

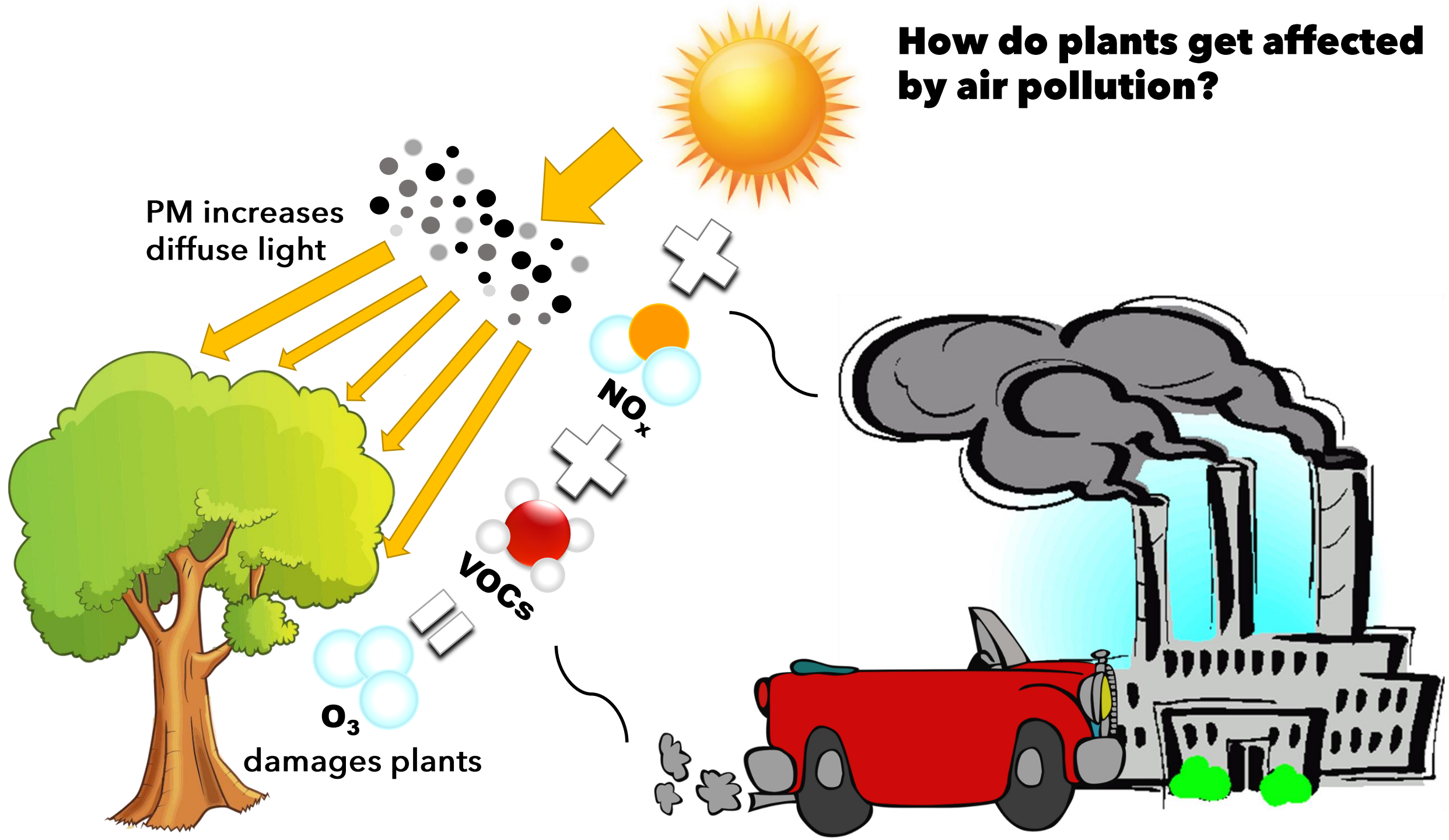
Enhanced terrestrial photosynthesis in Europe during the COVID-19 lockdown

Angela Che Ing Tang, Denis Loustau,
Christophe Flechard et al.

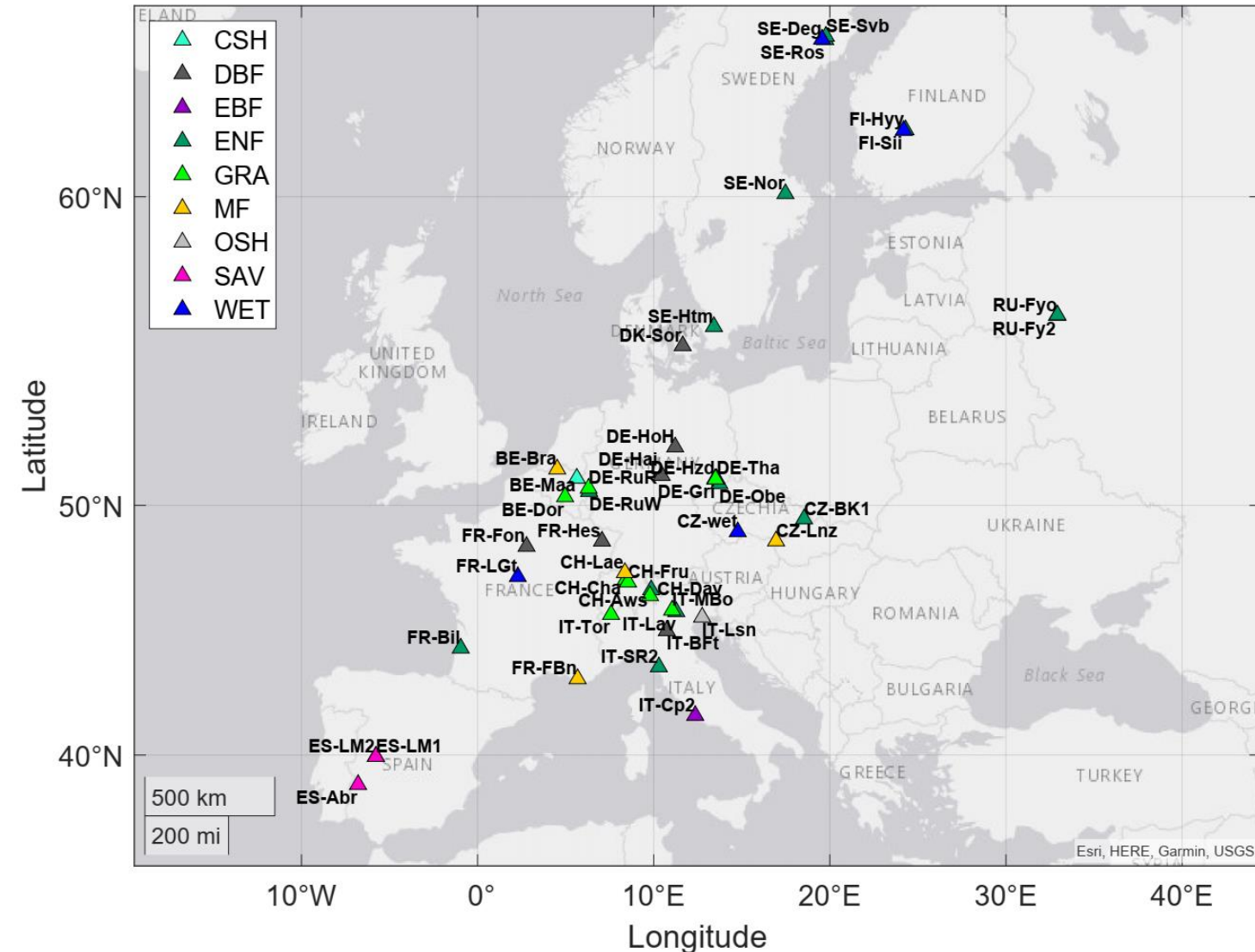
*Institut national de recherche pour l'agriculture,
l'alimentation et l'environnement (INRAE), France*



How do plants get affected by air pollution?



