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GLOBAL CHANGE
RESEARCH INSTITUTE CAS

Impact of drought and forest clear-cut on ecosystem C and energy exchange

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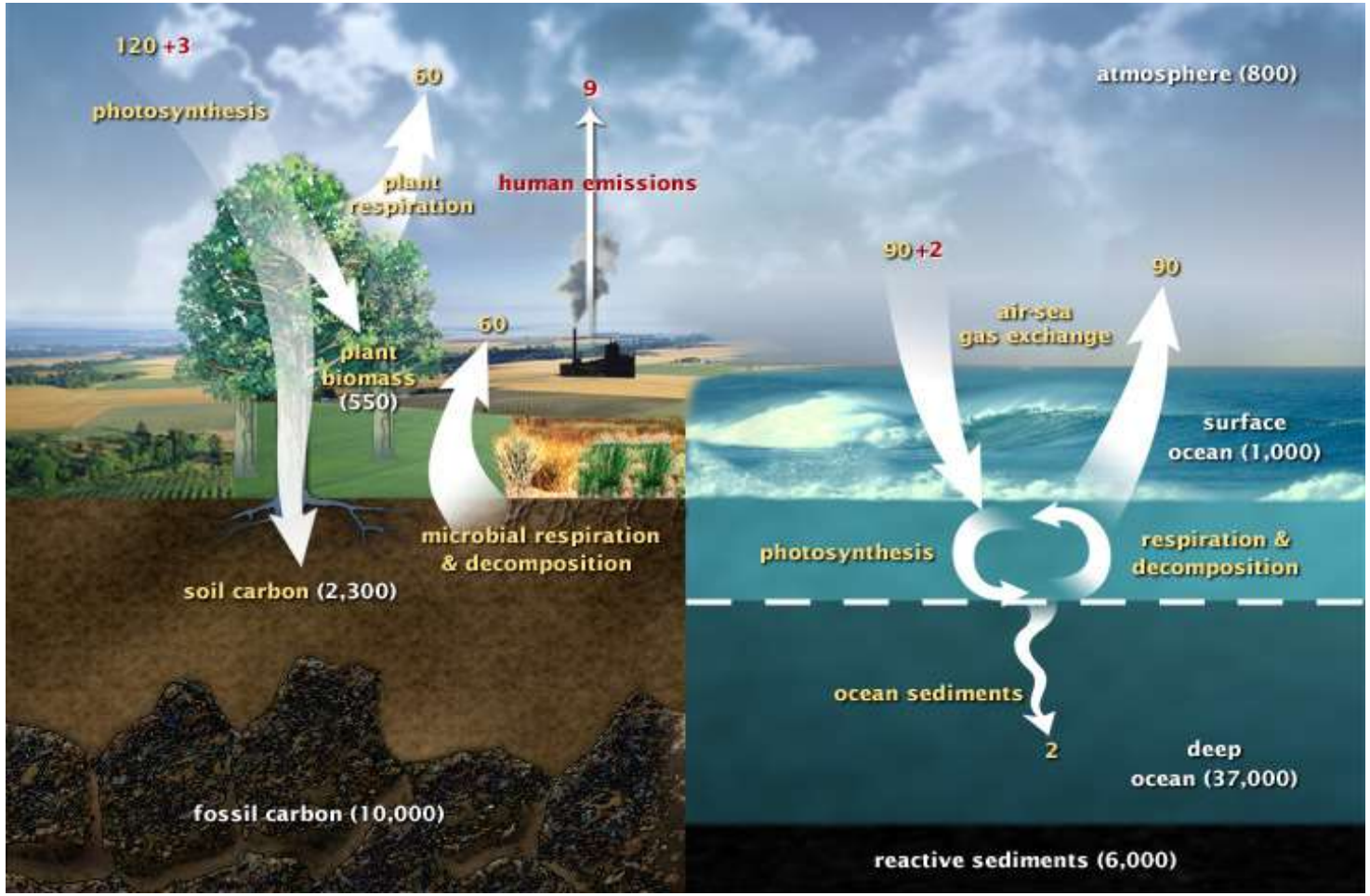
Main research pillars

