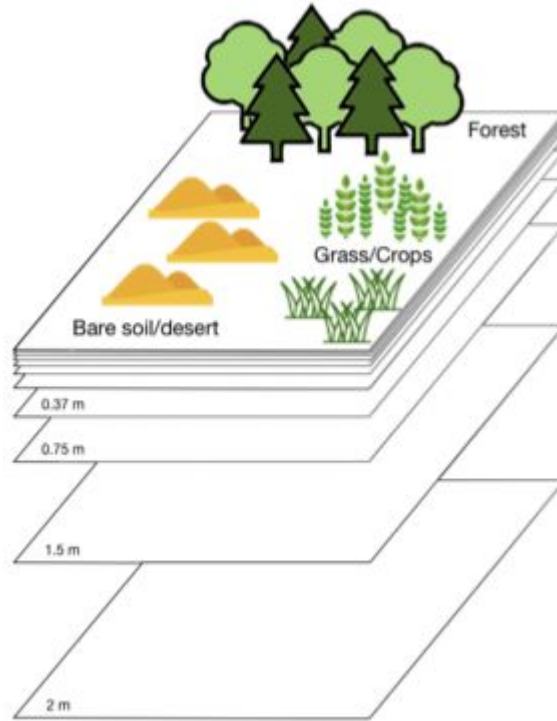


Calibrating drydowns

Identifying and optimising Soil Surface Moisture drydowns in the ORCHIDEE land-surface model

Nina Raoult, Catherine Ottlé, Philippe Peylin, Vladislav Bastrikov, Pascal Maugis...

Soil Moisture in ORCHIDEE



- ❖ 3 hydric budgets for soil columns associated to vegetation
- ❖ Weight average of the 3 SM variables
- ❖ 11 layer discretization for the soil column

In-situ sites

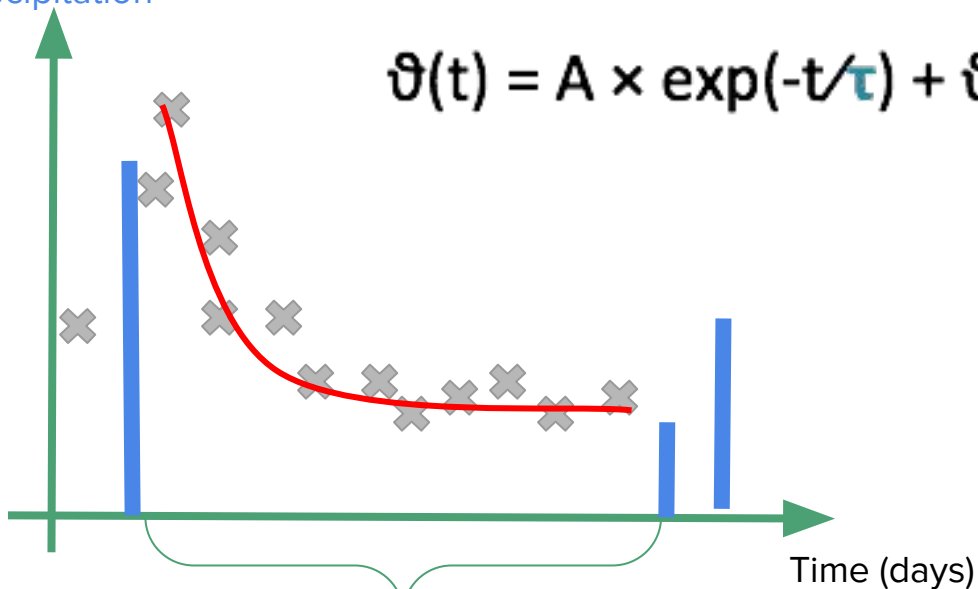


- ❖ ISMN sites within the footprint of FLUXNET tower
- ❖ FLUXNET provides accurate forcing data and flux data (GPP/LE) for evaluation.