Study sites & datasets

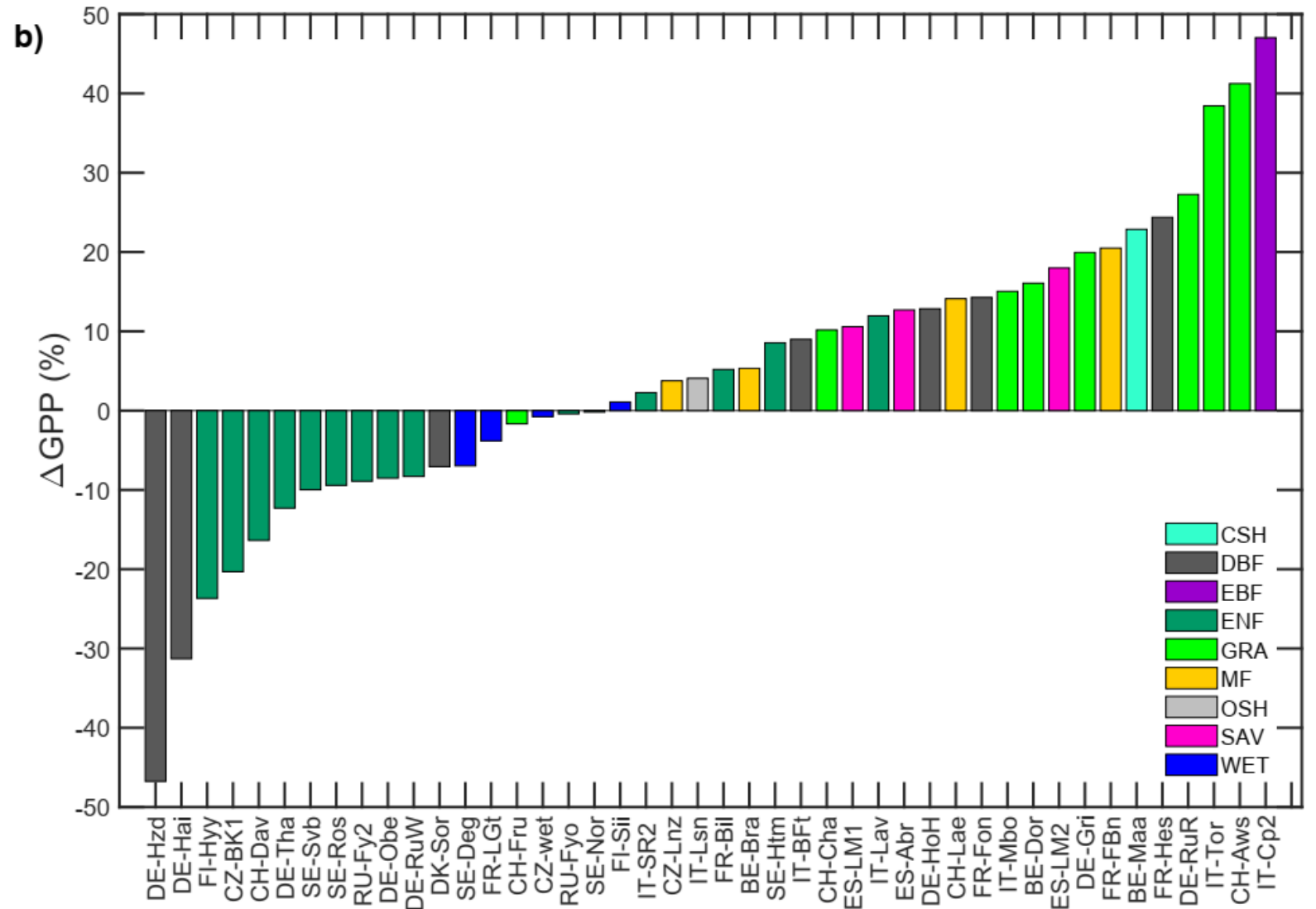
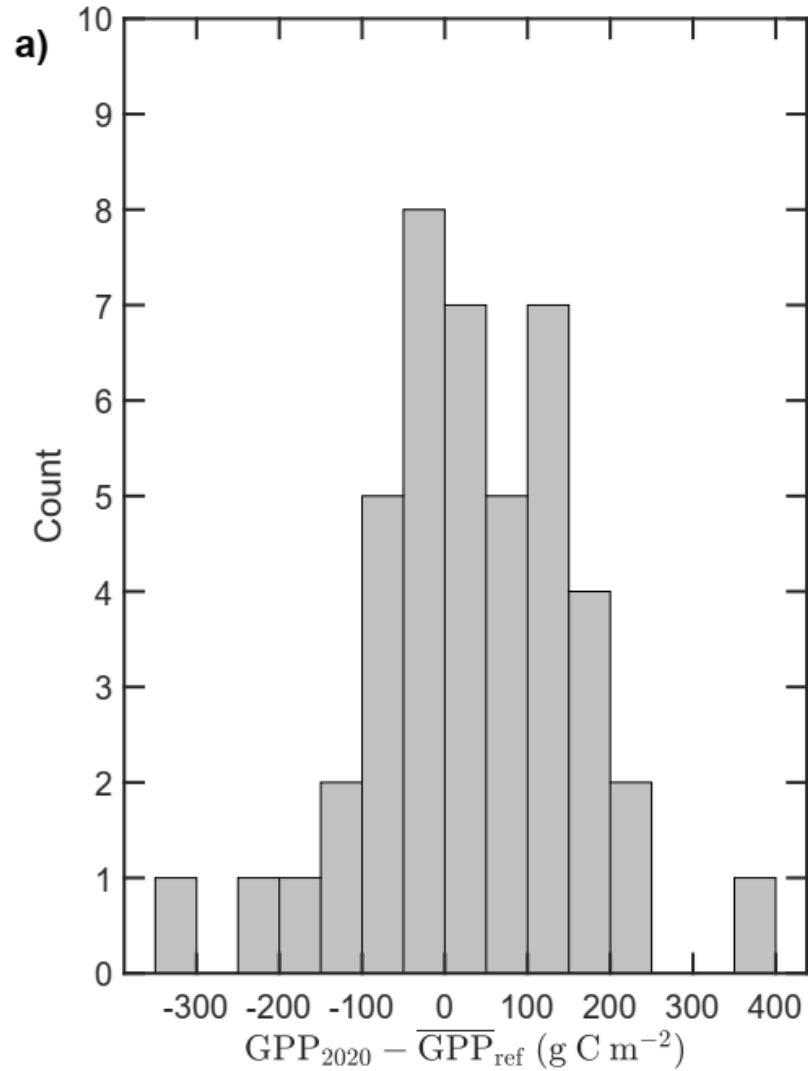


Fluxes and meteorological data:
ICOS Carbon Portal from
<https://doi.org/10.18160/2G60-ZHAK>

Air pollution data (LOTOS-EUROS):
Copernicus Atmosphere Monitoring
Service
<https://atmosphere.copernicus.eu/>

CAMS radiation data:
<https://www.soda-pro.com/web-services/radiation/cams-radiation-service>

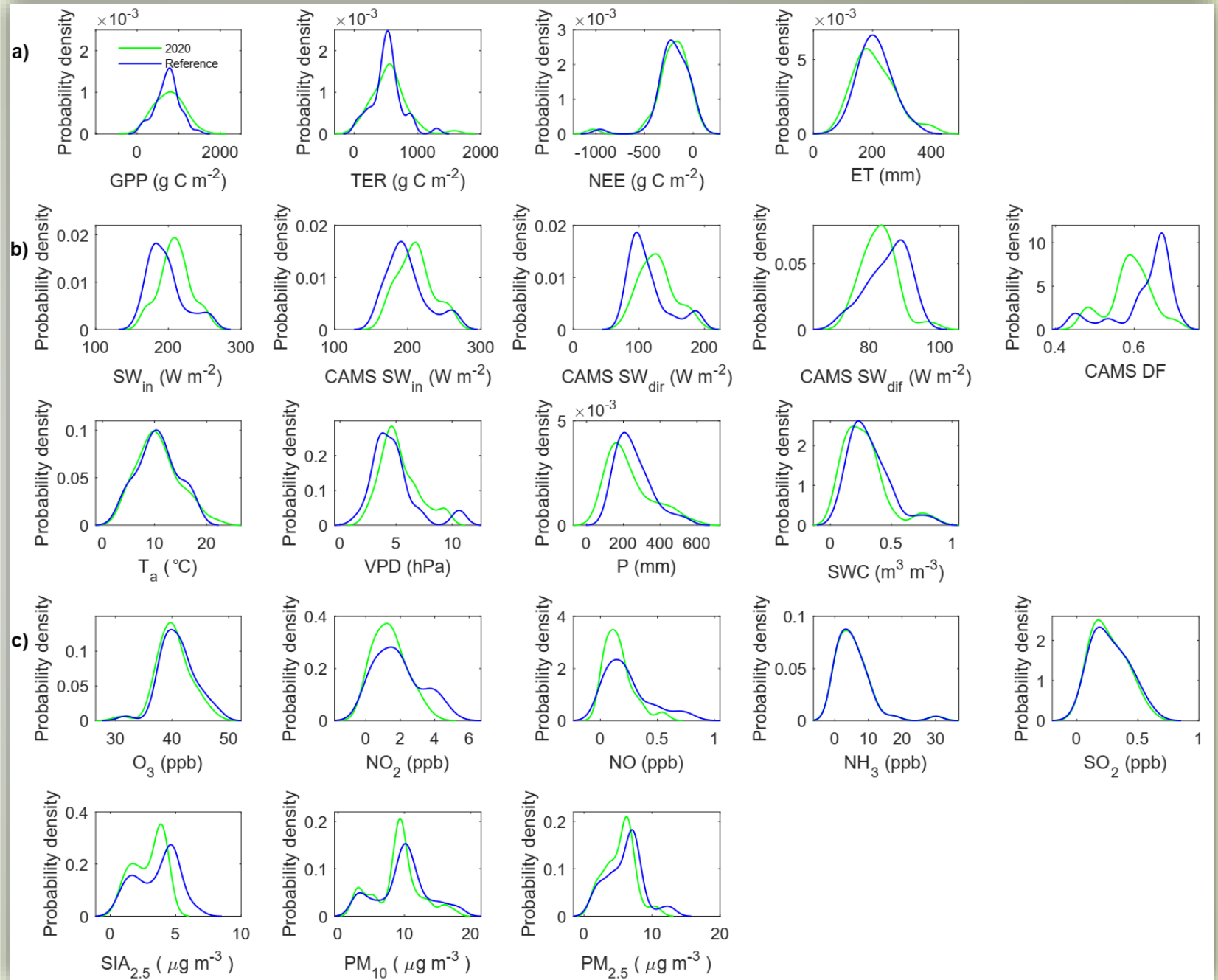
Gross primary productivity (GPP) anomalies