Global C cycle

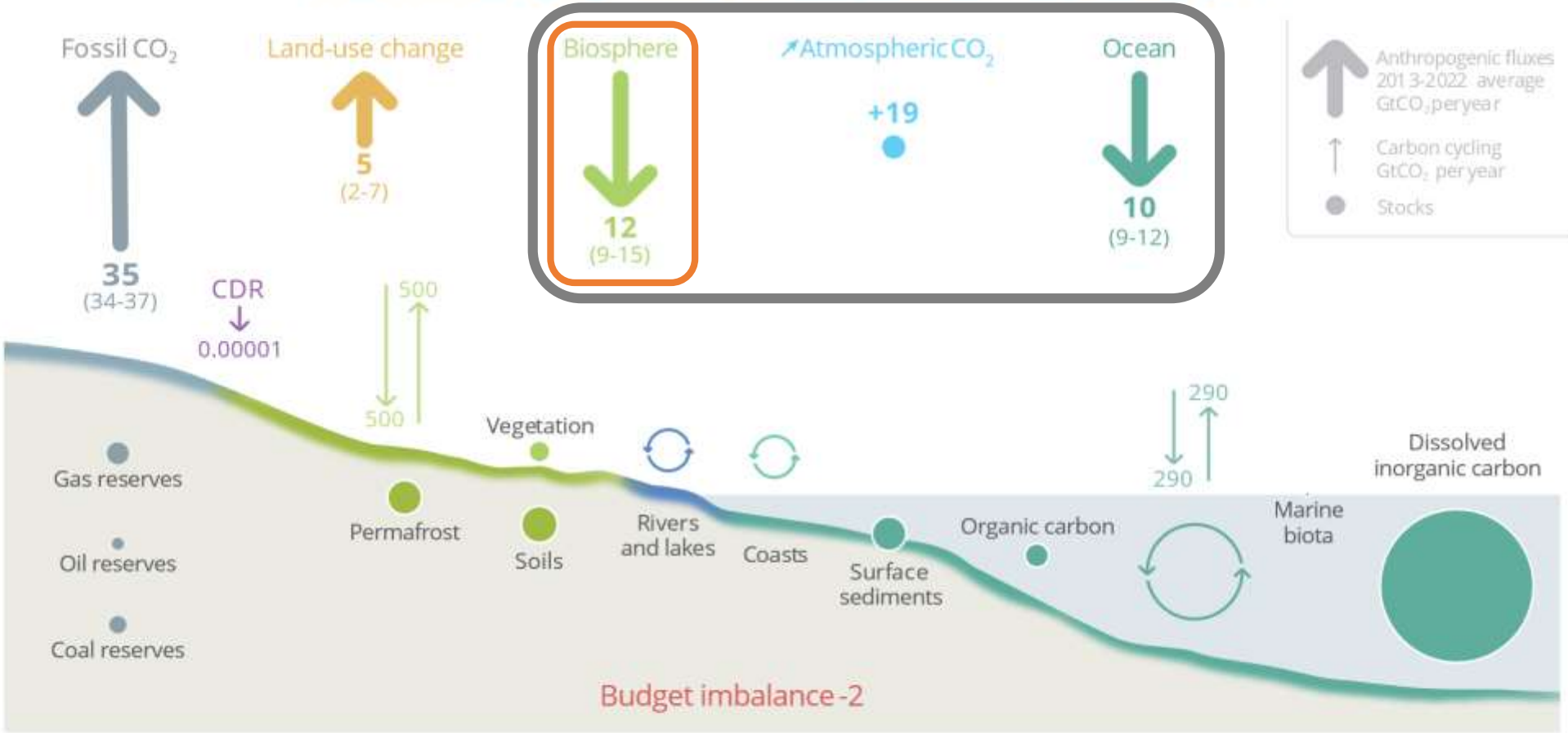


Values for y. 2011

- units: Pg = 10^{15} g C
- yellow – natural fluxes
- red – human contribution
- white – stored carbon (pools)

Anthropogenic perturbation of the global carbon cycle

Perturbation of the global carbon cycle caused by anthropogenic activities, global annual average for the decade 2013–2022 ($GtCO_2$/yr)



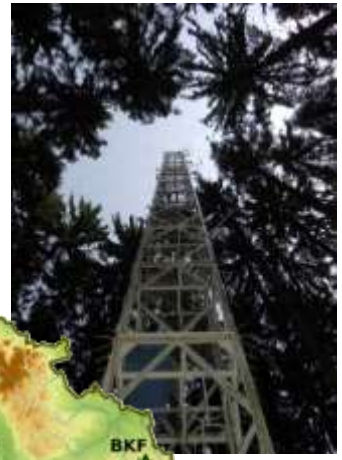
CDR here refers to Carbon Dioxide Removal besides those associated with land-use that are accounted for in the Land-use change estimate.
The budget imbalance is the difference between the estimated emissions and sinks.
Source: NOAA-GML; Friedlingstein et al 2023; Canadell et al 2021 (IPCC AR6 WG1 Chapter 5); Global Carbon Project 2023

