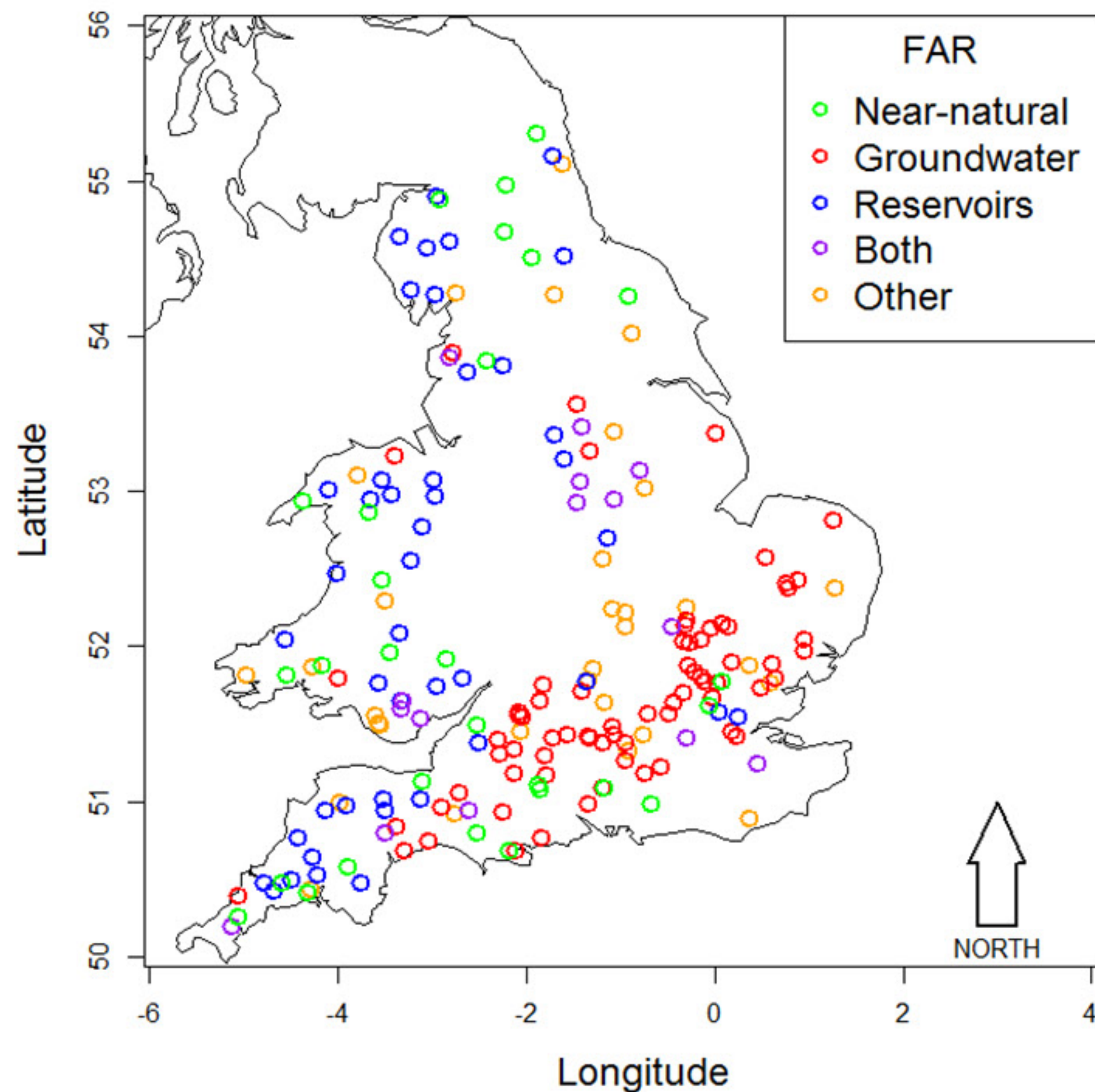


The question is: When, where and why?