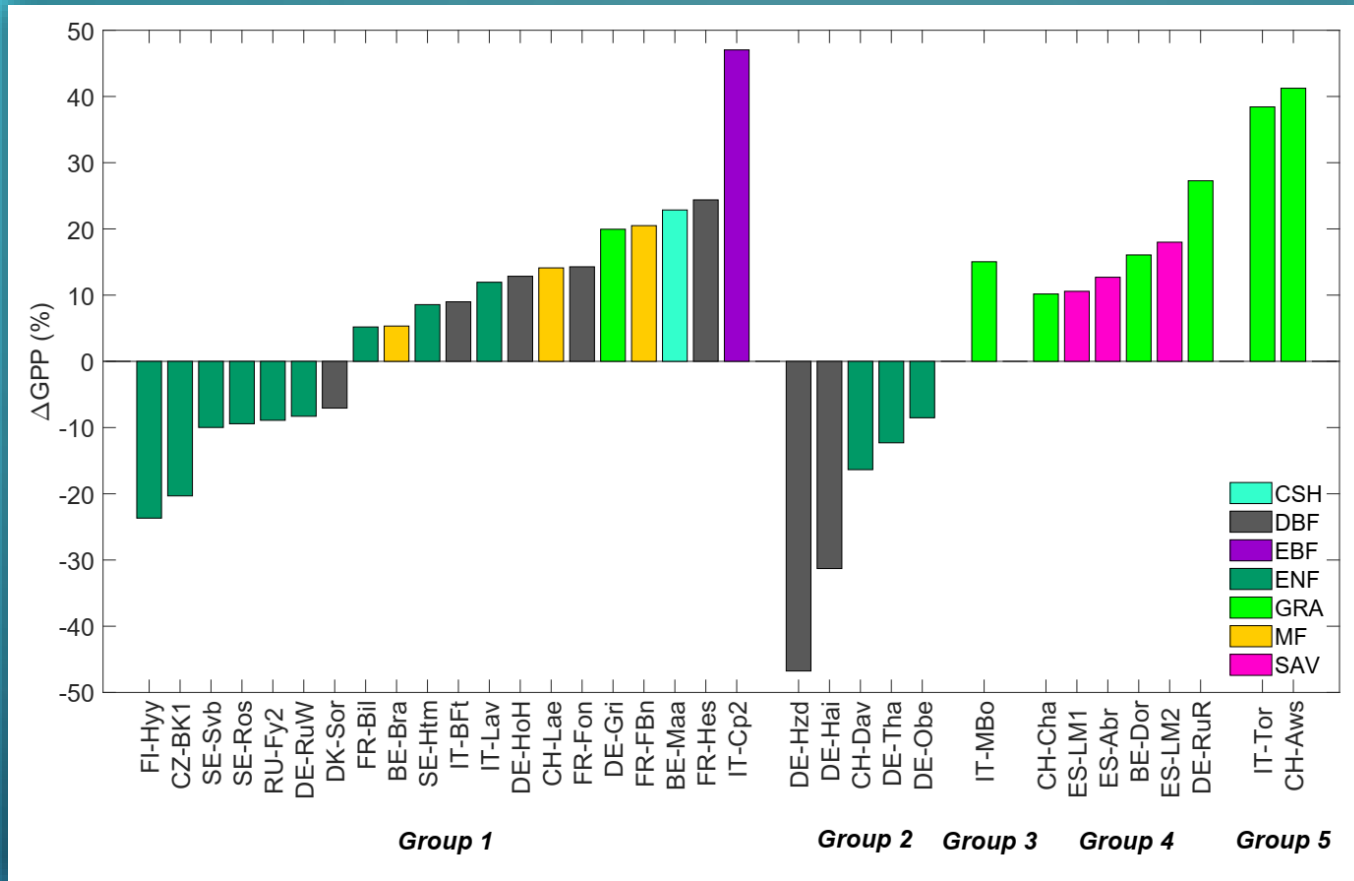
Fluxes

Meteorology

Air pollutants



Attributions of GPP anomalies



Group 1: Meteorology

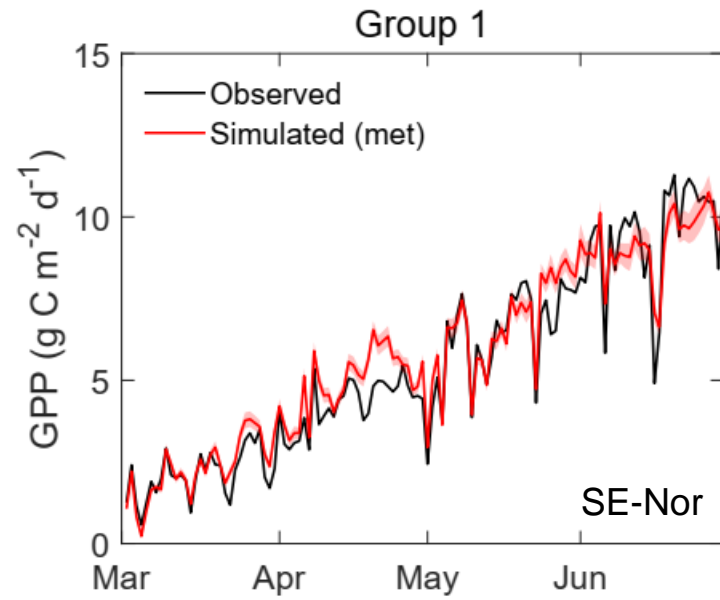
Group 2: Drought legacy effects

Group 3: Meteorology + pollutants

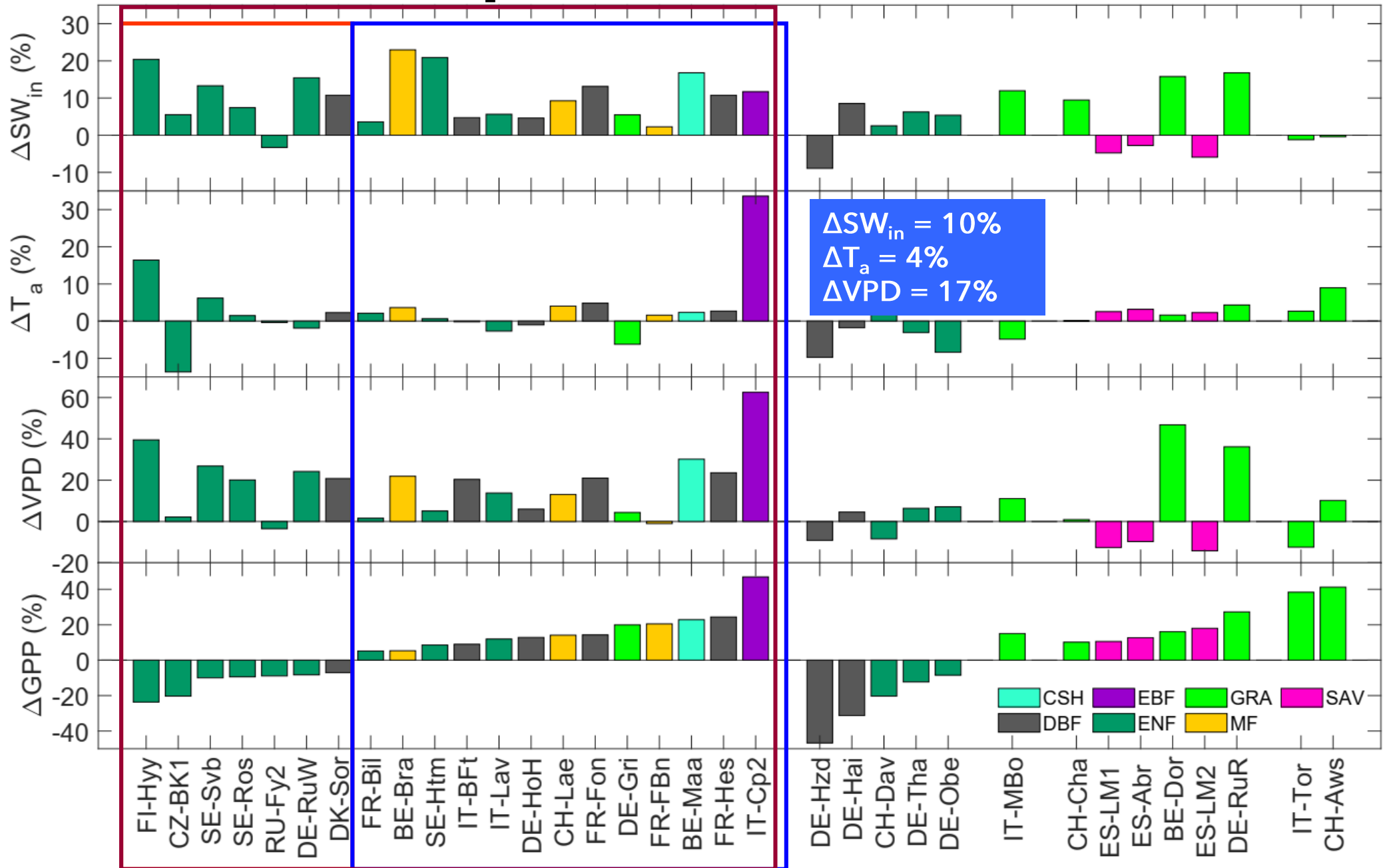