National network of CO_2 fluxes observations

ICOS Integrated Carbon Observation System

Agroecosystems

Highland and montane spruce forests

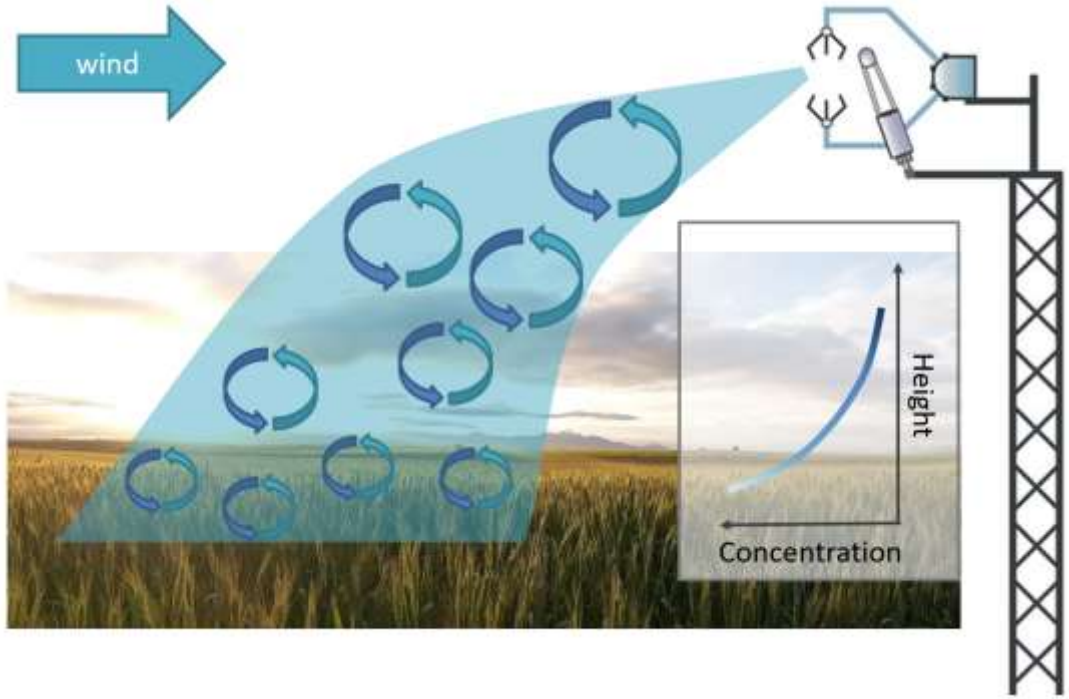


Beech montane forest

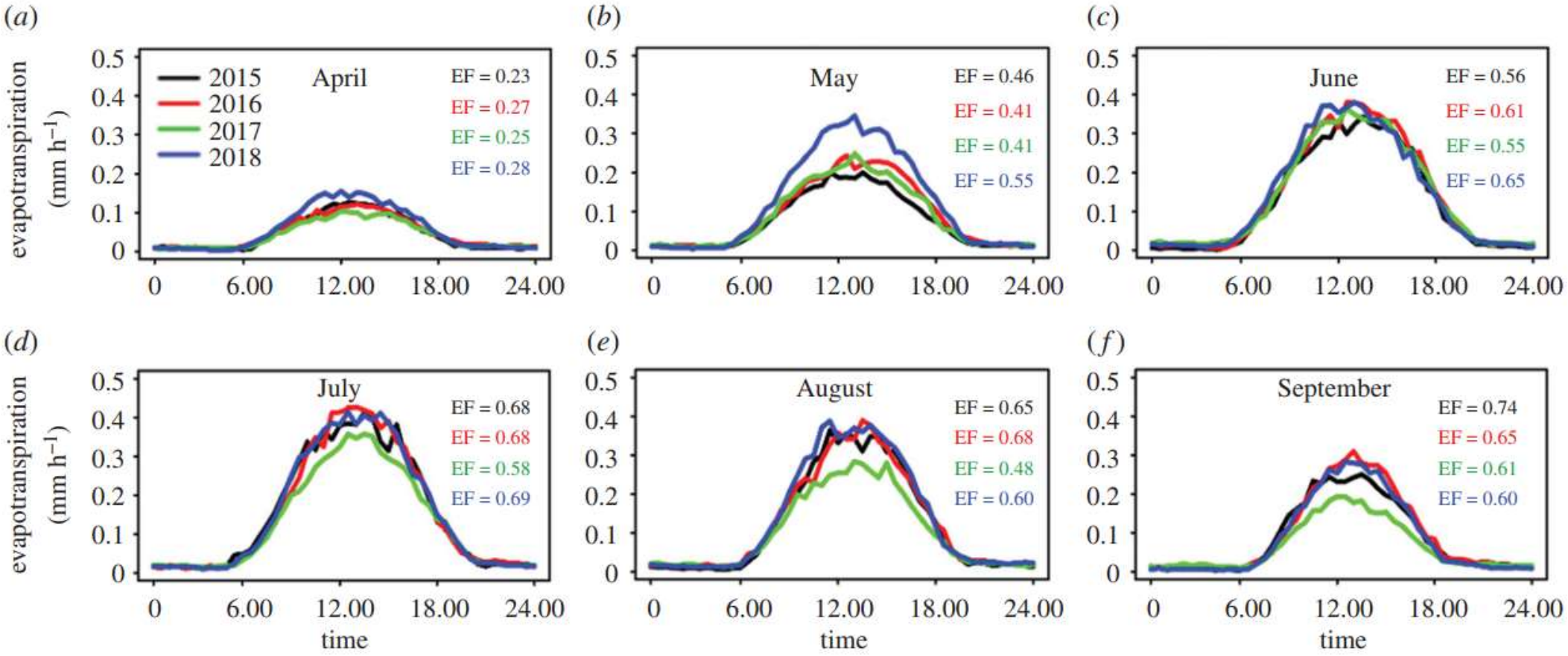
Wetland

Floodplain mixed deciduous forest and meadow

