

Anomalies in vegetation activity in the early growing season determine the climate-vegetation coupling in Europe

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Background

Challenges

- Vegetation behaves differently within the growing season.
- Large scale climate-vegetation coupling could affect vegetation variability and the overall regional carbon budget.
- Our understanding so far builds upon annual mean of vegetation state based on fixed definition of growing season, not considering growing season inhomogeneity

Methods

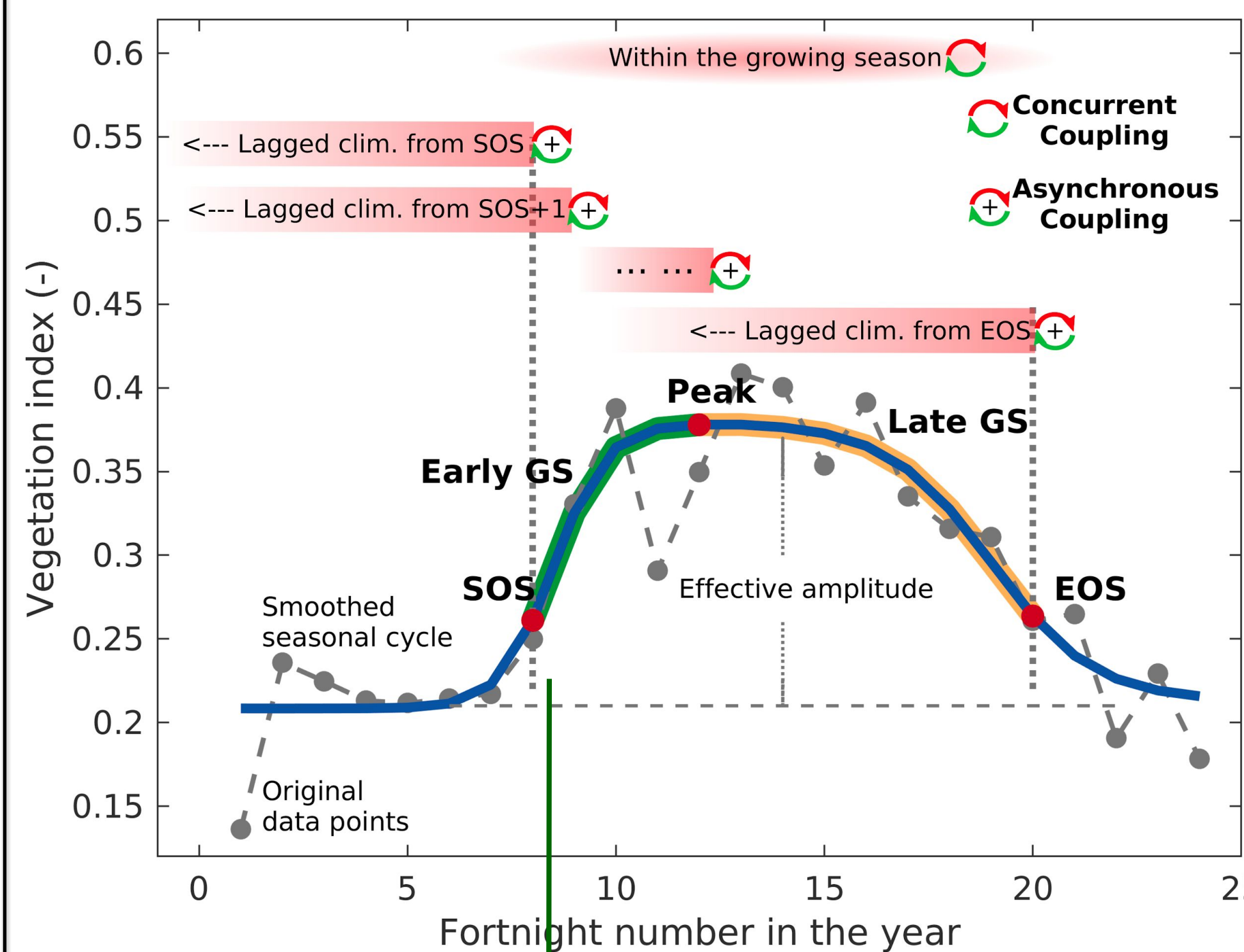


Fig. 2. Schematic diagram of the characterization of the growing season (GS)