Group 4: Meteorology + management

Group 5: Meteorological + geographical factors

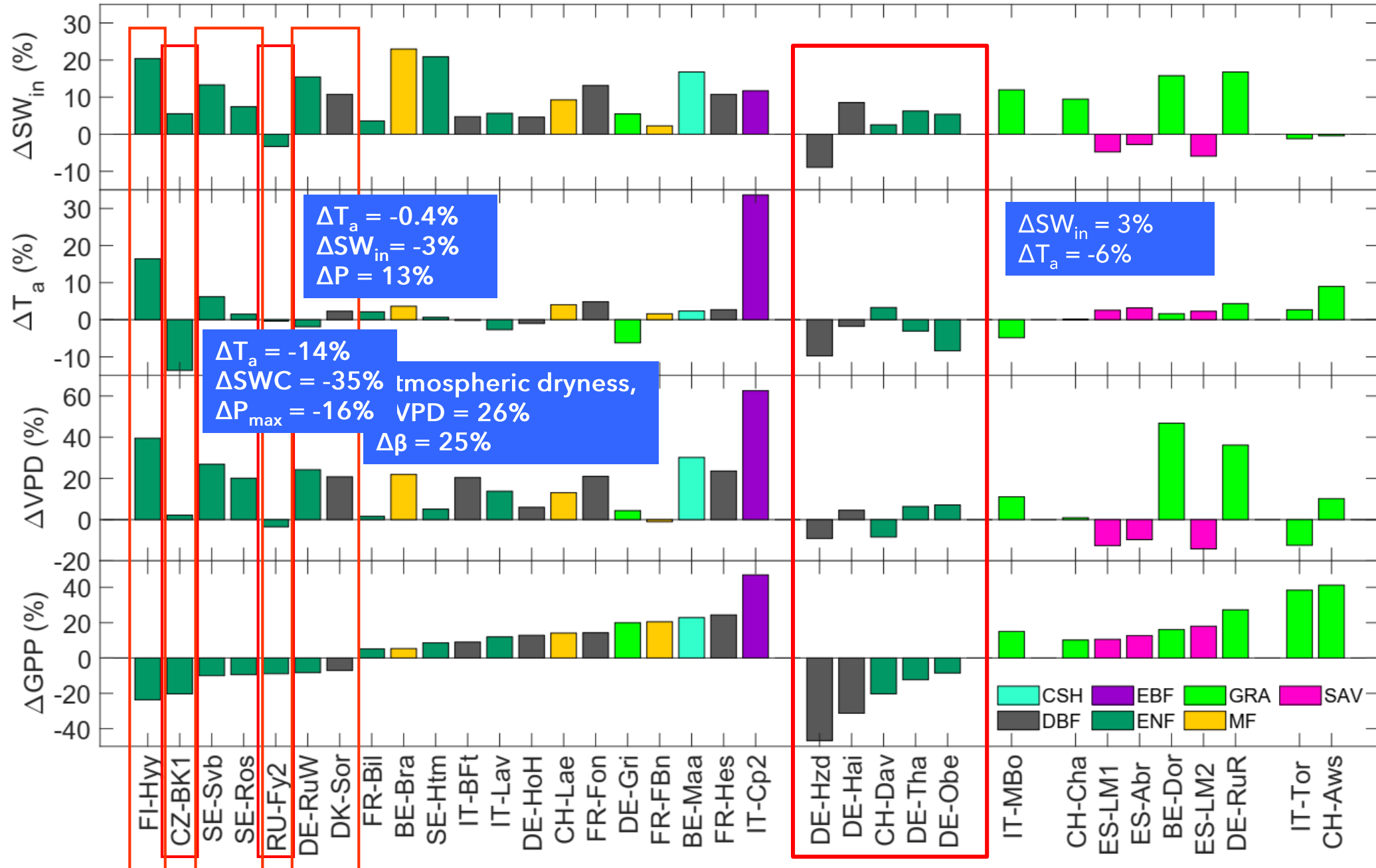
Multiple linear modelling & simulation for group classification



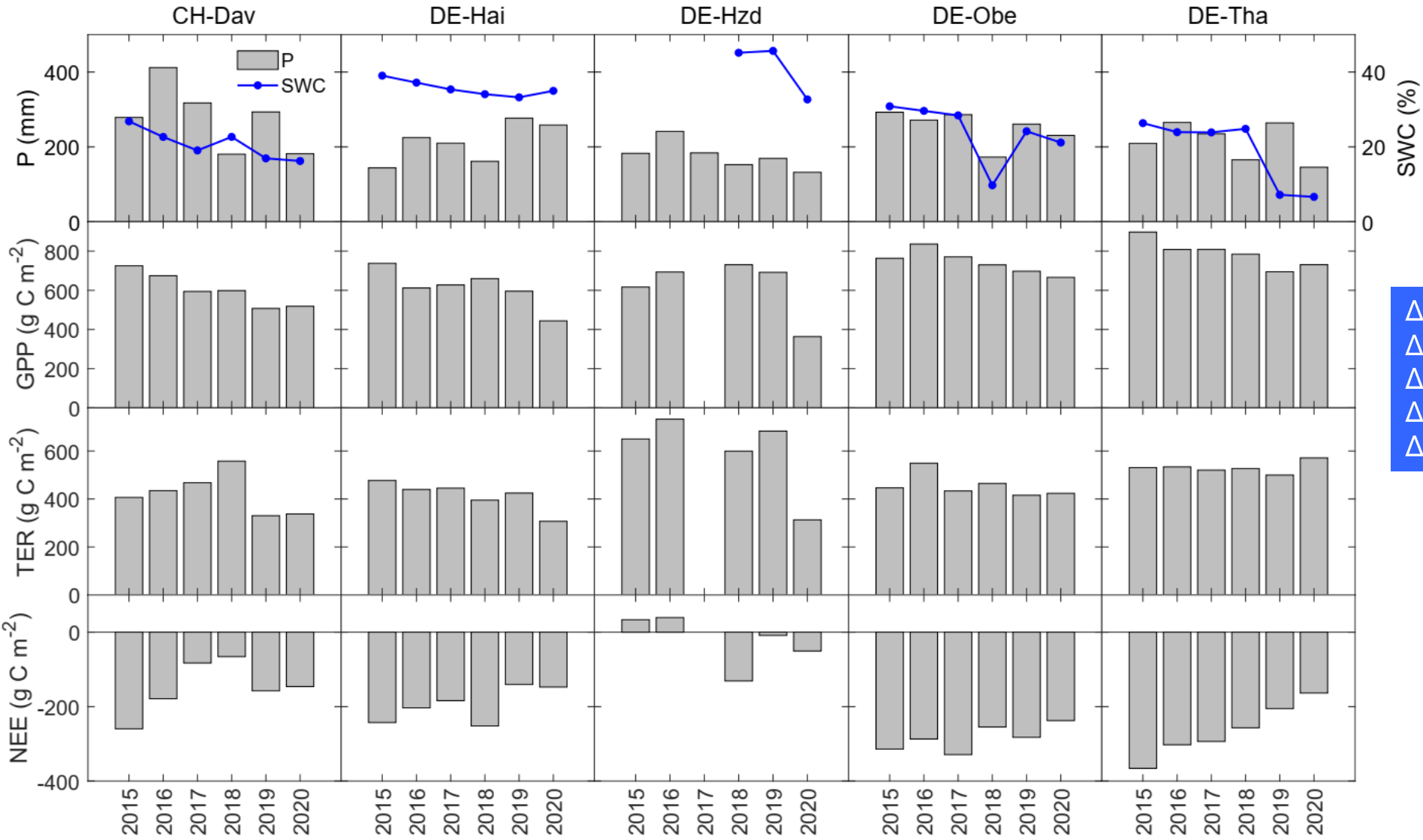
Group 1 (-ve ΔGPP)