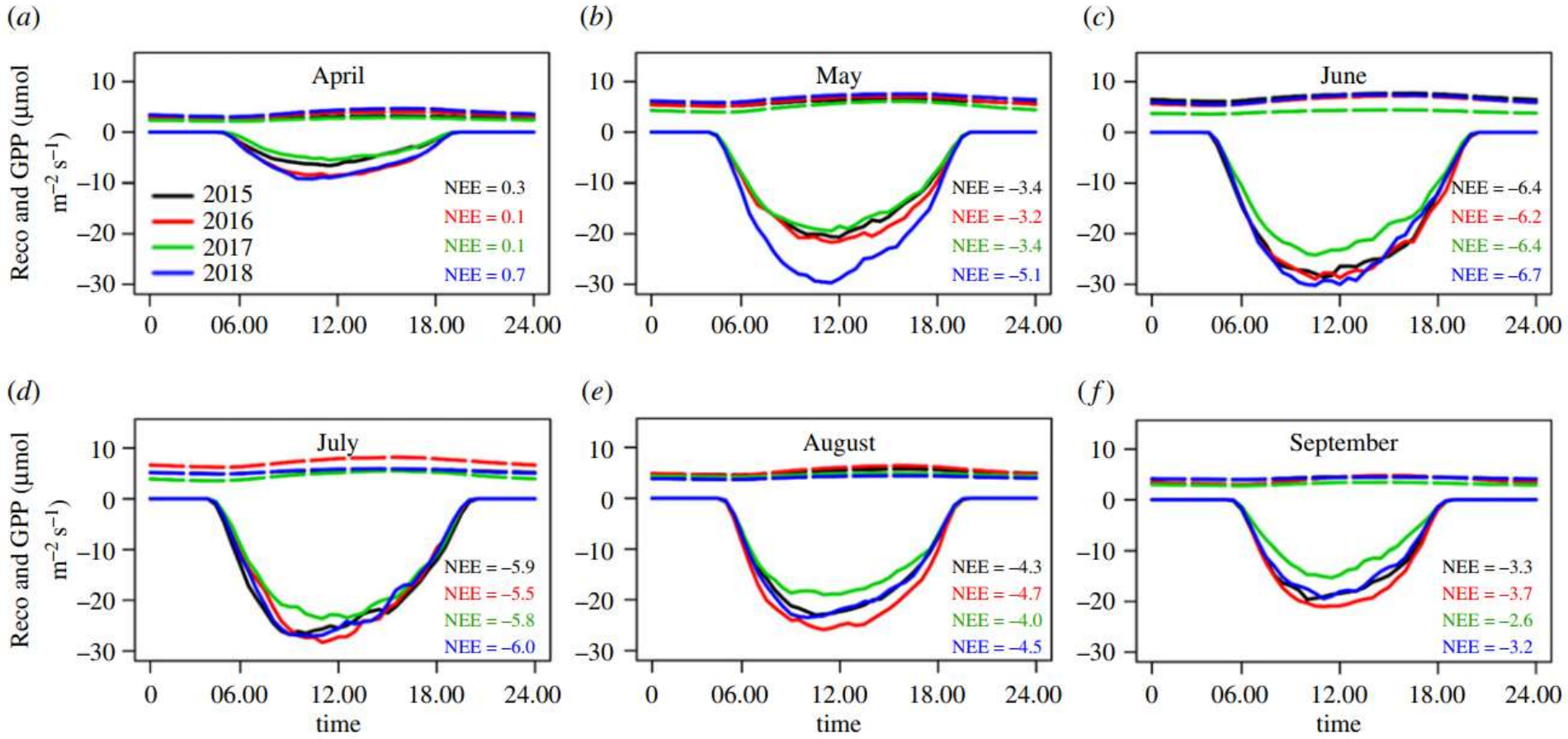
Methods: eddy covariance and chambers



Floodplain forest sensitivity to drought



Floodplain forest sensitivity to drought

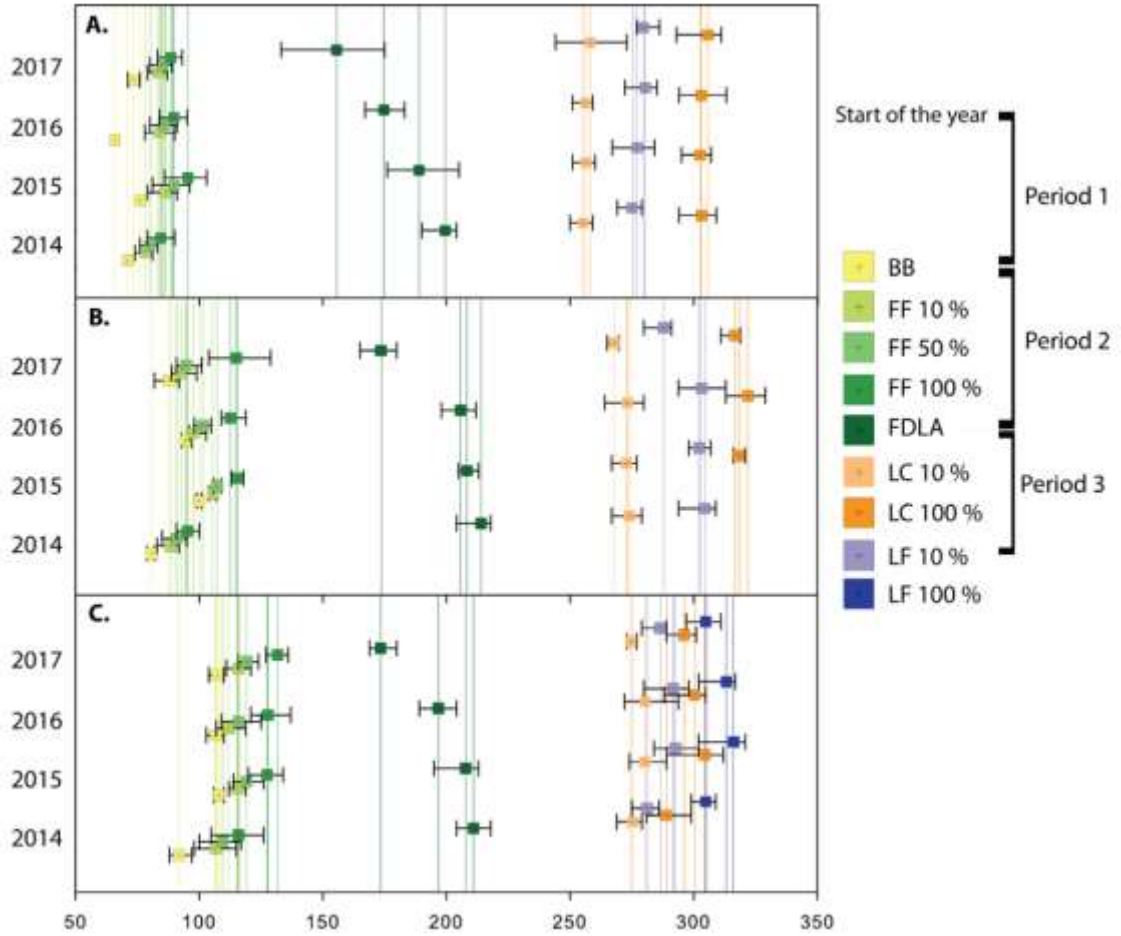


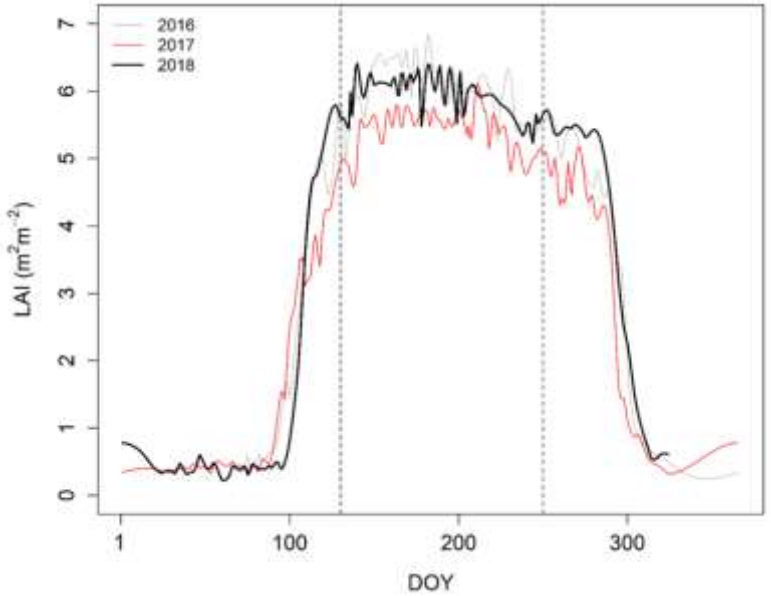
Spring frost in 2017 leading to reduced production