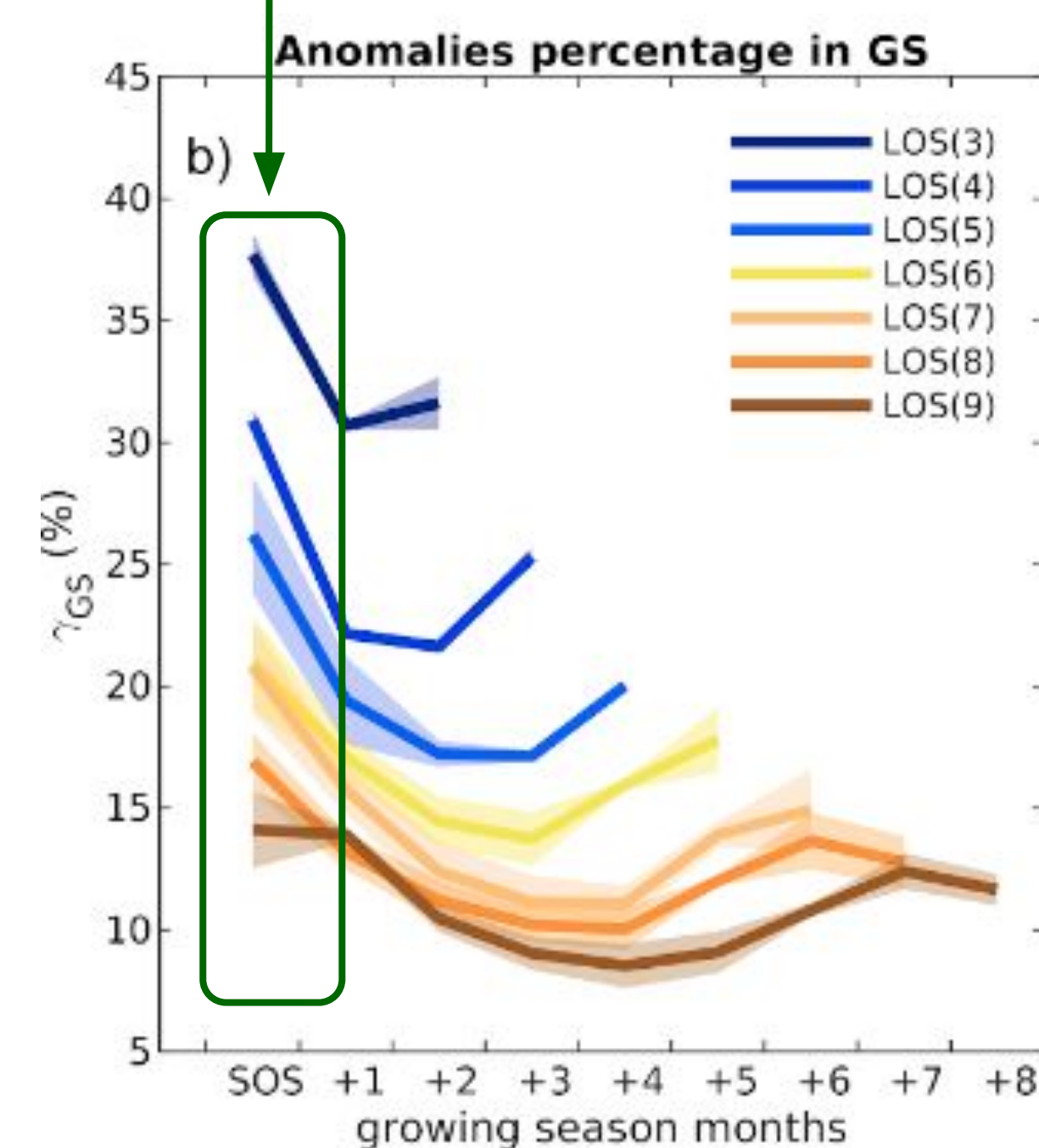


Fig. 3. Relative contribution of absolute monthly greenness anomalies to the total absolute anomaly for the entire growing season

- (i) growing season is defined for each gridpoint
- (ii) climate-vegetation couplings are computed based on the local climate and teleconnection indices relative to each growing season month
- (iii) Vegetation states based on multiple vegetation indices: EVI and NDVI from two remote sensing products

1 Local drivers of climate-vegetation coupling

- (i) During the early growing season, temperature dominates over the boreal and temperate regions
- (ii) During the late growing season, soil moisture dominates over a large part of the continent.