Group 2

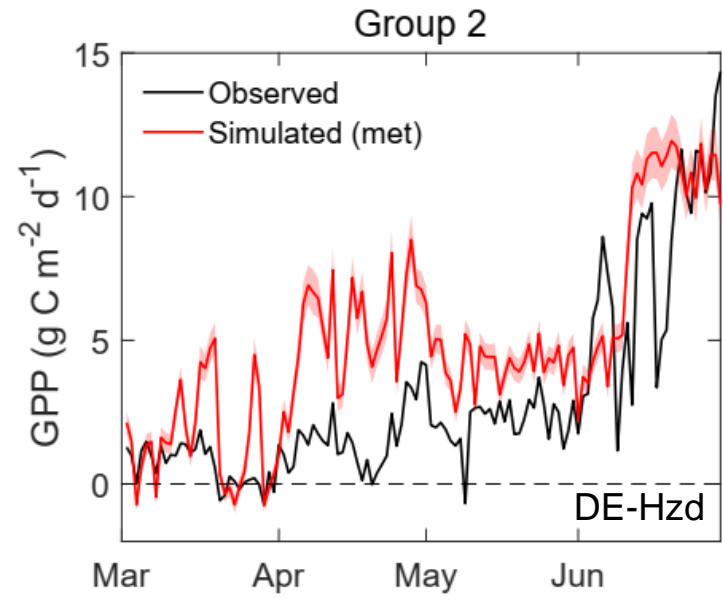
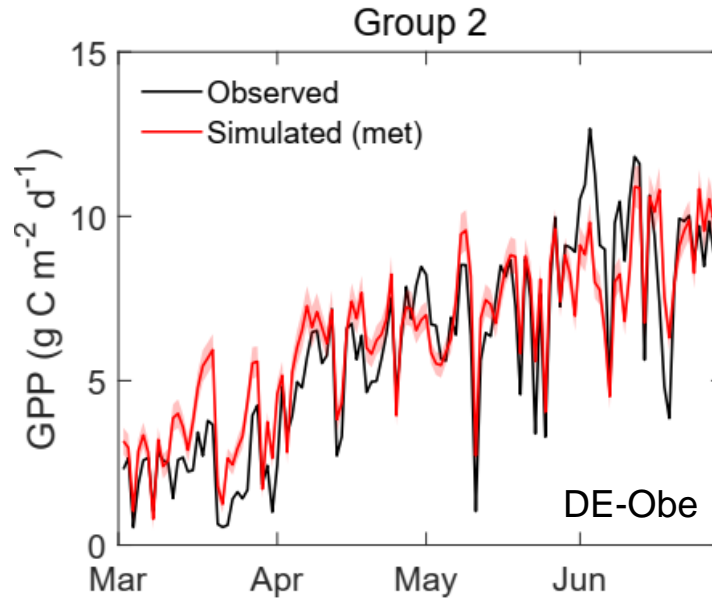
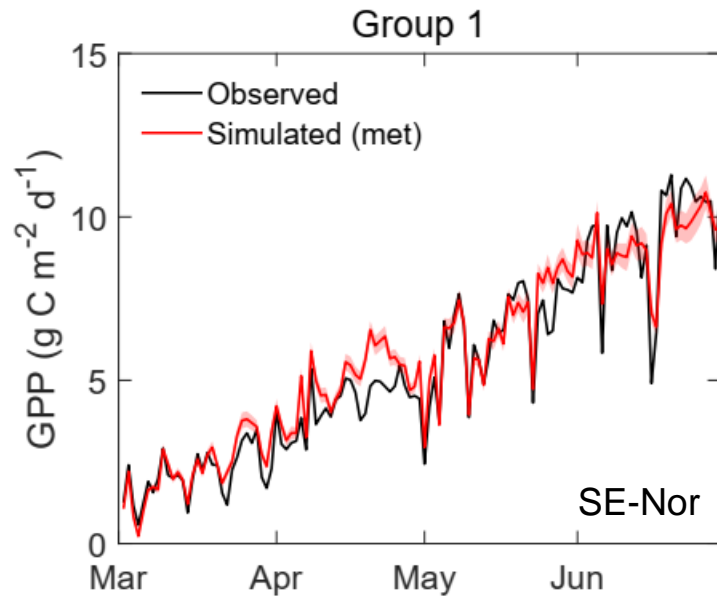


Drought legacy effects (Group 2)