Definition of drydowns

Soil Moisture (θ)

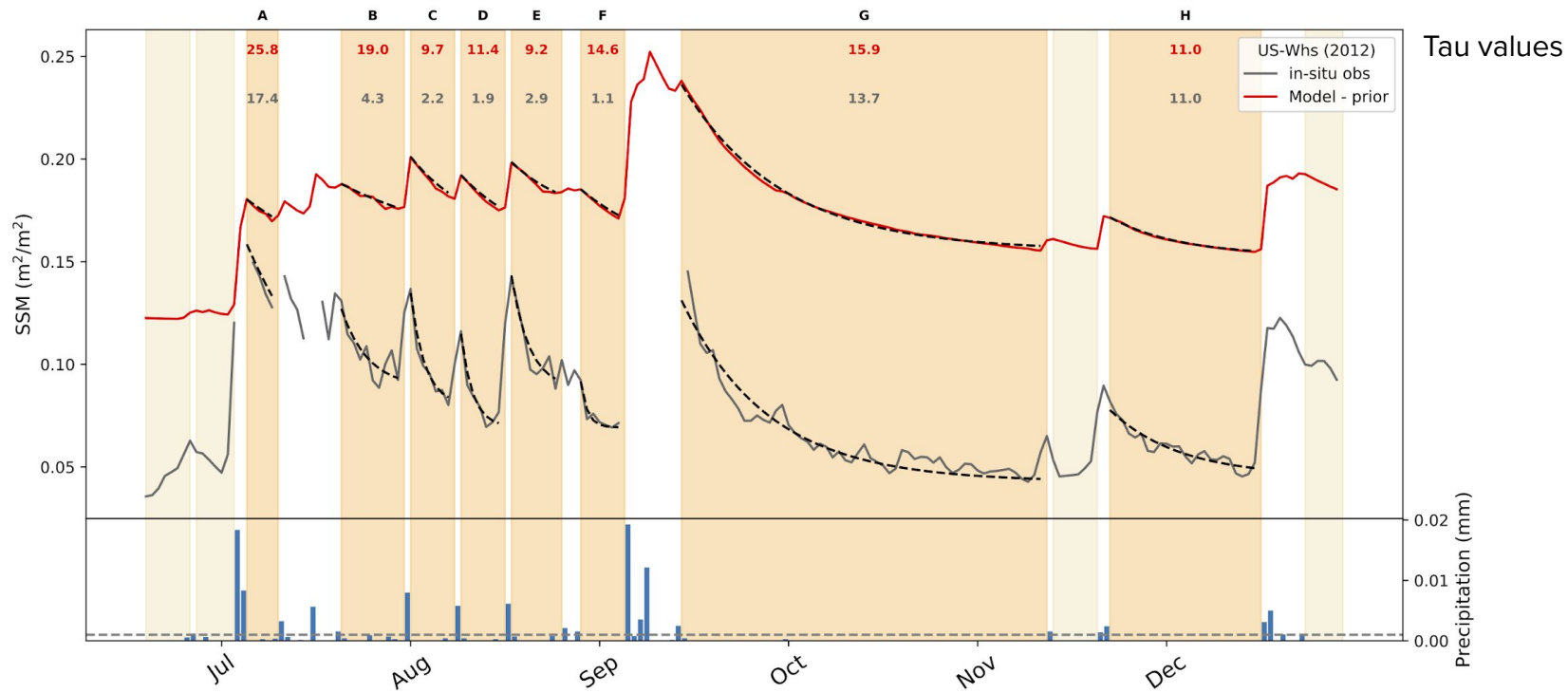
Precipitation



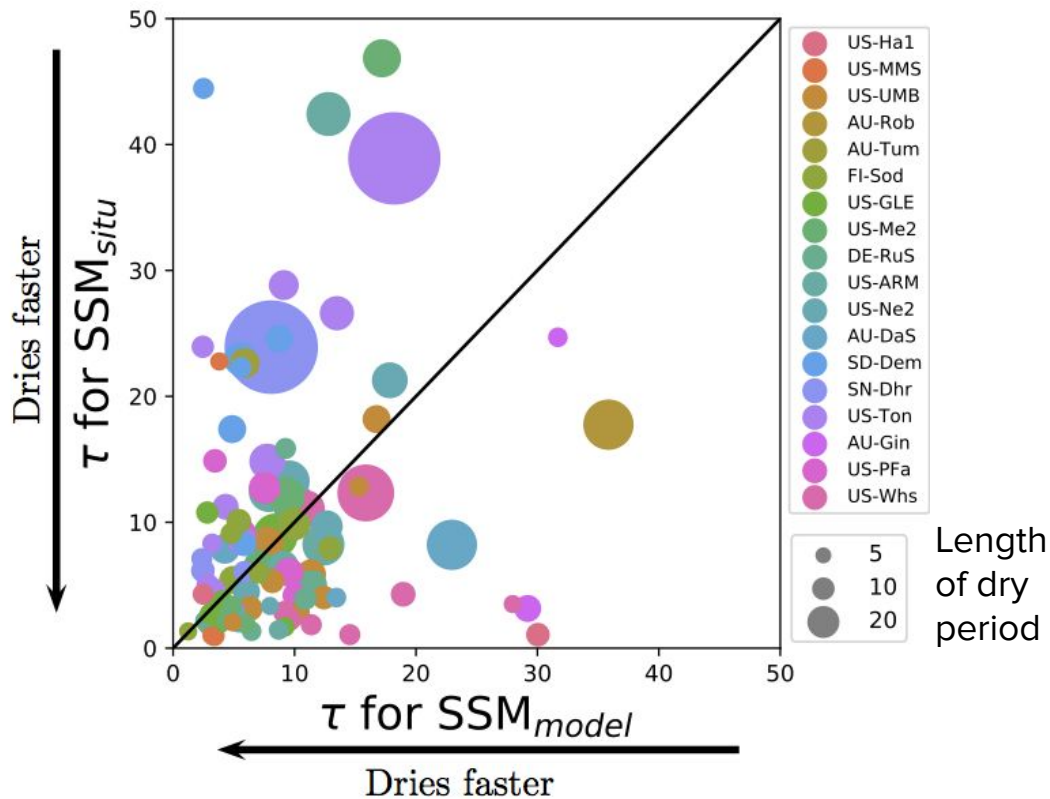
At least 5 days with no rain

- ❖ Due to large biases in SM, focus on temporal dynamics
- ❖ Measure of soil moisture memory
- ❖ τ is the metric of interest