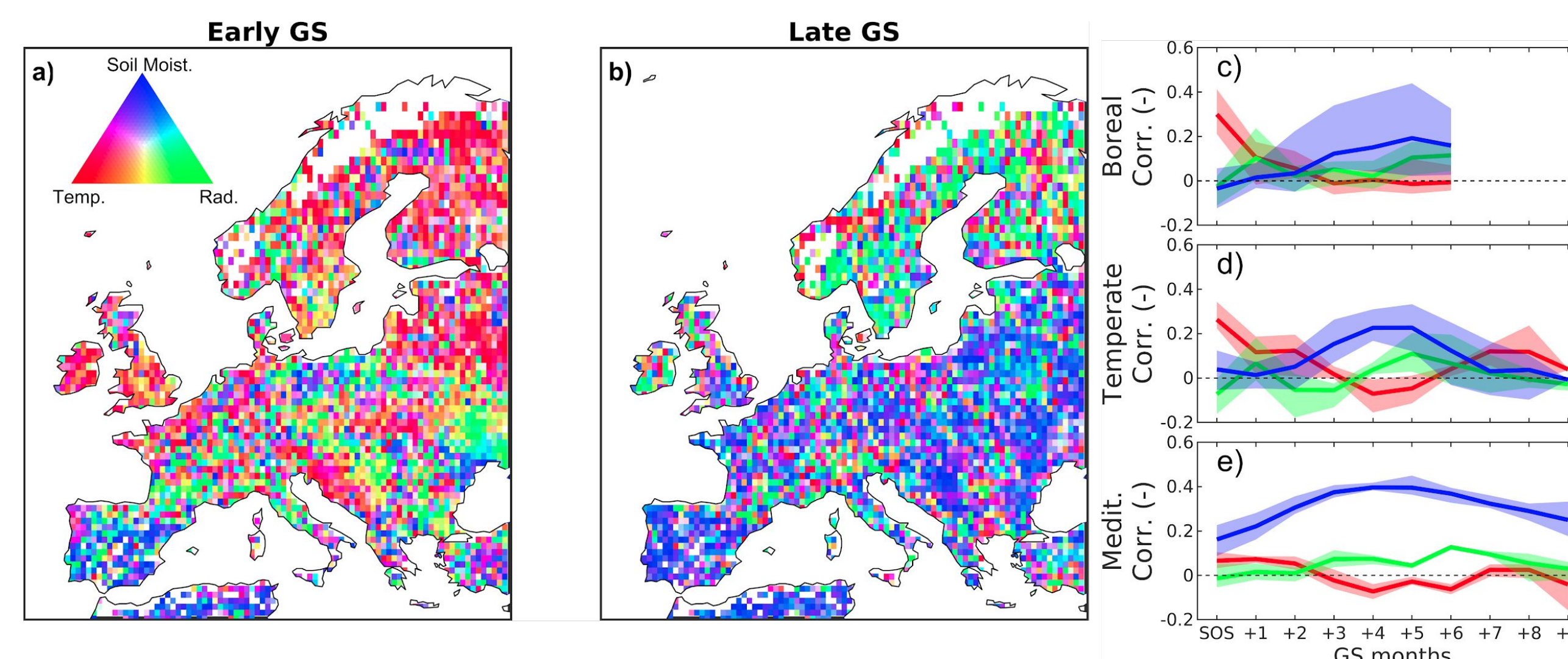


Fig. 4. Concurrent climate-vegetation coupling for the early (a) and late (b) growing-season.