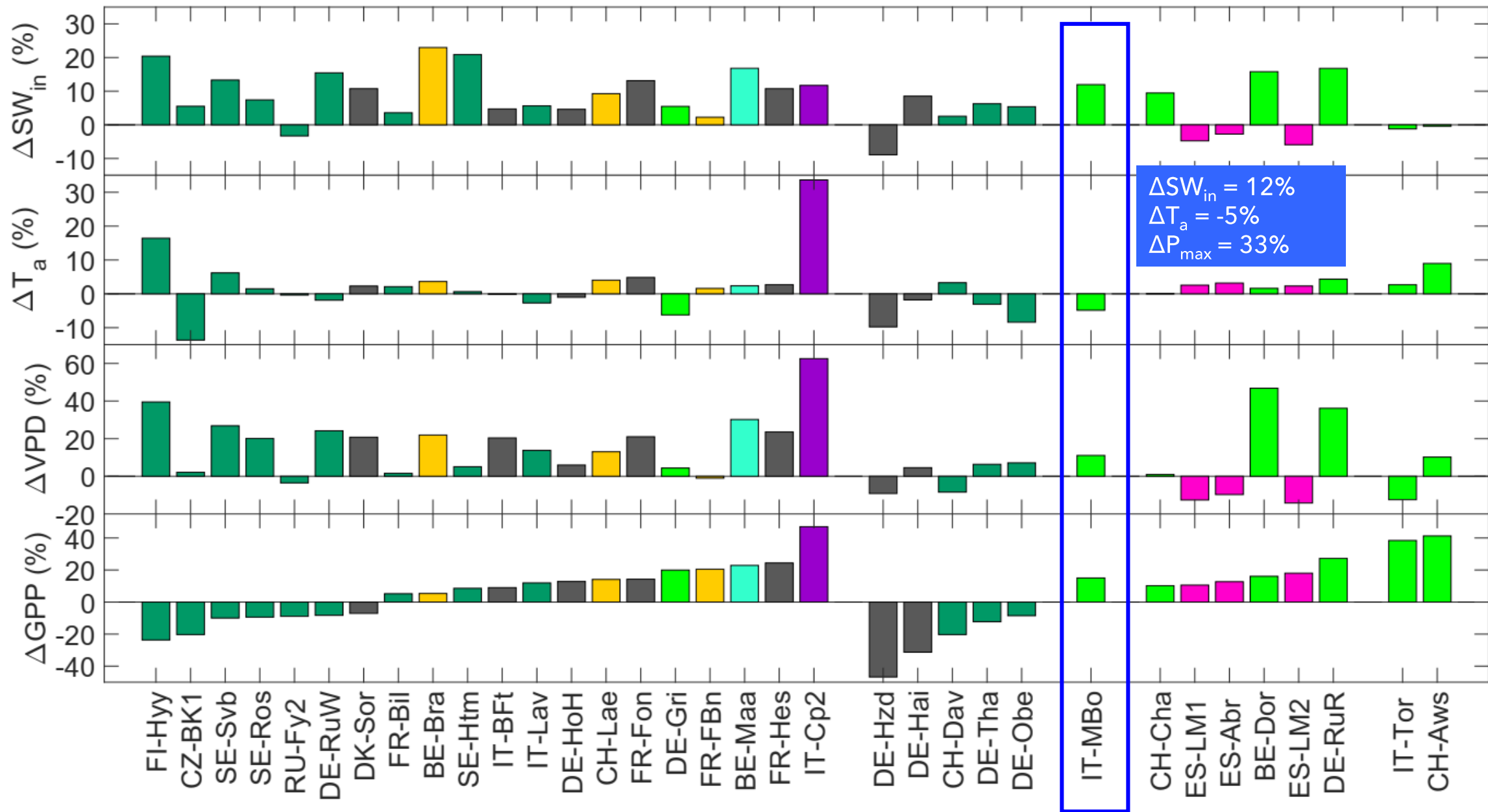


$\Delta\beta = 44\%$
 $\Delta\text{SWC} = -25\%$
 $\Delta\text{P} = -17\%$
 $\Delta\text{ET} = -23\%$
 $\Delta\text{P}_{\text{max}} = -27\%$

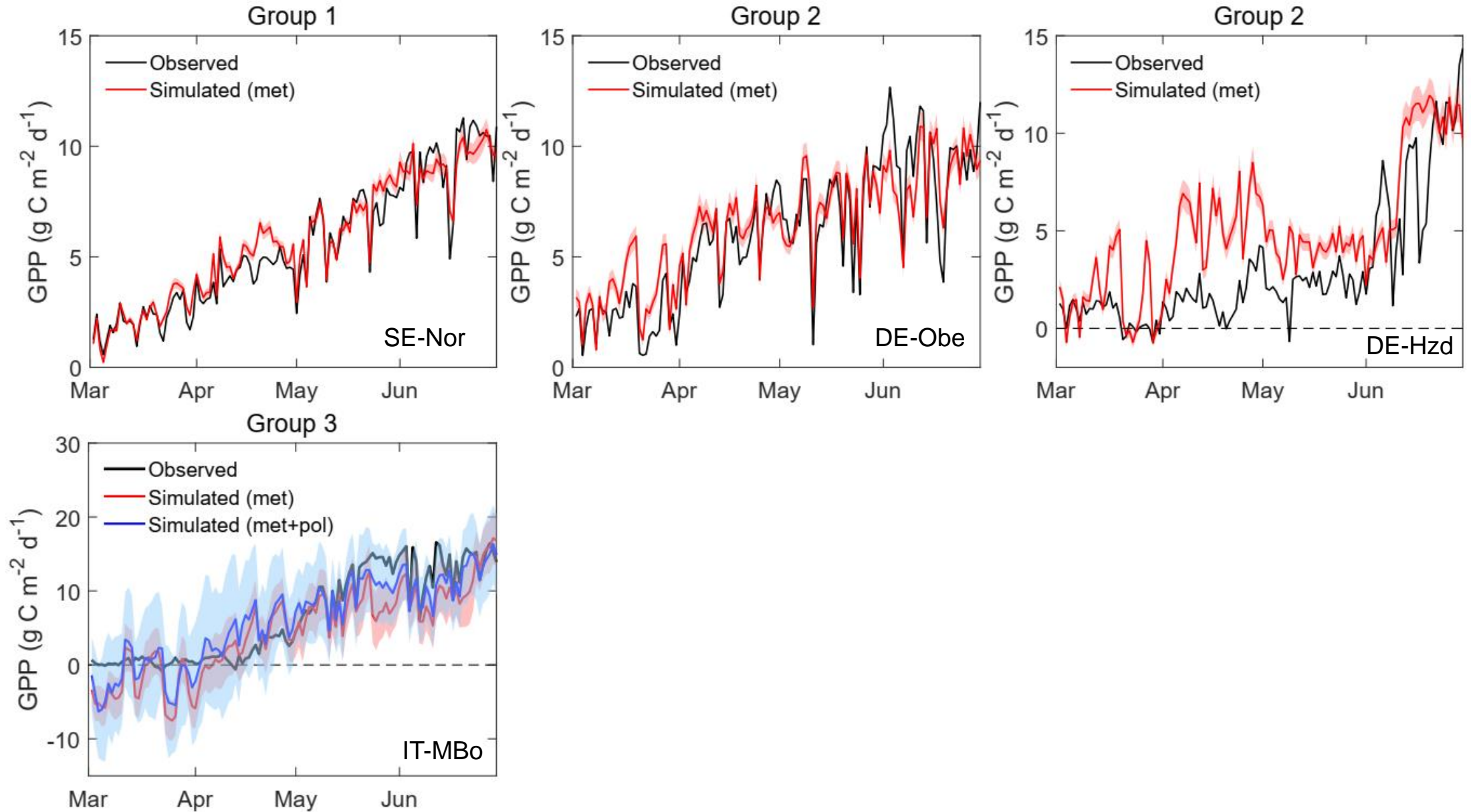
Multiple linear modelling & simulation for group classification