Local example

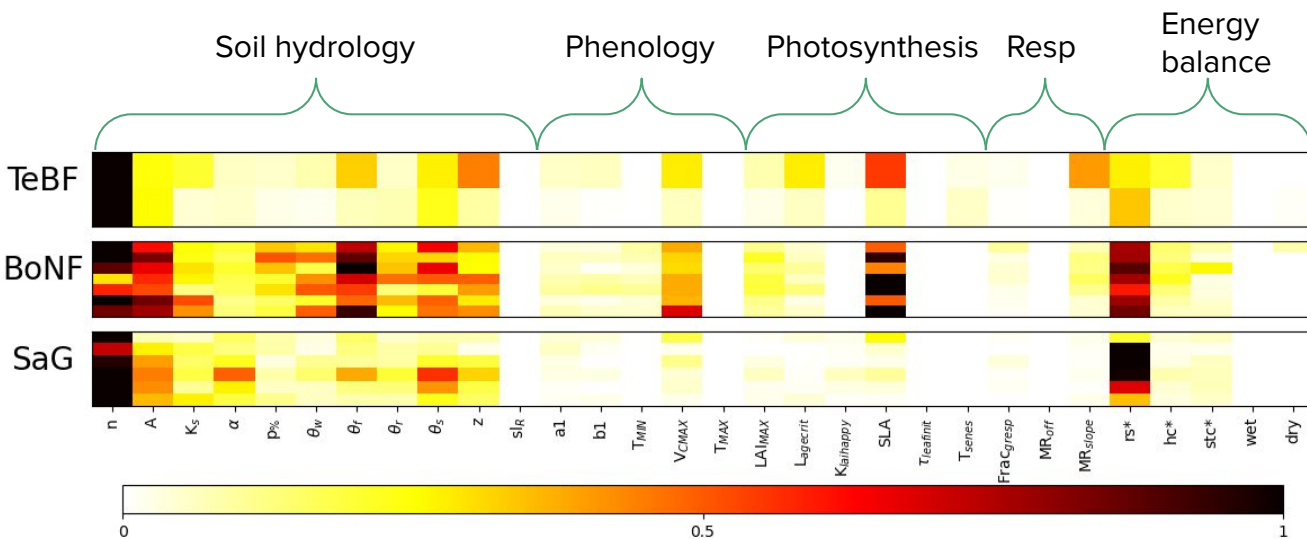


Overall trends



- ❖ Generally, the model dries out faster than the observation
- ❖ Too small sample of sites to draw conclusions about vegetation, soil texture or climate