## Starting point

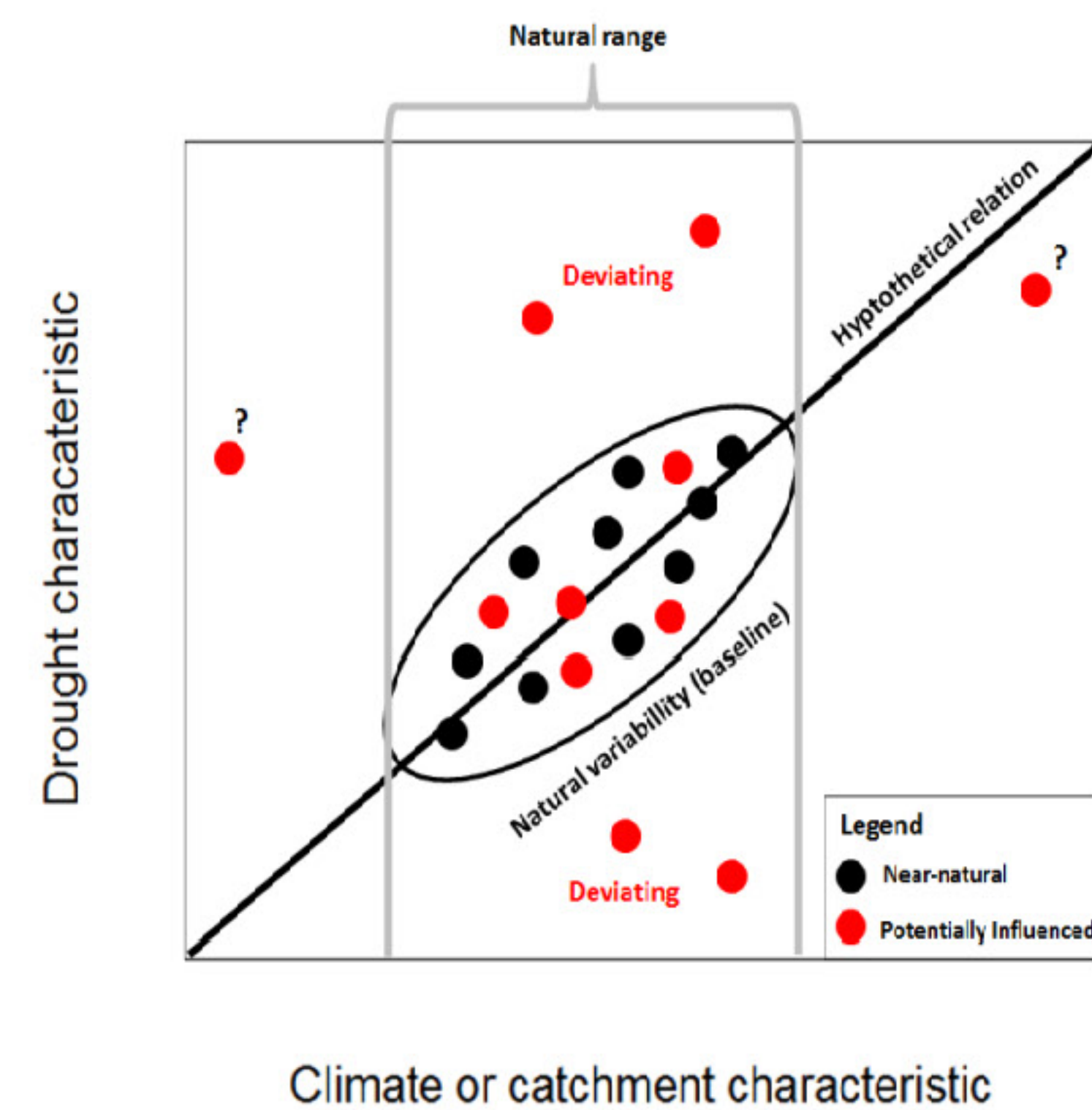
A large dataset of precipitation streamflow records (N=187) with and without human influences