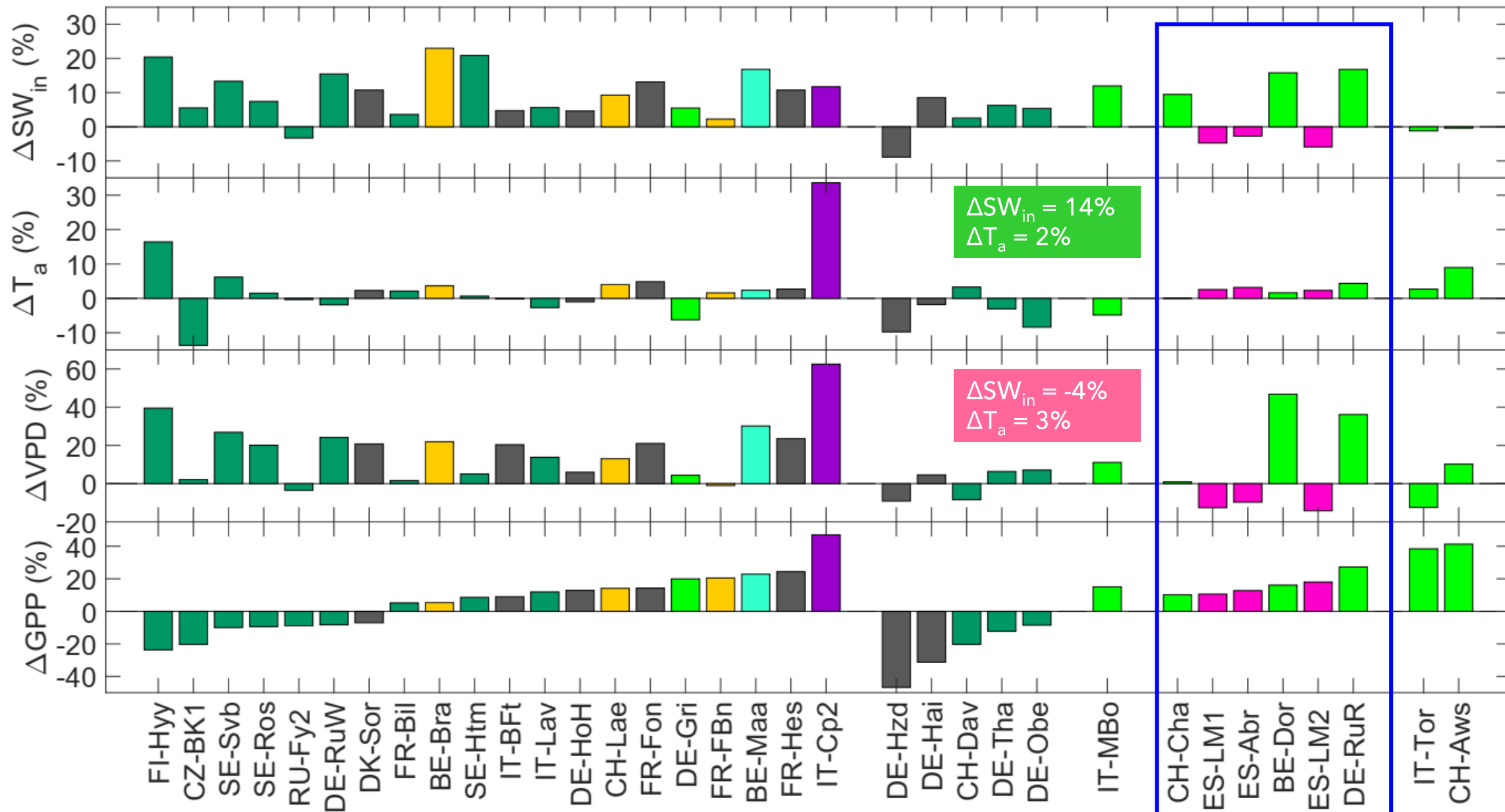
Group 3



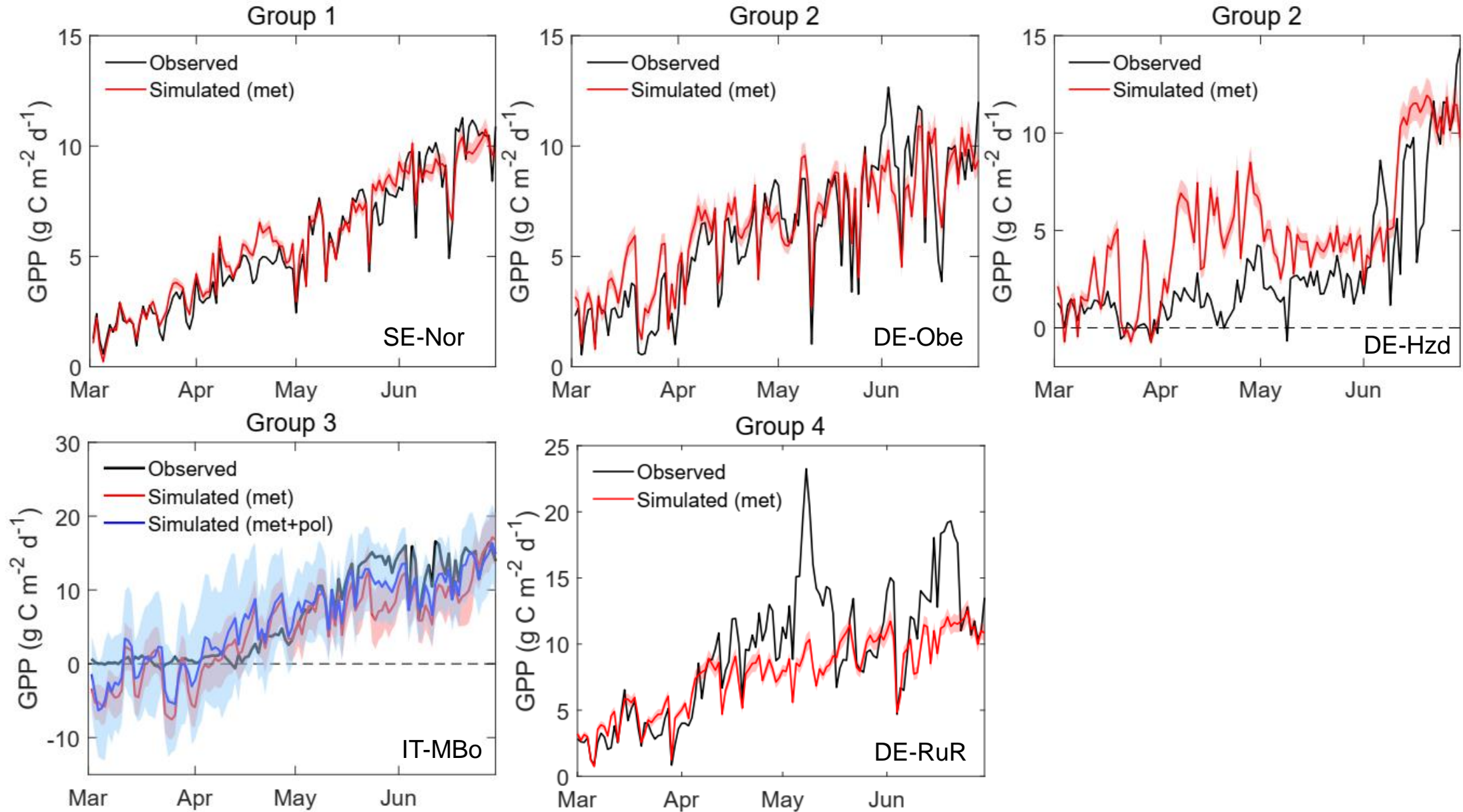
Multiple linear modelling & simulation for group classification