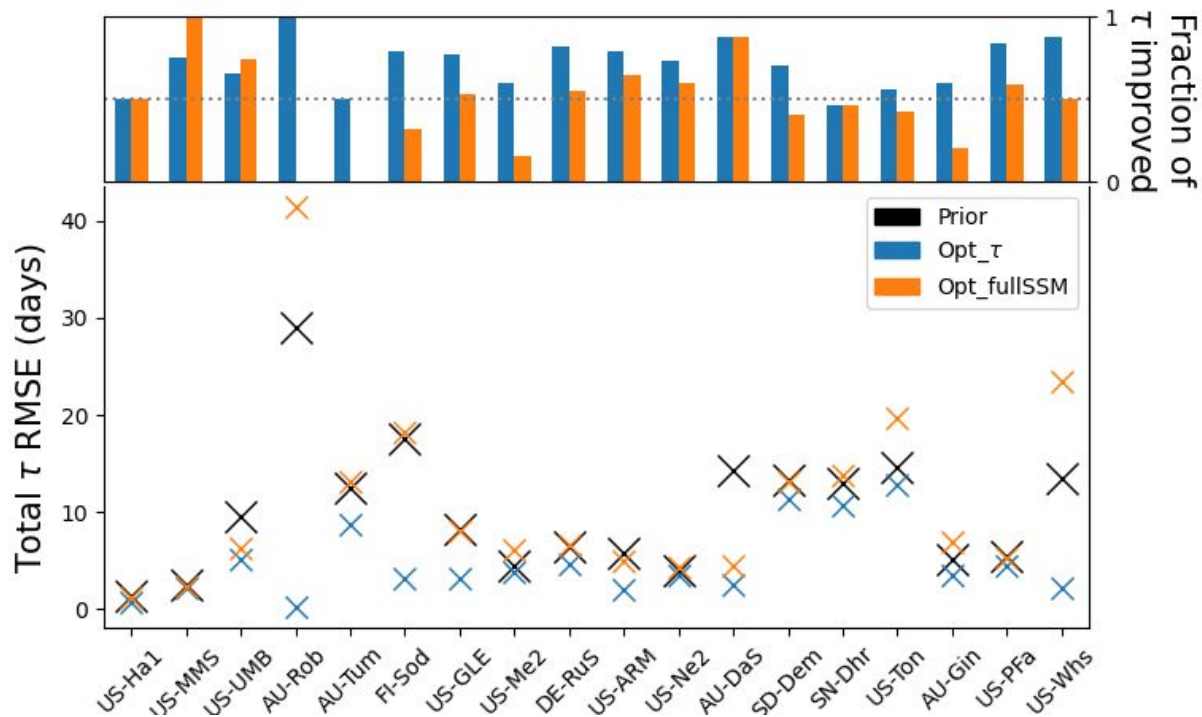
Parameter selection



- ❖ Sensitive analysis performed using Morris algorithm

- ❖ Hydrology parameters, rs^* , SLA and V_{cmax} kept for calibration

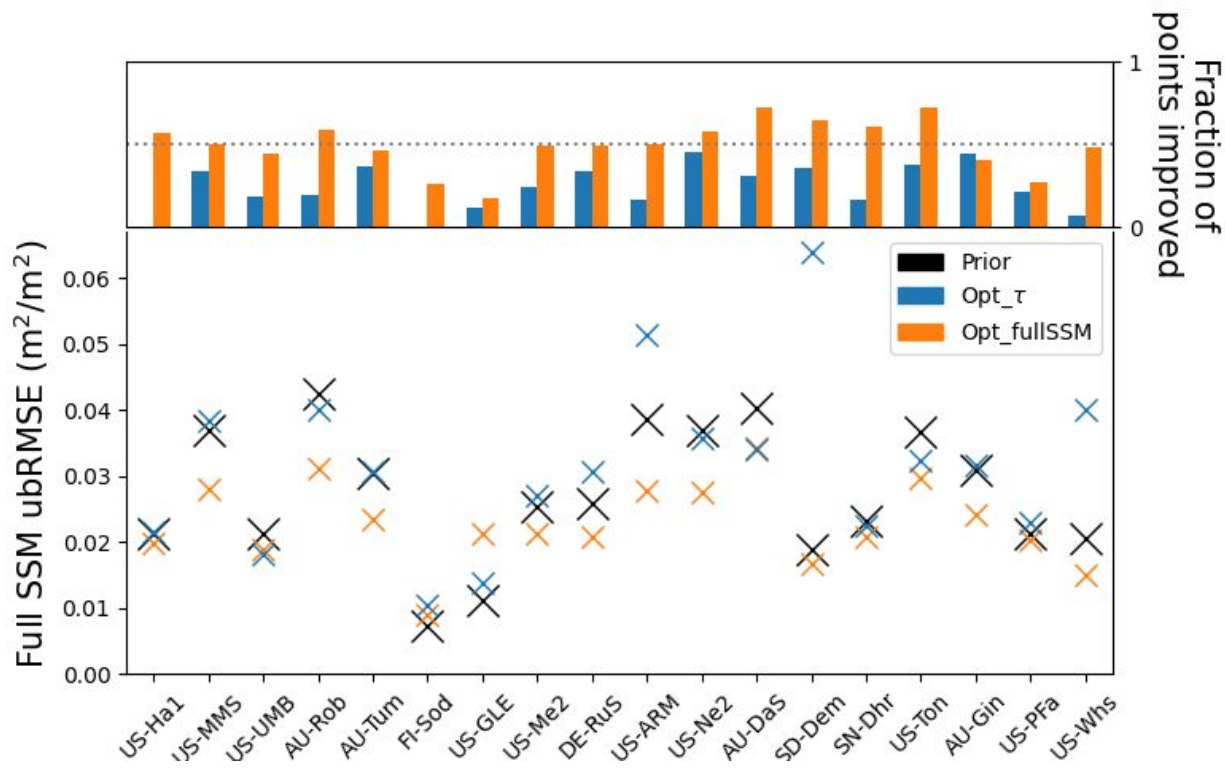
Calibration



Opt_ τ - calibration using τ values | Opt_fullSSM - using whole bias-corrected SSM timeseries

- ❖ Using Opt_ τ , for all sites, at least half of the τ values improve
- ❖ Opt_ τ outperforms Opt_fullSSM in improving drydowns