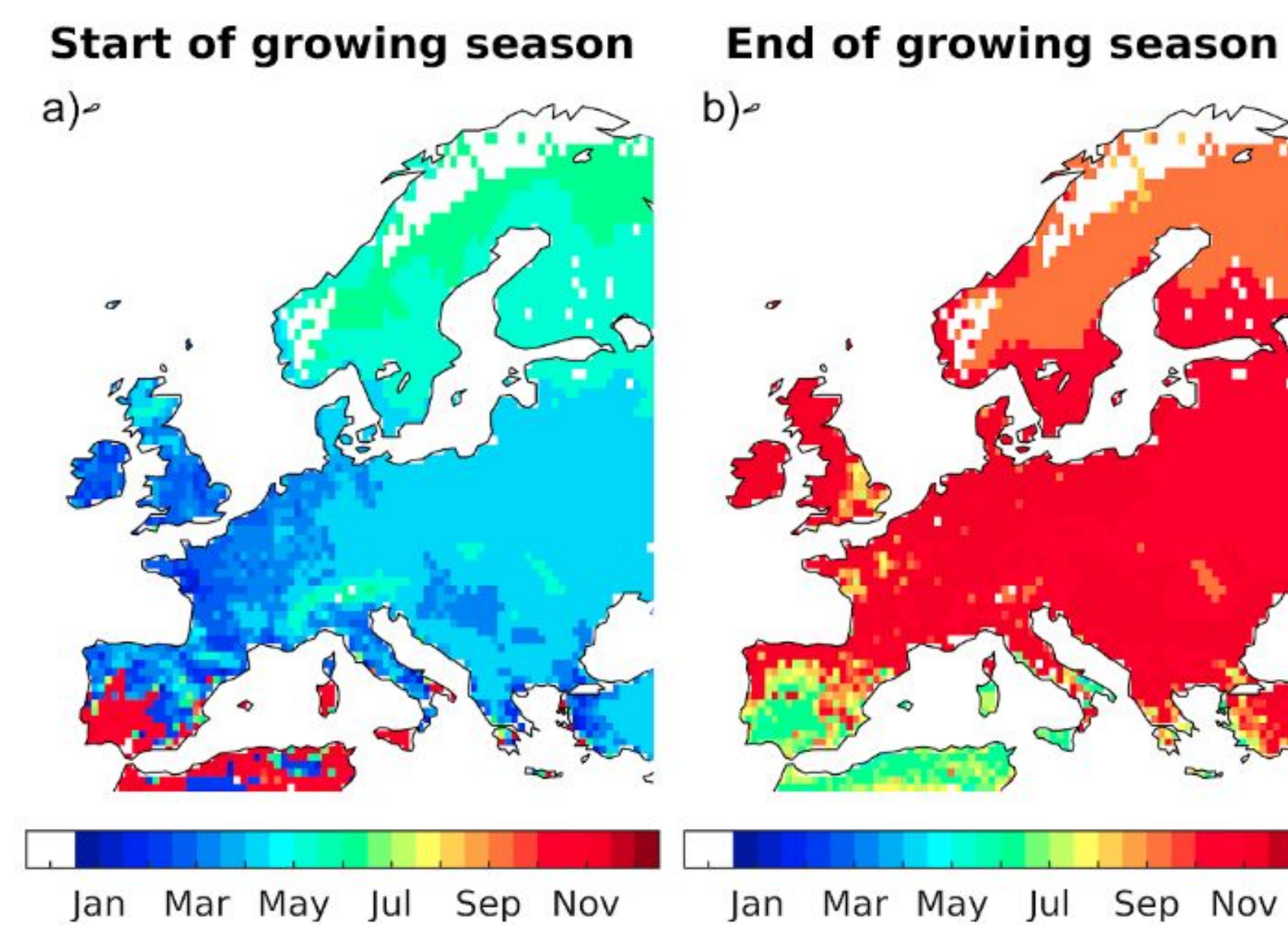


Fig. 1. Growing season inhomogeneity

Question

Which part of the growing season generally has a strong sub-seasonal climate-vegetation coupling?

