

Regionalization of Vapor Pressure Deficit (VPD) in Spain

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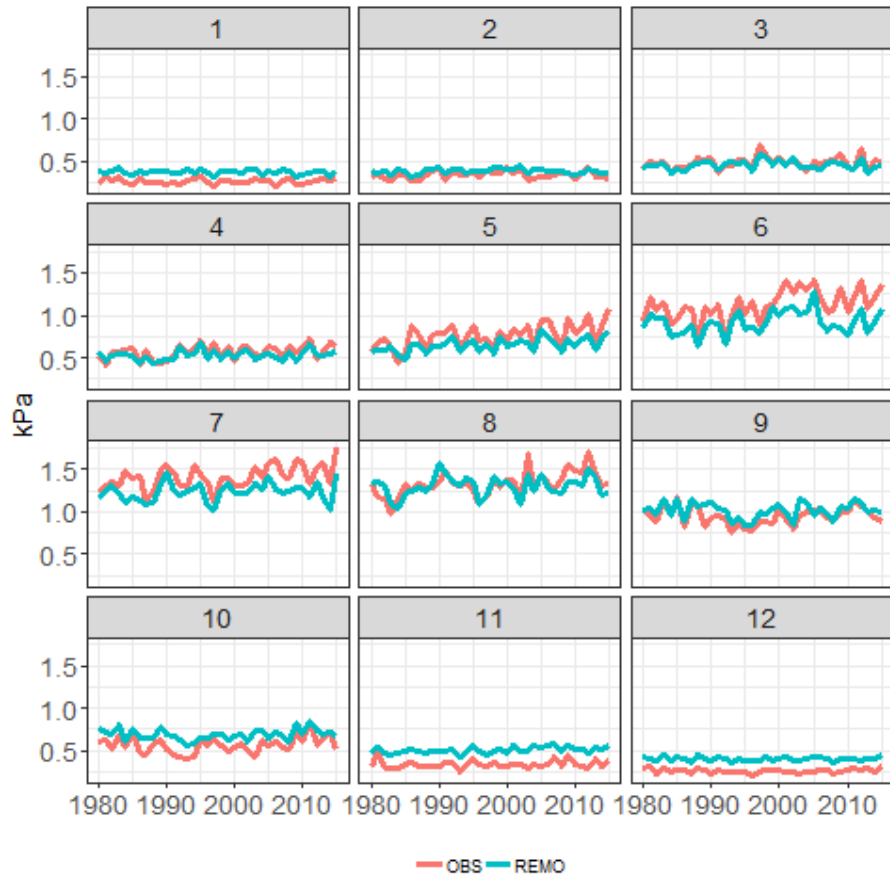
Introduction

- Vapor pressure deficit (**VPD**) is a relevant variable for water and energy balance, and also for water management.
- Plays a **key role** in atmospheric evaporative demand (**AED**), but also in actual evapotranspiration (**ET**) and plant physiology.
- To calculate **VPD** data of **air temperature** and **air humidity** are required.
- **VPD** is expected to increase in the future guided by:
 - Temperature increase
 - Relative humidity decrease

Introduction

- Observations of **air humidity** are usually scarce in the long-term
 - Spain: 1961-2015
 - Air temperature: More than 1000 stations
 - Air humidity: Less than 200
- High-resolution reanalysis can play a relevant role to study **VPD** evolution
- Using the same spatial resolution of CORDEX, **REMO** model was executed using ERA-I as the forcing data, covering the 1980-2015 period for Spain.
- All the relevant variables to calculate AED are saved 3-hourly.
- One of the main problems to use the **REMO** data is that RCMs are generally affected by **bias**

Bias in VPD



- **VPD** is highly seasonal as well as the **bias**.
- **Positive bias** means drier conditions in the atmosphere
 - It is detected in winter
- **Negative bias** means wetter conditions in the atmosphere
 - It is detected in summer