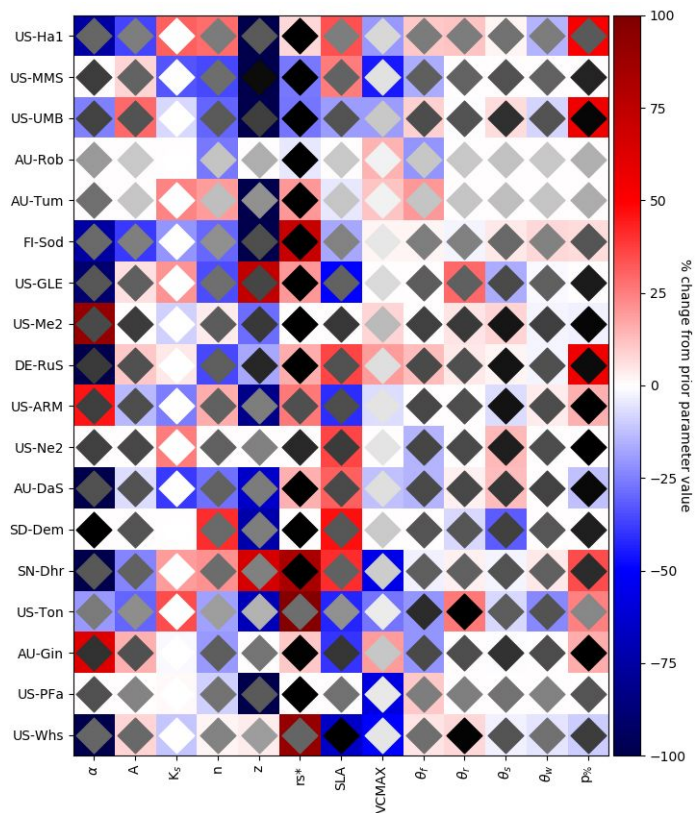
Effects of calibration on full SSM ts



Opt_τ - calibration using τ values | **Opt_fullSSM** - using whole bias-corrected SSM timeseries

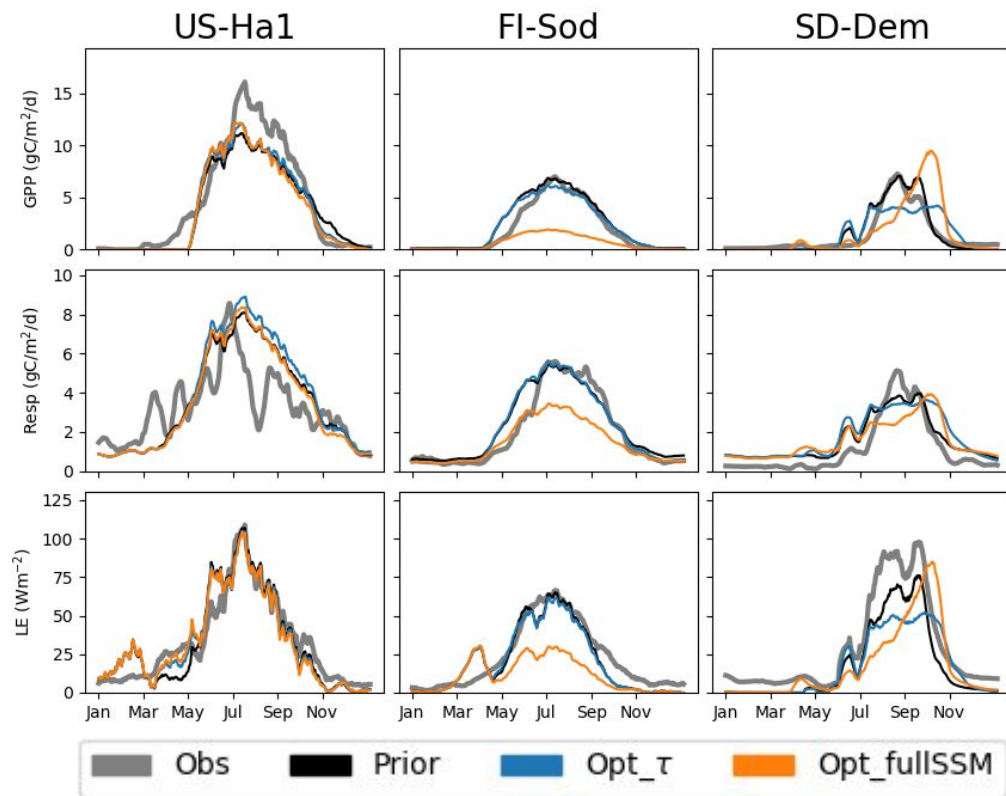
- ❖ Opt_τ reduces/maintains the prior ubRMSE for half of the sites
- ❖ Opt_fullSSM outperforms Opt_τ when considering the full timeseries

