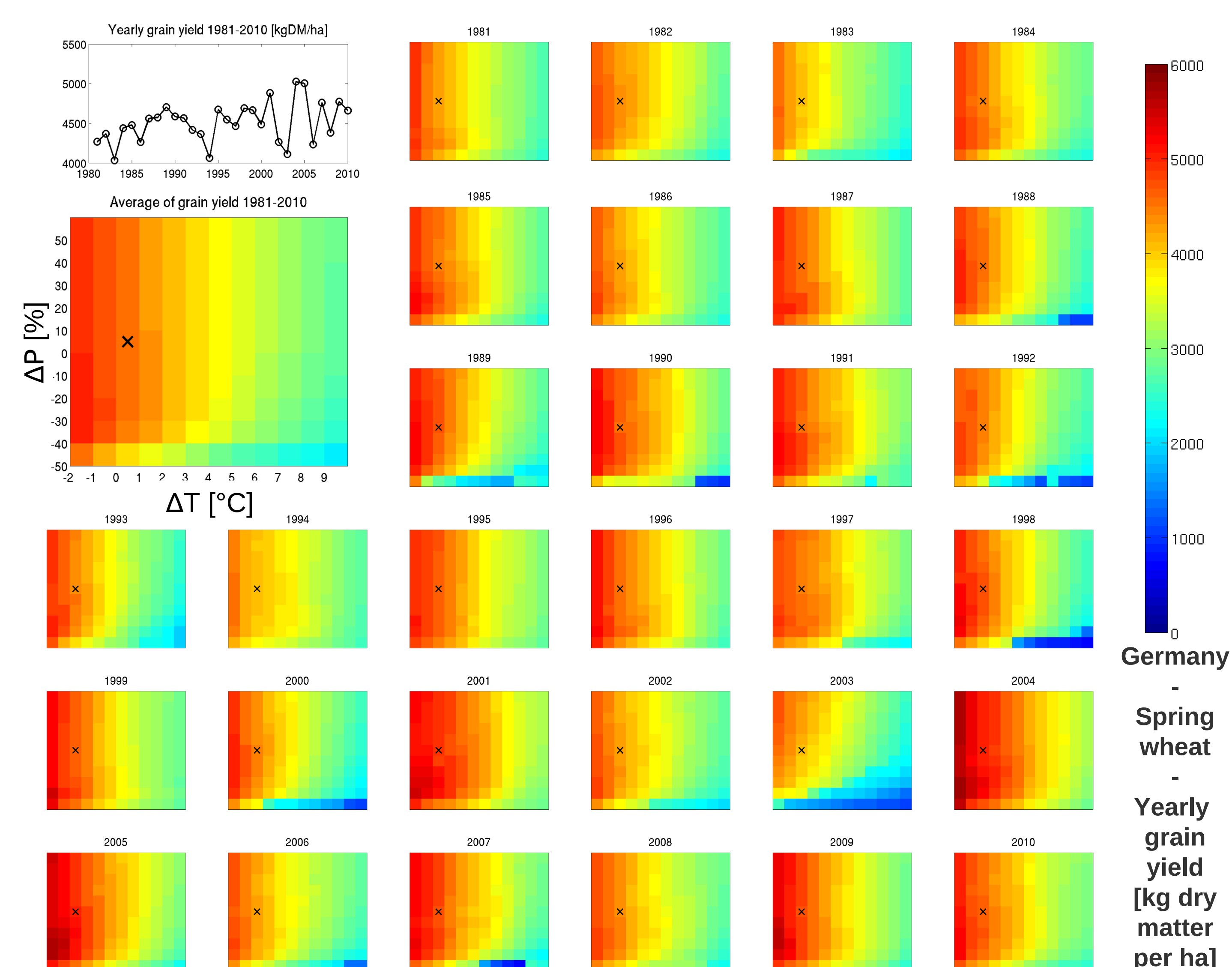
Conclusion

CARAIB could be easily adapted for both grasslands and crop modeling. Plant parameters will be fully calibrated in the next steps of these two MACSUR exercises. Yet, uncalibrated runs of the grassland modeling could already reproduce the overall pattern of the NEE.

Impact Response Surface (IRS) construction

- Sensitivity analysis of the model to temperature and precipitation changes (in context of climate change) → IRS
- 3 sites: Finland, Germany, Spain & 2 crops: winter & spring wheat
- IRS with $\Delta P = -50\% \rightarrow +50\%$ & $\Delta T = -2^\circ\text{C} \rightarrow +8^\circ\text{C}$ (121 climatic conditions) over 30 years of simulation
- Part of MACSUR C4.4 – 30 crop models involved.
- Task lead by Nina Pirttioja & Stefan Fronzek (SYKE, FI)

IRS



Larger sensitivity to temperature than precipitation change

References

- Warnant P., François L., Strivay D., Gérard J.-C., CARAIB: a global model of terrestrial biological productivity. *Global Biogeochemical Cycles*, 8, 255-270, 1994.
- Nemry B., François L., Warnant P., Robinet F. & Gérard J.-C., The seasonality of the CO₂ exchange between the atmosphere and the land biosphere: a study with a global mechanistic vegetation model. *J. Geophys. Res.*, 101, 7111-7125, 1996.