

Why GAM over GLM?

Use **one model** and account for seasonal effects of extreme occurrence directly in the model as a (cyclic) smooth function of time

Sense of **continuity** like in nature

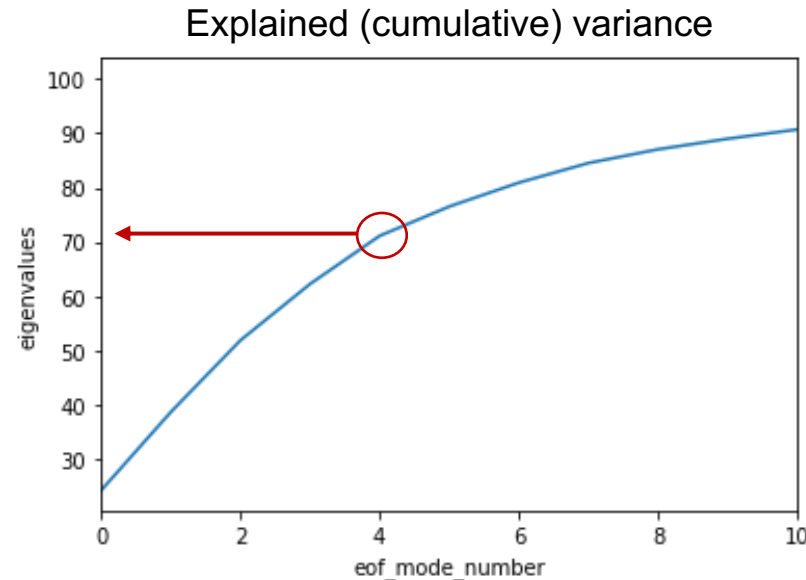
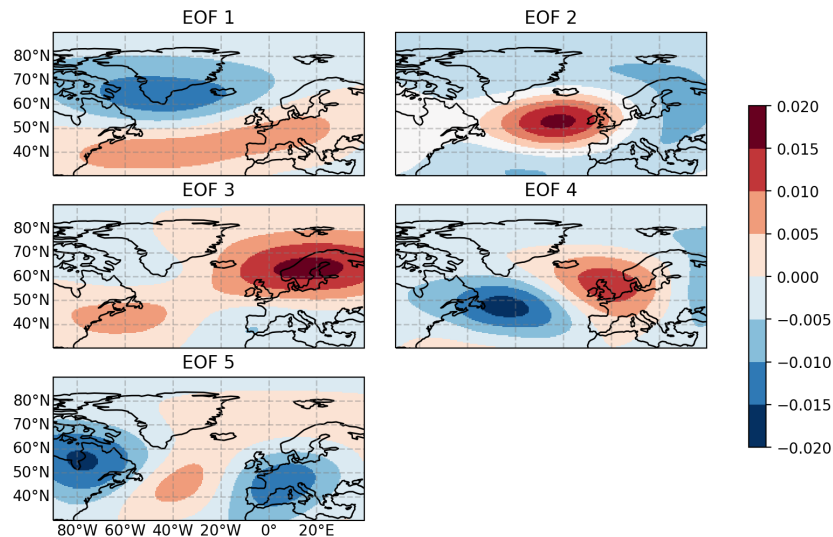
Allows to model **random bursts** of (in-)activity around a baseline hazard (just like with time-dependent Cox Regression, but in a continuous, non-linear manner)

No need on a priori knowledge of the parametric form of the relationship

Concept

It is well known that, e.g. Cassou (2010) and Comas-Bru (2014), the 3 leading winter-time EOFs of Z500a in the Euro-Atlantic sector reflect the North Atlantic Oscillation (NAO), the East Atlantic Pattern (EA) and the Scandinavian Pattern (SCA)

We use a year-round EOF analysis of daily Z500a (10-day LPF, see Grams et al. (2017)) to represent large-scale structures in the Euro-Atlantic sector and retain the top-5 PCs as predictors for the GAM:



Upcoming: Once the best model is selected based on AIC criterion, we test the interaction with the magnitude of local IVT anomalies to determine the relevance of IVT for clustering under a specific large-scale circulation pattern

Model

In its simplest setup, we model counts (Y) of extreme rainfall events (EPEs) in a 20-day window with seasonal variability of EPEs $f(DOY)$ as smooth cyclic function and each PC predictor as a linear term:

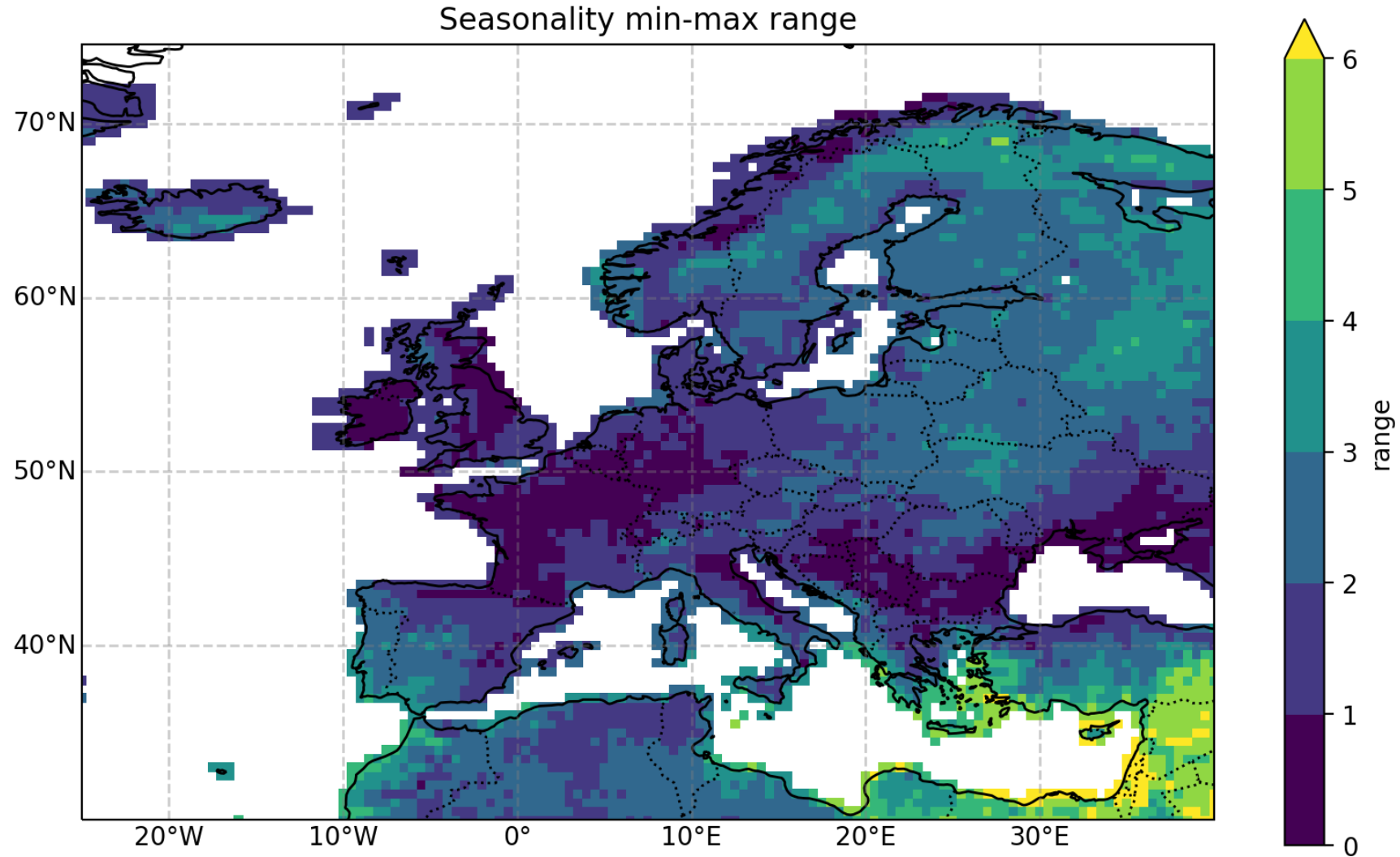
$$g(E(Y)) = f(DOY) + PC1 + \dots + PC5$$

We also test for pairwise interactions of the PC predictors:

$$g(E(Y)) = f(DOY) + PC1 + \dots + PC5 + PC1:PC2 + \dots + PC4:PC5$$

The final model is selected based on minimisation of the AIC criterion and can contain main effects and pairwise interactions.

Range of seasonal term $f(DOY)$



Main effects and interaction terms