Summary

- Variations during the first two months of the growing season largely determine the full-year coupling.
- The NAO, SCA and EA are the most relevant teleconnection indices over large parts of boreal and temperate Europe.
- We highlight the importance of a growing season-oriented approach for studying the large-scale climate-vegetation coupling in Europe

2 Large-scale climate coupling dominated by early growing season dynamics

Weakening climate-vegetation coupling

more and more heterogeneous

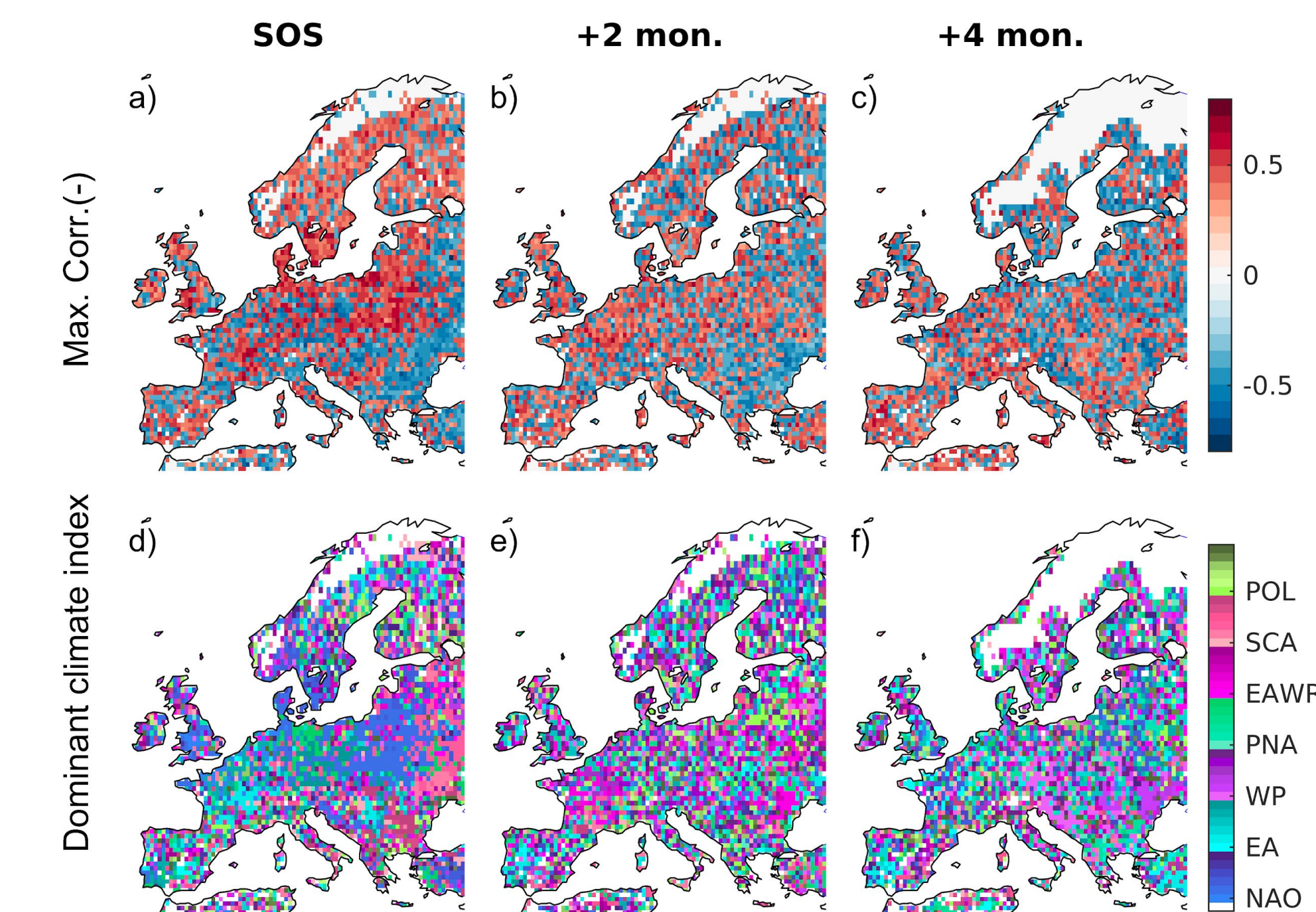


Fig. 5. Changes in spatial distribution of maximum strength of the climate-vegetation coupling with corresponding Pearson's correlation coefficient (r)