## Goal

- Identify streamflow records with drought characteristics that deviate from those expected under natural conditions
- Relate these deviations to various human influences, indicated by:
  - Factor Affecting Runoff codes
  - Station thumbnail descriptions

## Methods (concept)

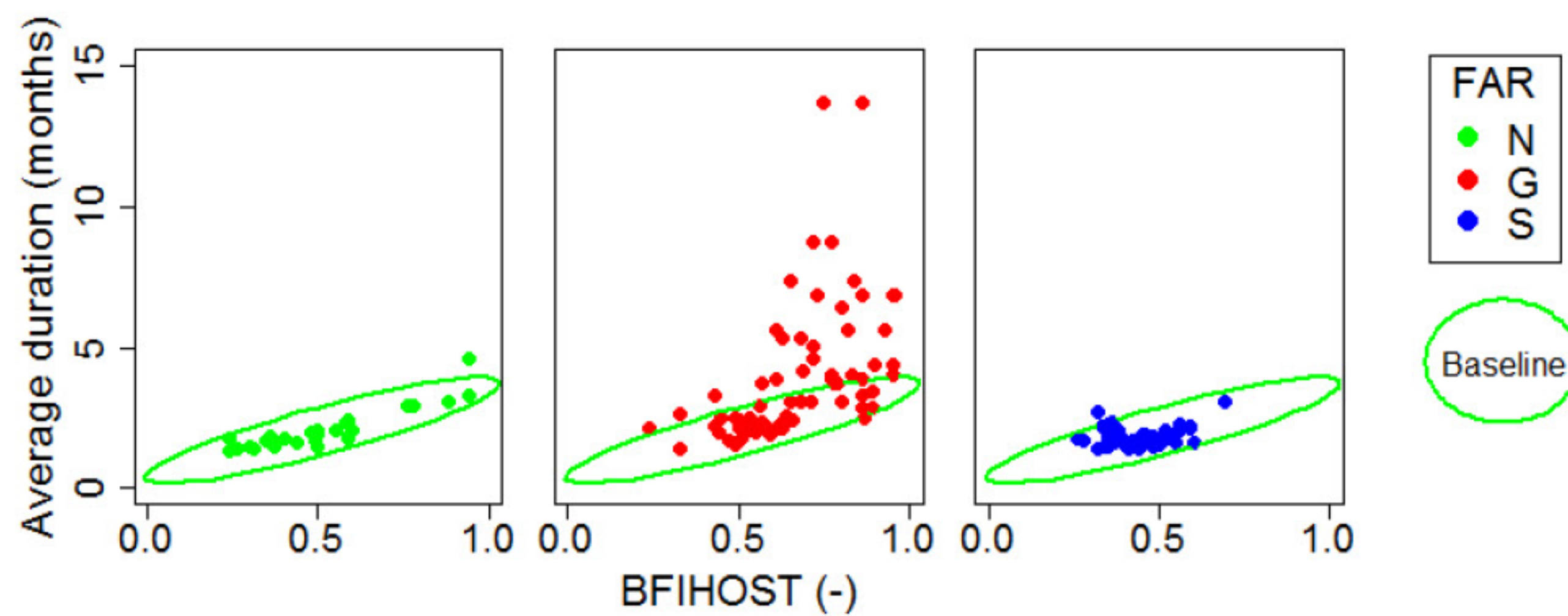


We screen for deviations in:

- 1) Relation between BFIHOST and average drought duration
- 2) Correlation between streamflow and meteorological drought indices
- 3) Temporal drought occurrence distribution