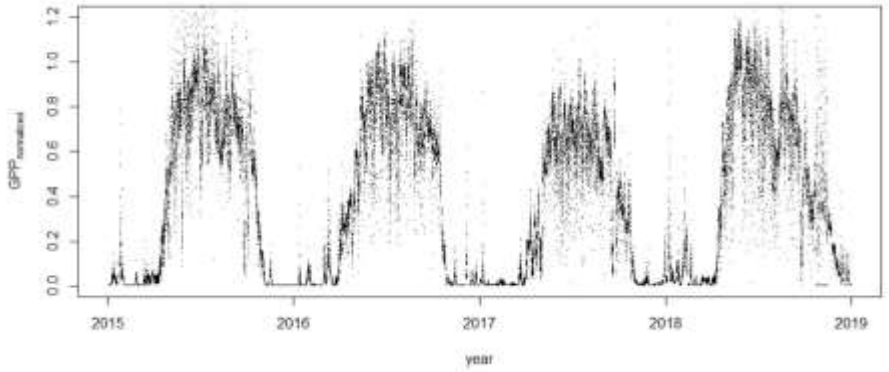
hornbeam

oak

ash

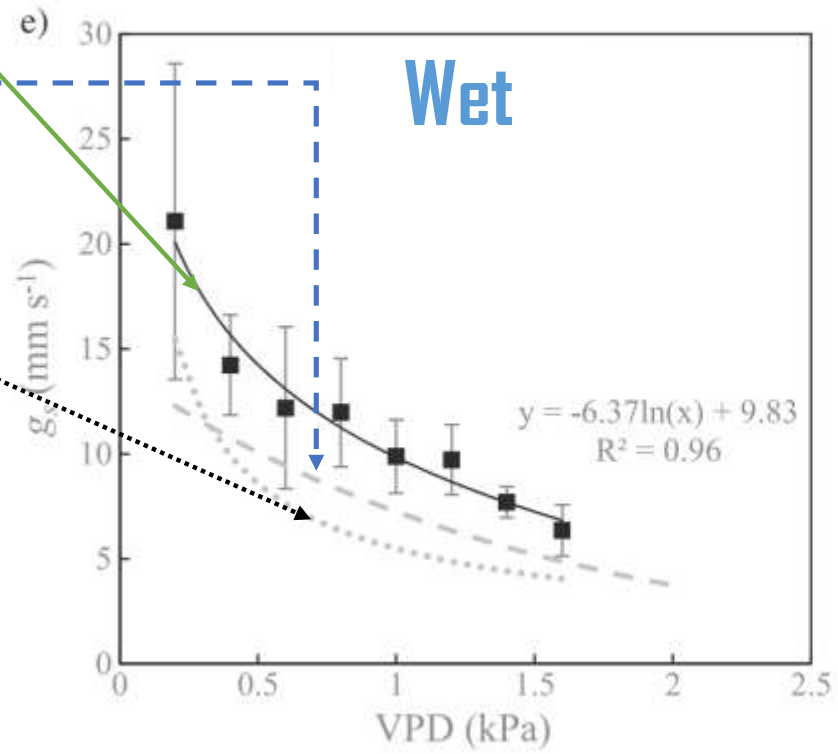


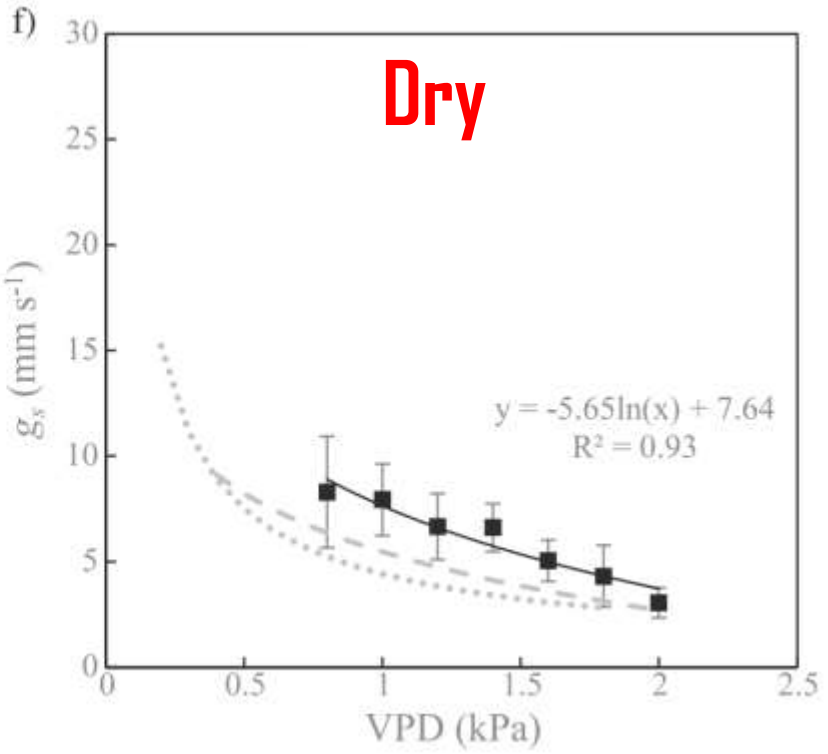




Stomatal conductance during drought