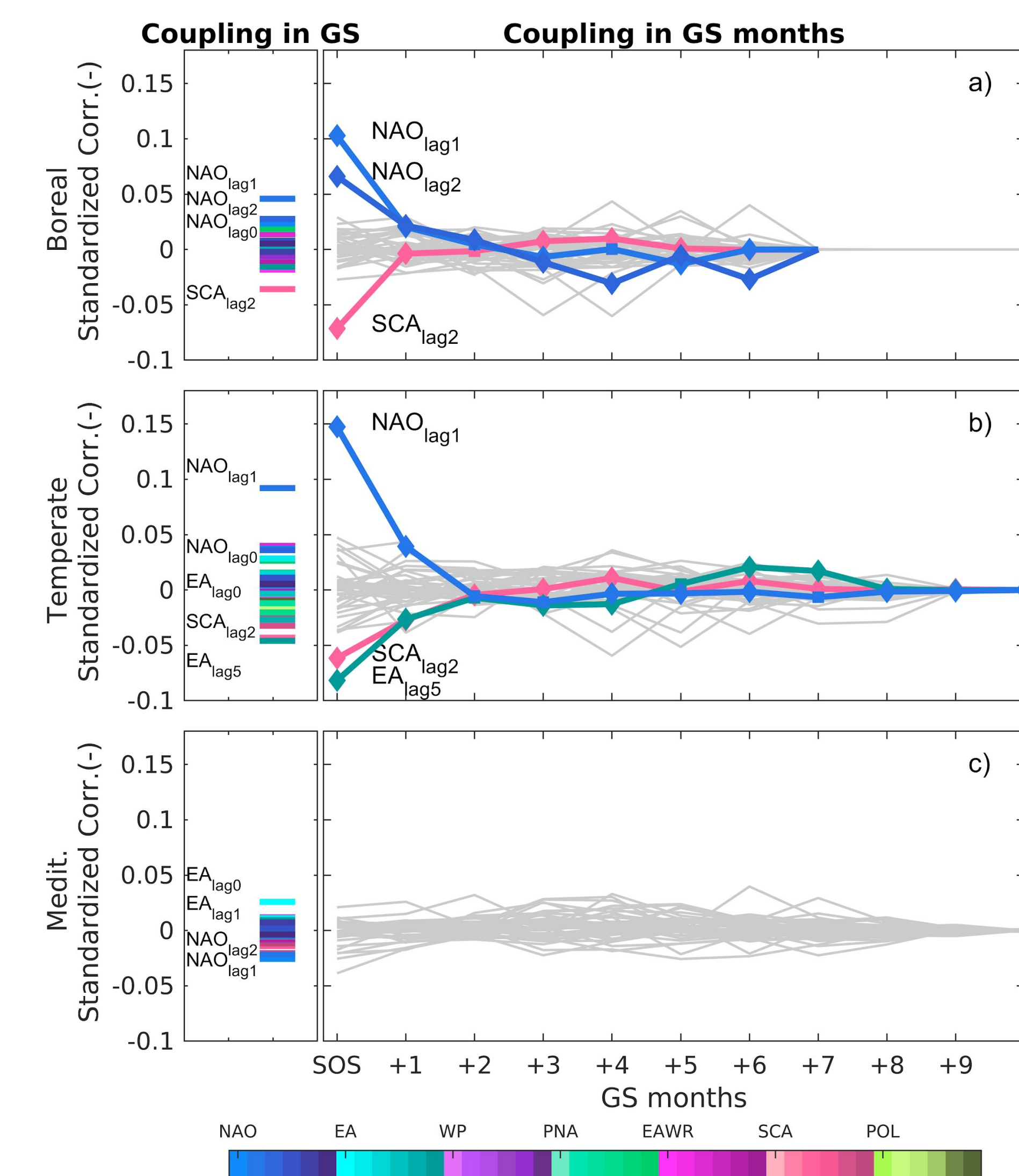


Fig. 6. Seasonal average (left column) and seasonal evolution (right column) of the strength of asynchronous climate-vegetation coupling for different climate zones. The climate-vegetation coupling is expressed by Pearson's correlation coefficients (r) between teleconnection indices and VI anomalies.

For more details please refer to:
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