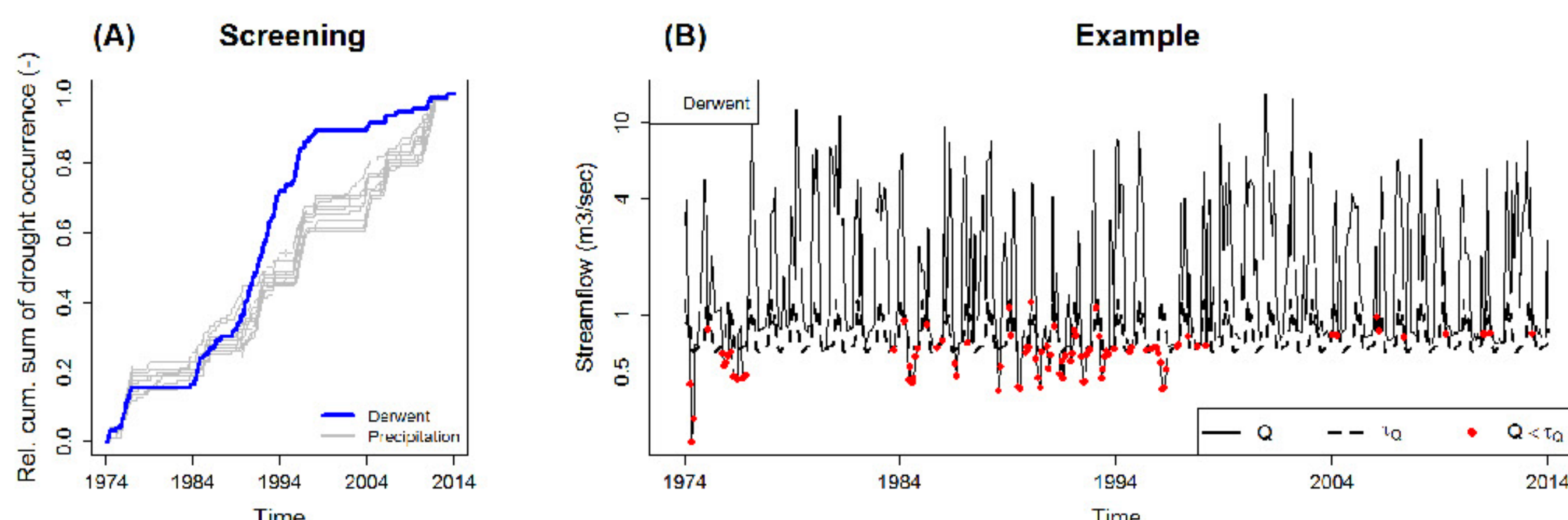
## Results

### 1) Relation between BFIHOST and average drought duration

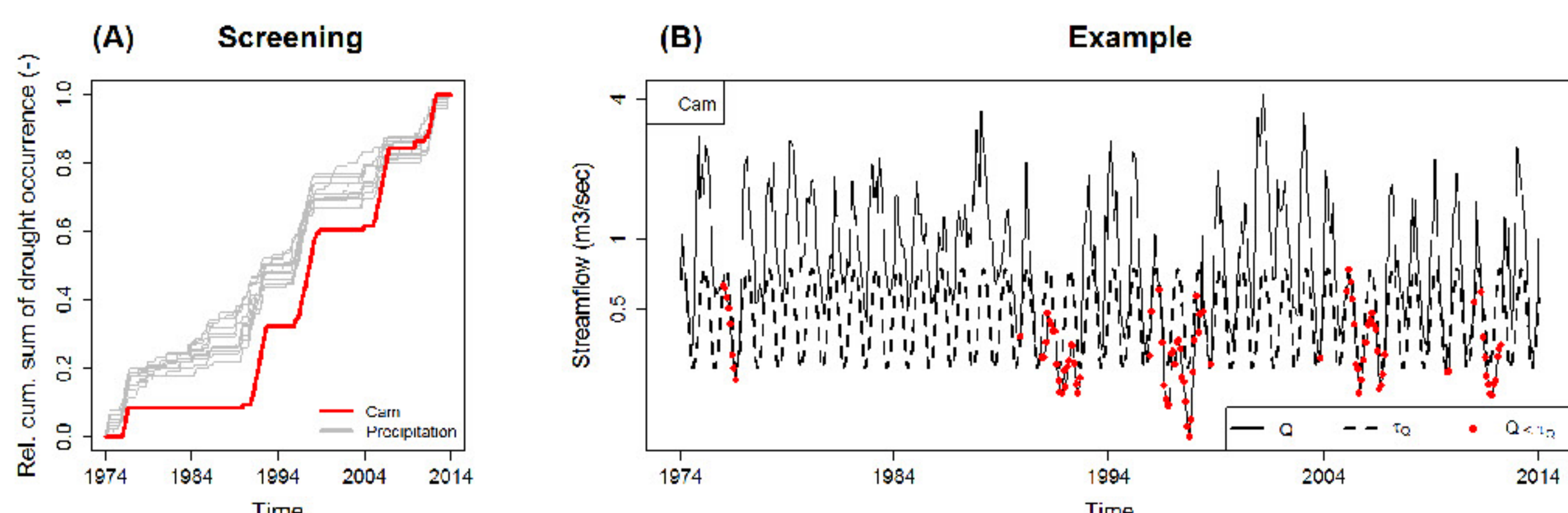