Posterior parameters



- ❖ Effect of the τ calibration on the parameters
- ❖ Darker diamonds represent a larger reduction in parameter uncertainty

Effect on other fluxes



- ❖ Little to no change when using Opt_τ
- ❖ More significant deterioration of fit when using Opt_fullSSM

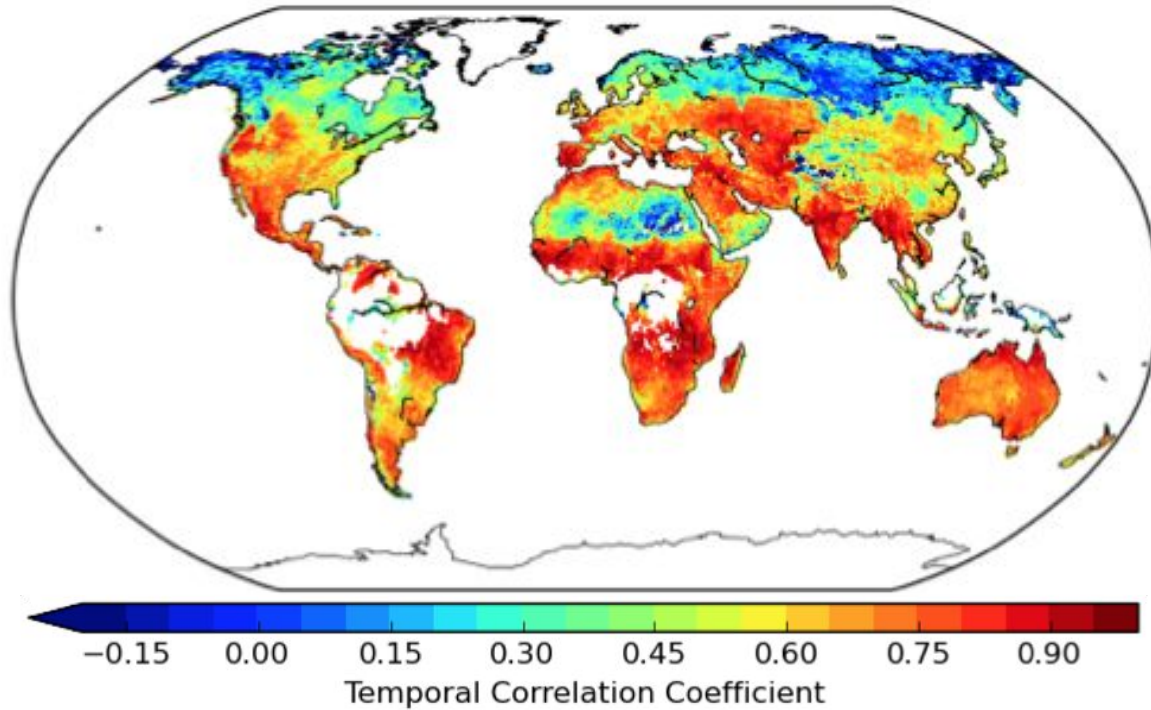
Future Perspectives

- ❖ Submit manuscript by the end of the month:

Raoult, N., et al. (2020), *Evaluating and Optimising Surface Soil Moisture drydowns in the ORCHIDEE land-surface model*, Journal of Hydrometeorology