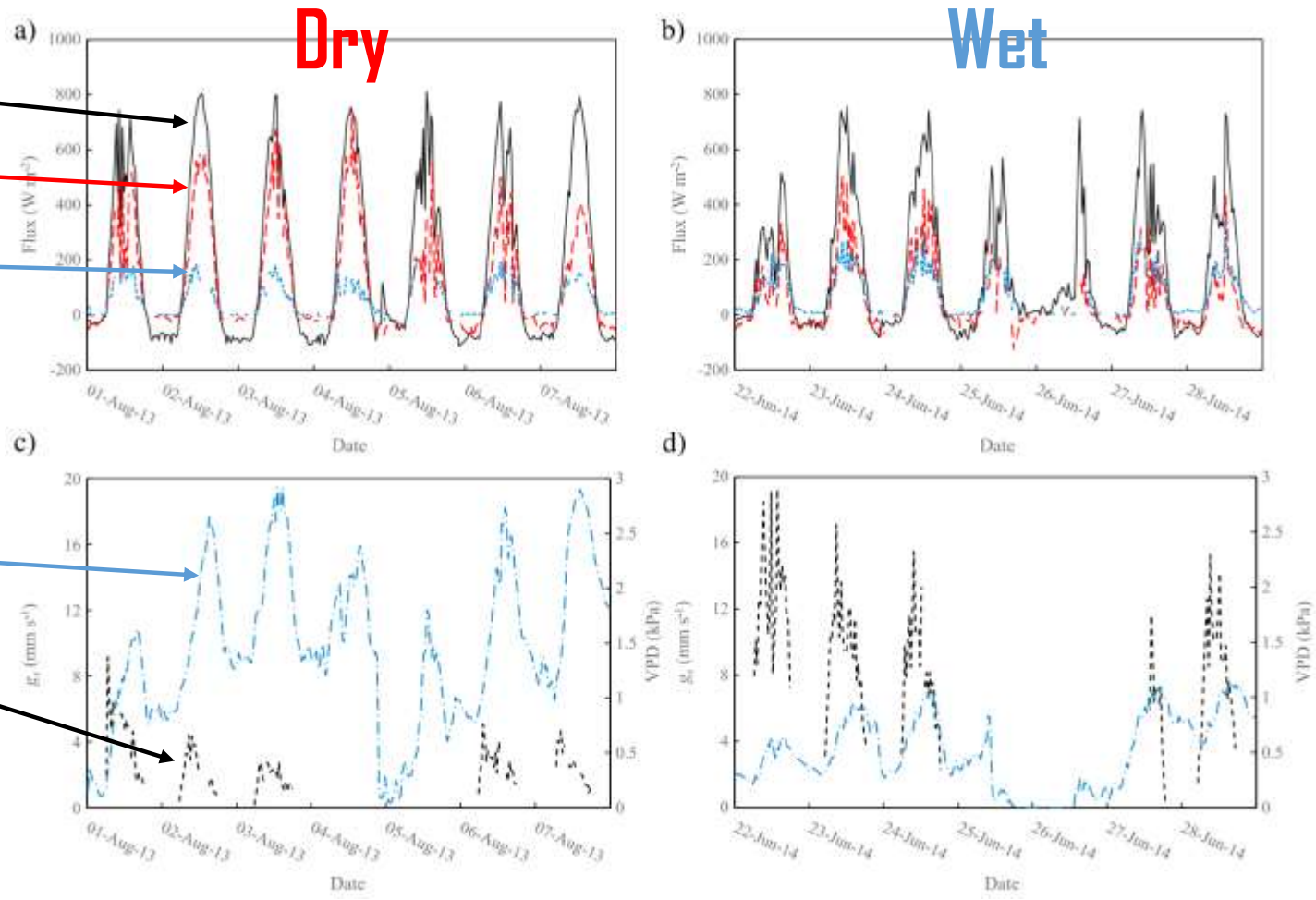
- European beech
- Norway spruce (moist climate)
- Norway spruce (dry climate)





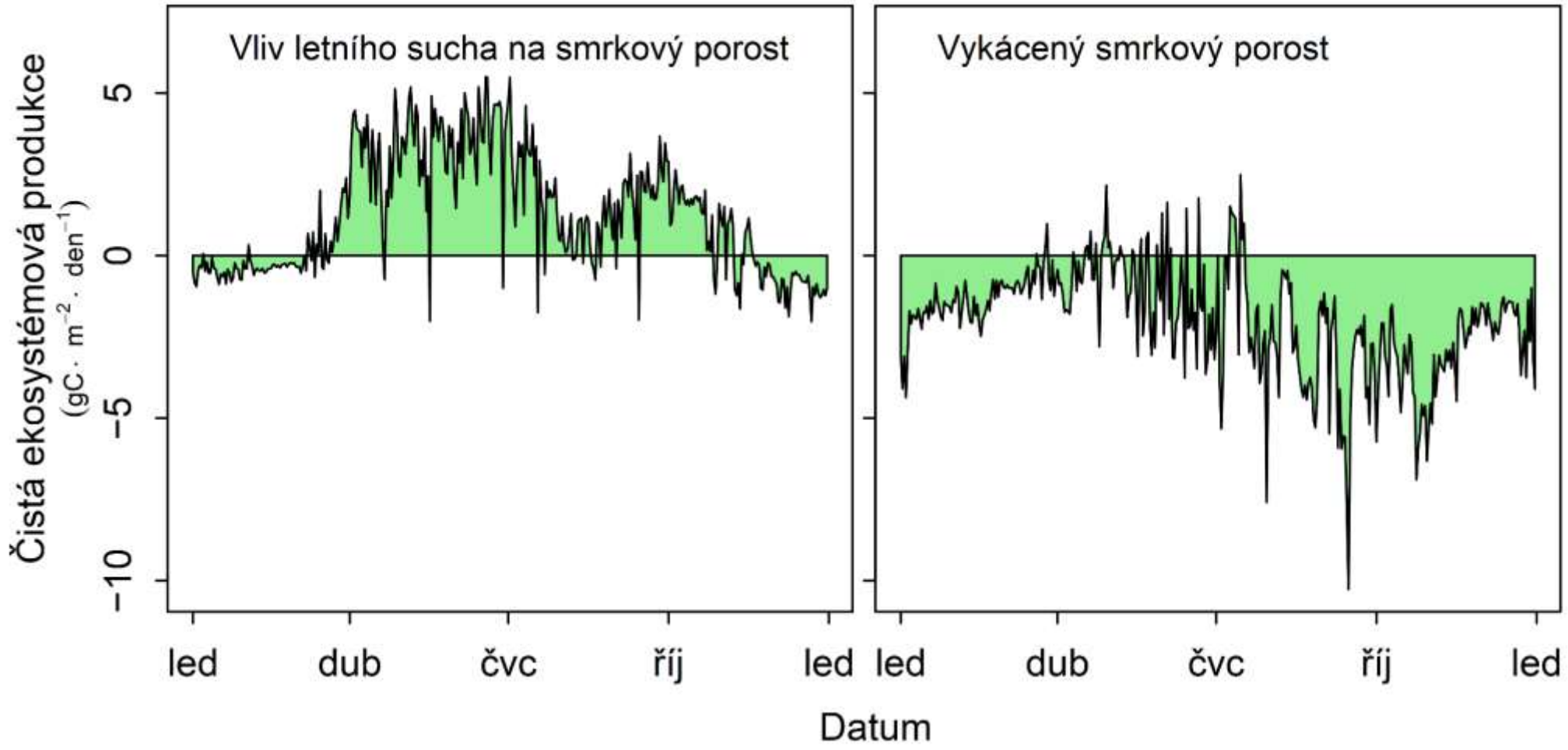
Dry vs wet conditions – Norway spruce canopy