*Prolonged average drought duration for part of the catchments for which groundwater abstractions have been indicated*

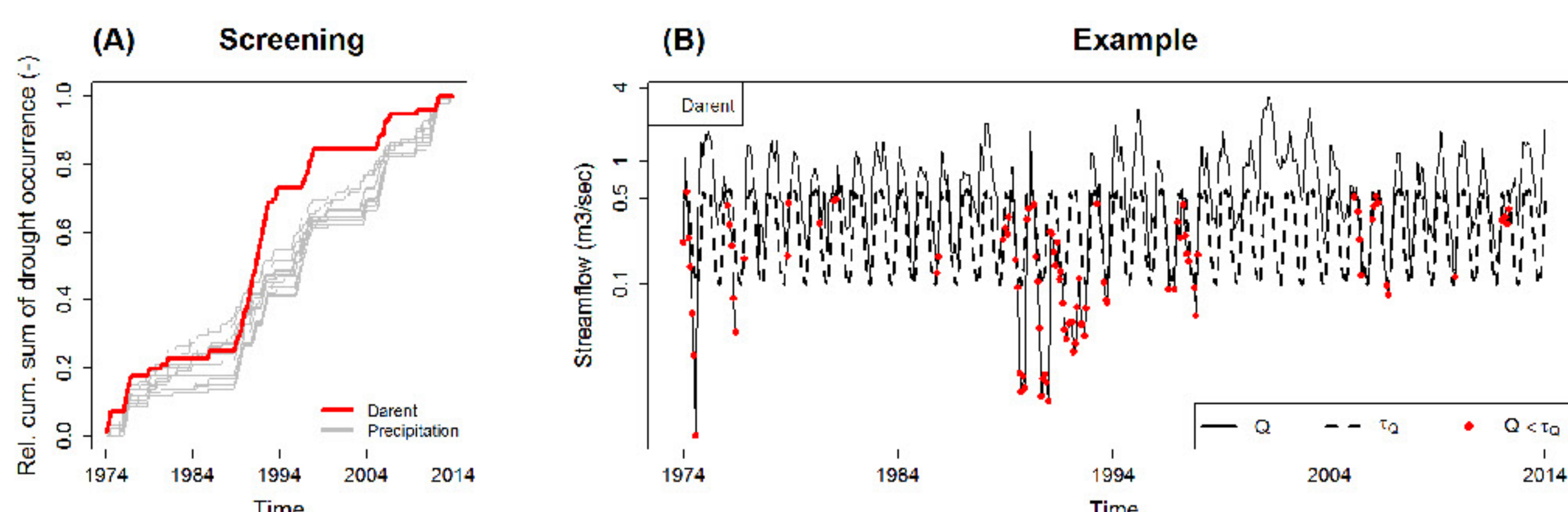
### 3) Temporal drought occurrence distribution