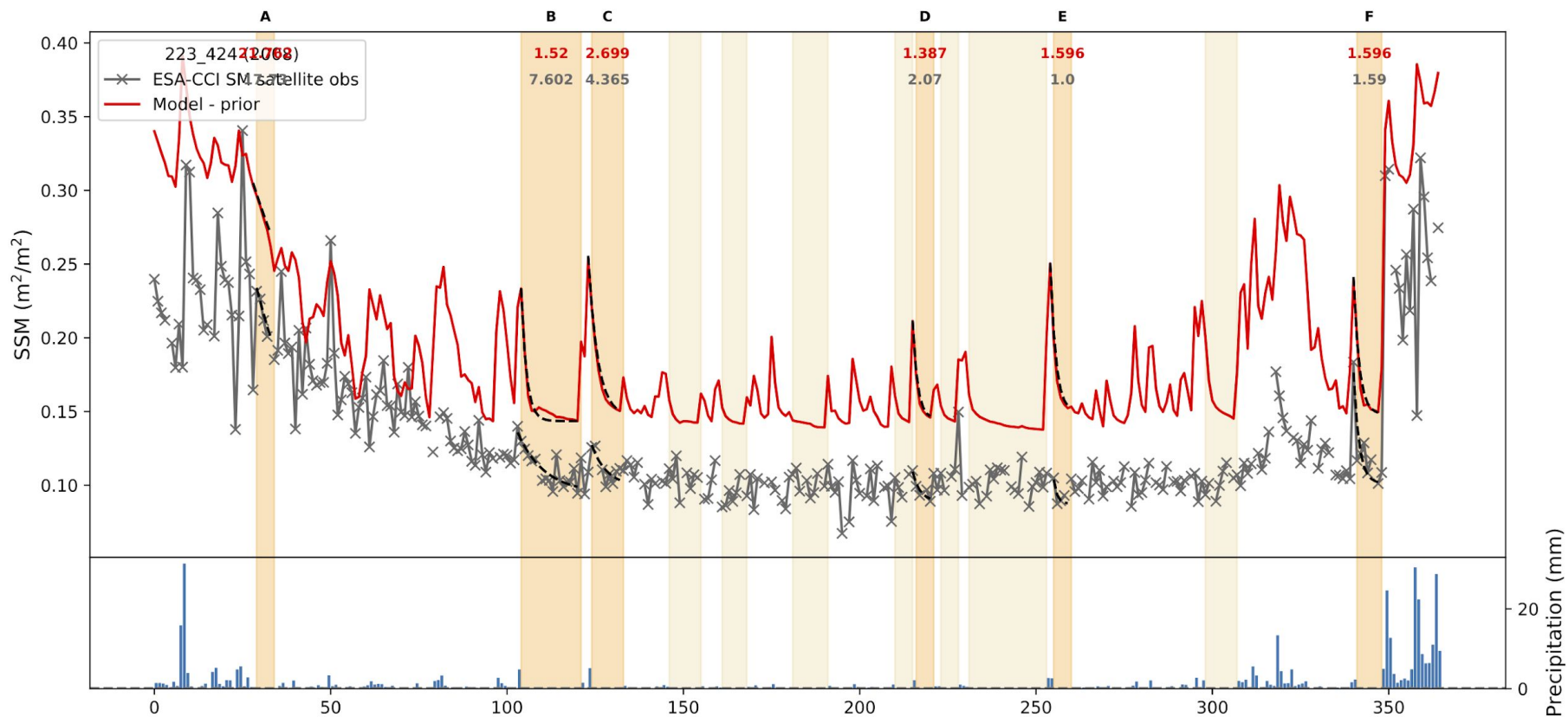
- ❖ Use satellite data
 - Investigate global trends
 - Perform global calibration of soil moisture retrievals
- ❖ Simultaneous global calibration of soil moisture with other data streams
 - NDVI or SIF
 - Land surface temperature

The ESA-CCI SM product



- ❖ Product merges number of different sensors
- ❖ Strong correlations between ESA-CCI SM & ORCHIDEE SM output (driven with ECWMF's CERASAT data)

First results with ESA-CCI SM product



Global trends with the ESA-CCI product