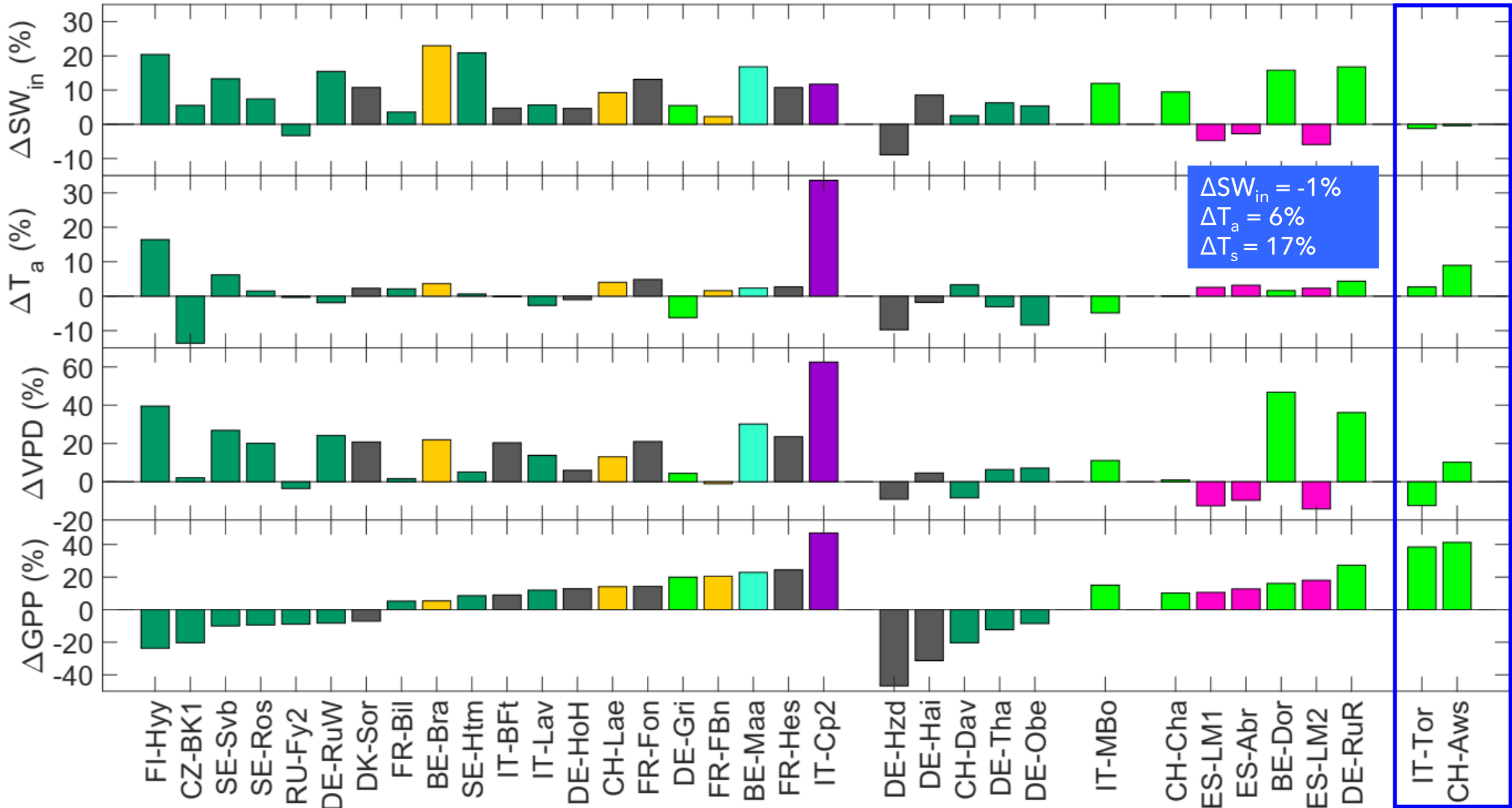
Group 4



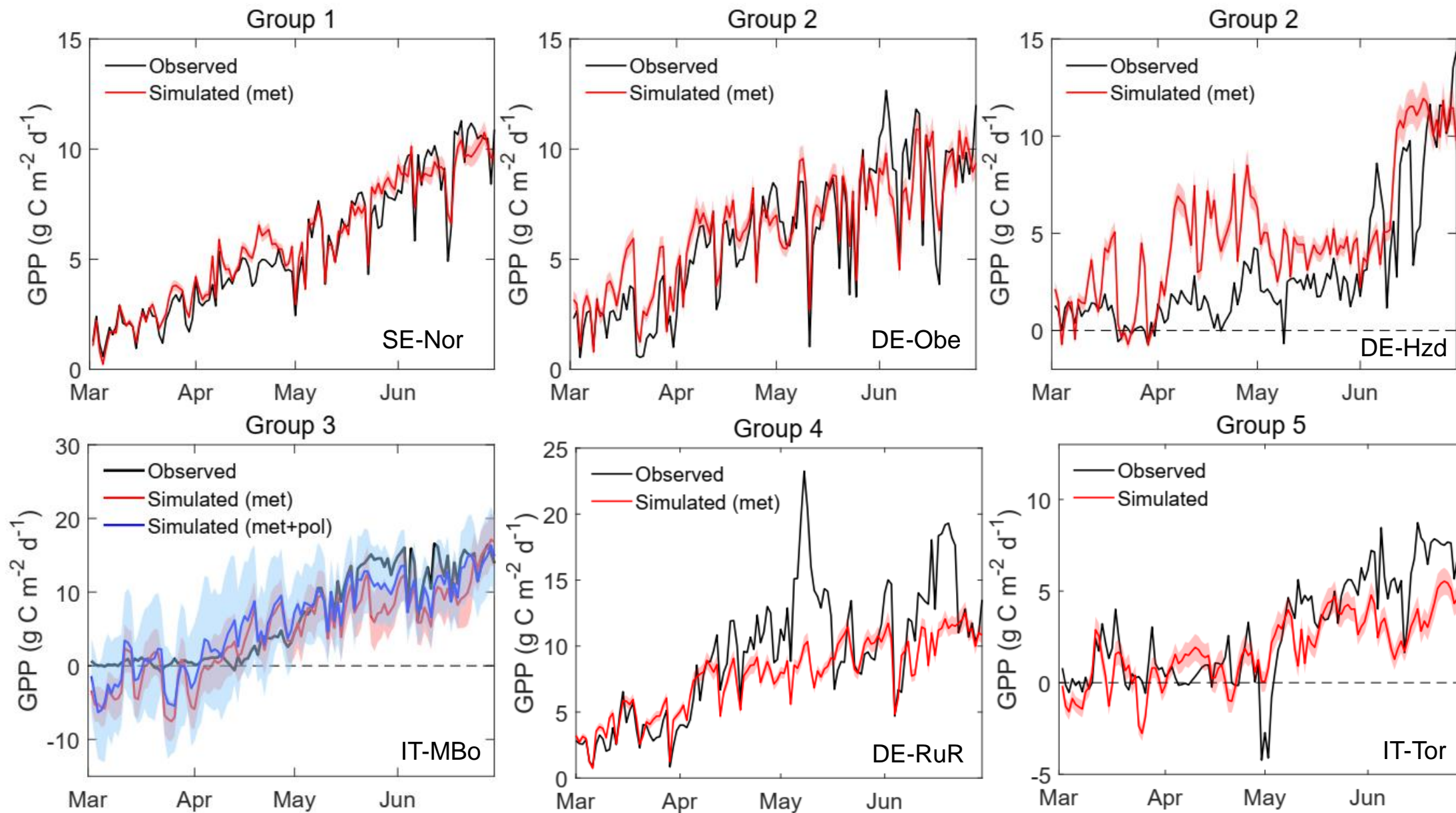
Multiple linear modelling & simulation for group classification



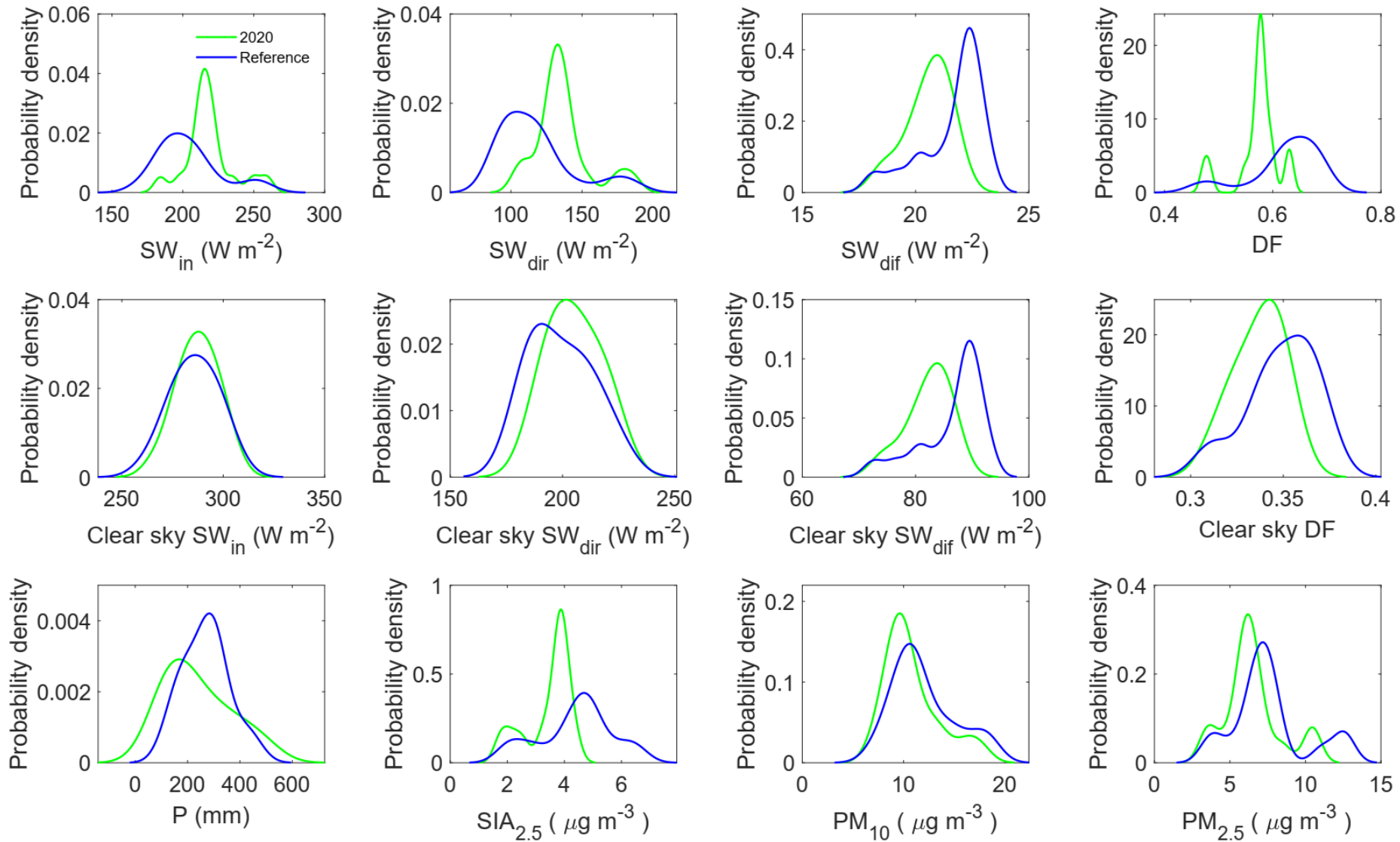
Group 5



Multiple linear modelling & simulation for group classification



Radiation anomalies due to aerosol optical depth or cloudiness?



Conclusions

- $[O_3]$ remained nearly constant during the COVID-19 lockdown. This does not support the hypothesis of a COVID-19 effect on GPP mediated by a change in O_3 .
- Our results showed that atmospheric and soil dryness were influential to weaken the plant carbon uptake, while increased intensity of incoming shortwave radiation had a dominant role in the GPP enhancement.
- The effect of the global irradiance on GPP exceeded the reduced diffuse fertilisation effect.
- GPP enhancement during the COVID-19 lockdown in spring 2020 could be ascribed to increased solar irradiance due to reduced cloudiness and aerosol optical depth.