*Less drought months towards the end of record – likely caused by changes in reservoir operations*

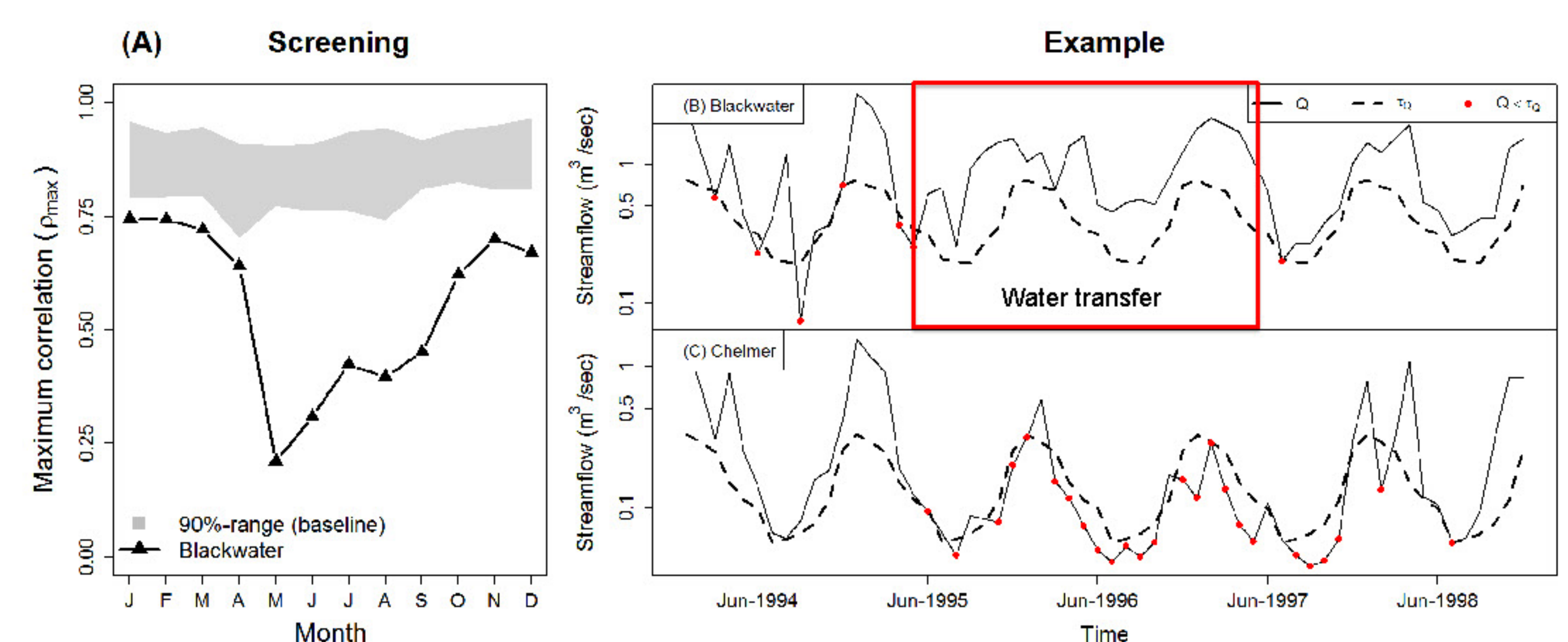


*More drought months towards the end of record – possibly caused by groundwater abstractions*