- Available energy
- Sensible heat
- Latent heat
- Vapor pressure deficit
- Stomatal conductance

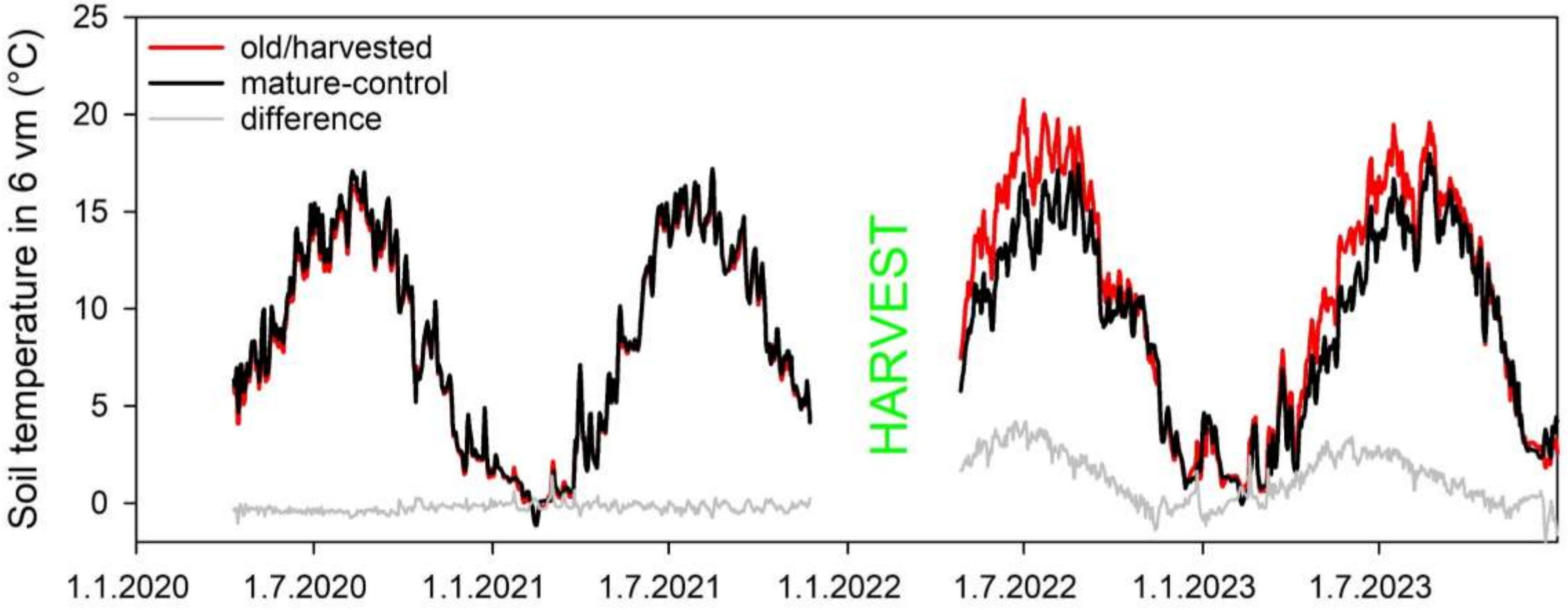


Norway spruce forest (Rajec) – clear-cut

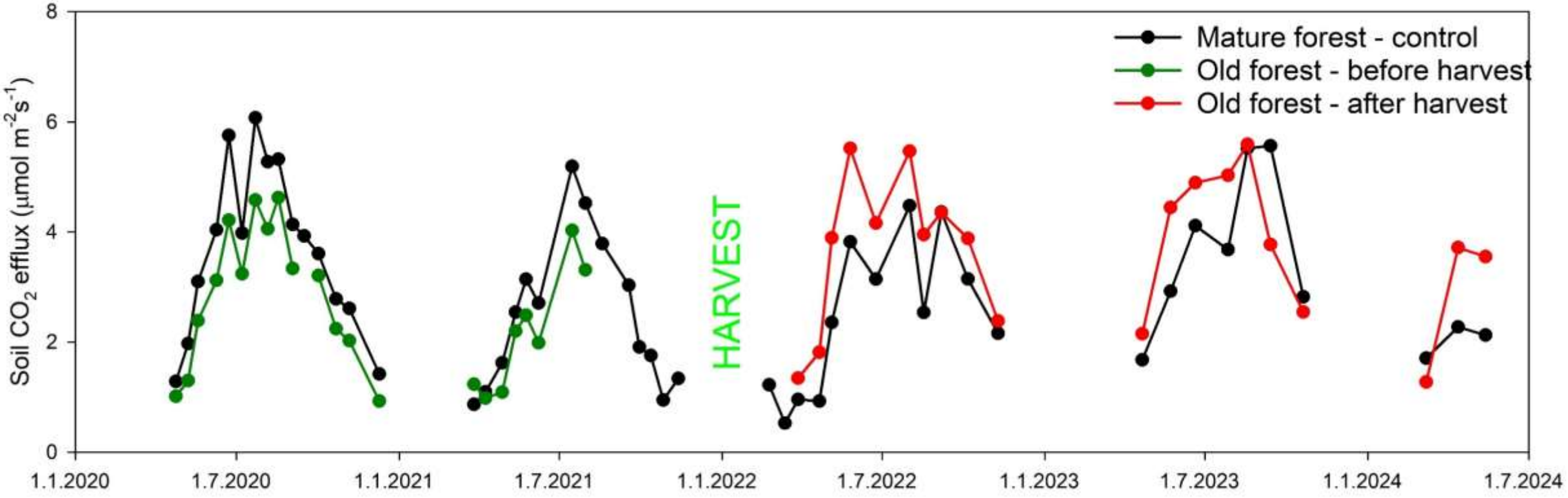
Rajec – clear-cut: production



Rajec – clear-cut: soil temperature

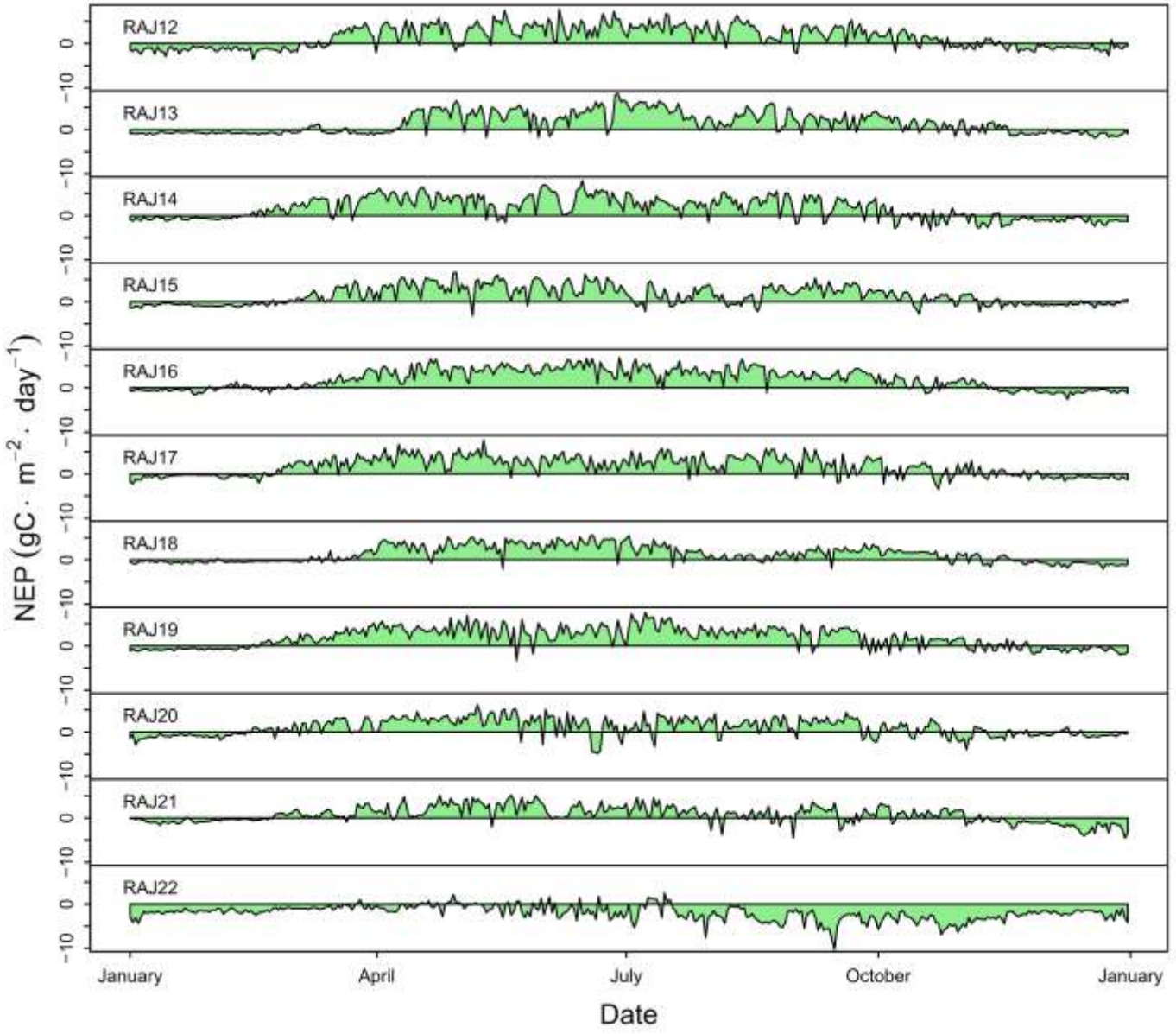


Rajec – clear-cut: soil CO_2 efflux



Summary

- Different responses to drought across sites and species
  - focus on beech vs spruce
- „Overheating“ of Norway spruce canopy during dry conditions
  - potential impacts on local climate (albedo effect)
- Possible compensation of summer drought by early spring
- Spring frost effect on the leaf development and yearly C uptake
- Detection of severe impacts of drough at spruce site with dry climate
- Clear-cut increases soil sun exposure, leading to large C losses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RAJ13
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NEP (gC · m⁻² · day⁻¹)
0
−10
January
April
July
October
January
Date