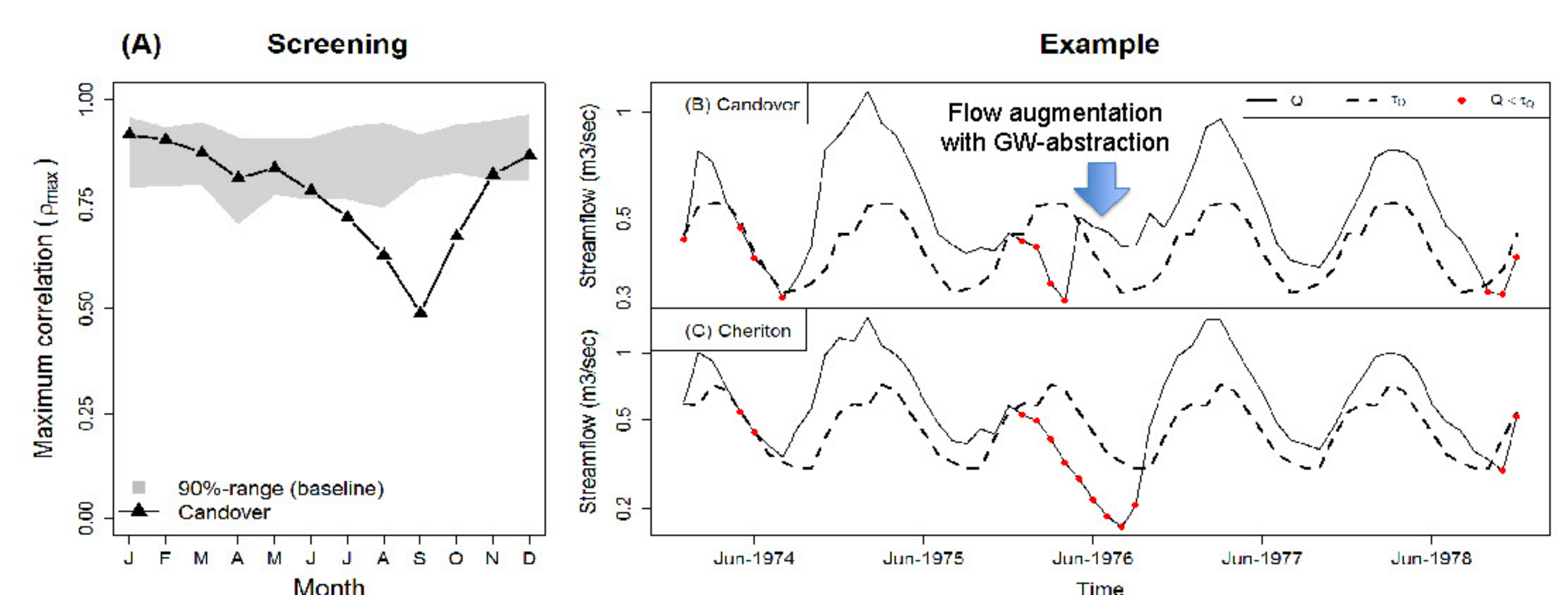


*Less drought months towards the end of record – likely caused by changes in GW-abstraction (river restoration program)*

### 2) Correlation between streamflow and meteorological drought indices



*Lower correlation in summer months – likely caused by water transfer schemes*



*Lower correlation in summer months – likely caused by flow augmentations during low flow*

## Discussion / Conclusions

- First order screening based approach successful in identifying some of the catchments with drought characteristics that deviate from those expected under near-natural conditions → easily applied in other geographical settings.
- Hard to generalize the impact of a particular human influence (e.g. GW-abstraction) as they can vary in, type, degree, overall impact and are susceptible for changes over time
- More detailed metadata is needed – how to collect? For each and every catchment or focus on focus on the smaller subset of catchments with deviating drought characteristics?
- Towards attribution: catchments with deviating drought characteristics as detailed case studies? → Feed into a dataset of impact catchments