Bias correction

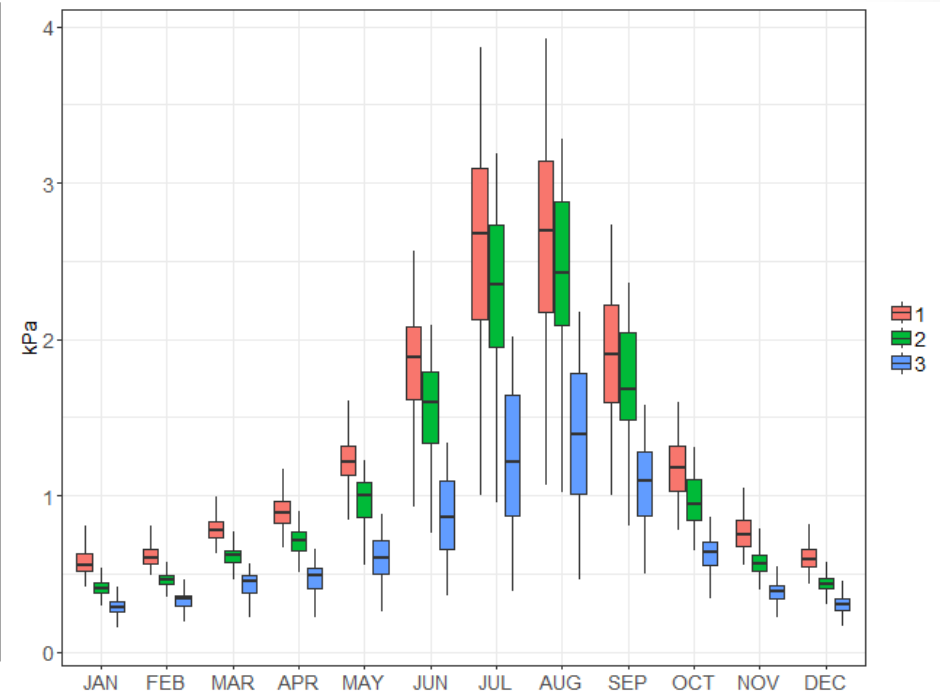
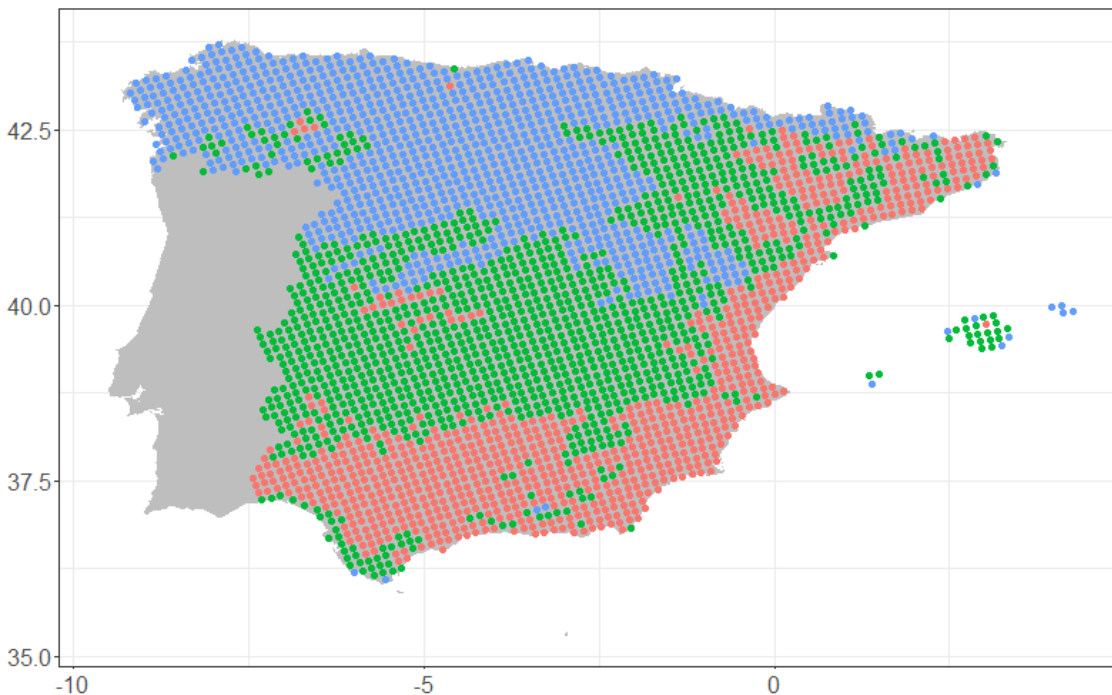
- Bias correction can not be unique for the whole territory and all the year.
- We want to test a **regional bias correction** based on:
 1. Regionalization would be obtained using a **clustering** method
 2. **Independent bias correction** would be implemented at each region
 3. All the observations available in each region would be used to obtain a single **QQMapping** for each region (and each month).
- What is the correct **number** of regions to be used?
 - **Low number**: Locations with high differences would be assigned to a same region
 - **High number**: Low number of observations would be available for the bias correction

Regionalization

- Use of WARDe clustering method.
- What is the correct **number** of regions to be used?
 - **Low number**: Locations with high differences would be assigned to a same region
 - **High number**: Low number of observations would be available for the bias correction
- WORK IN PROGRESS

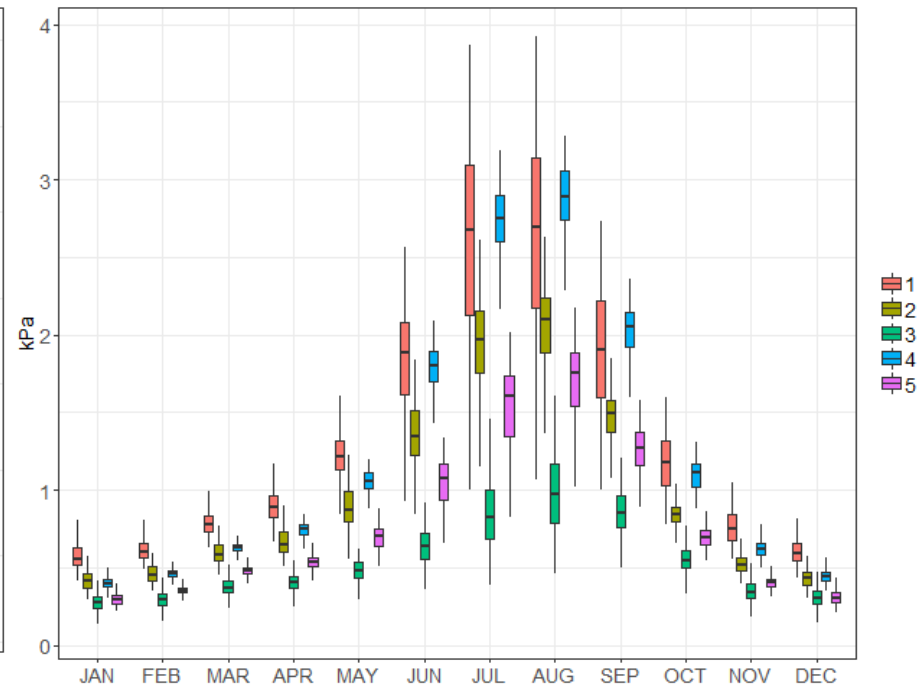
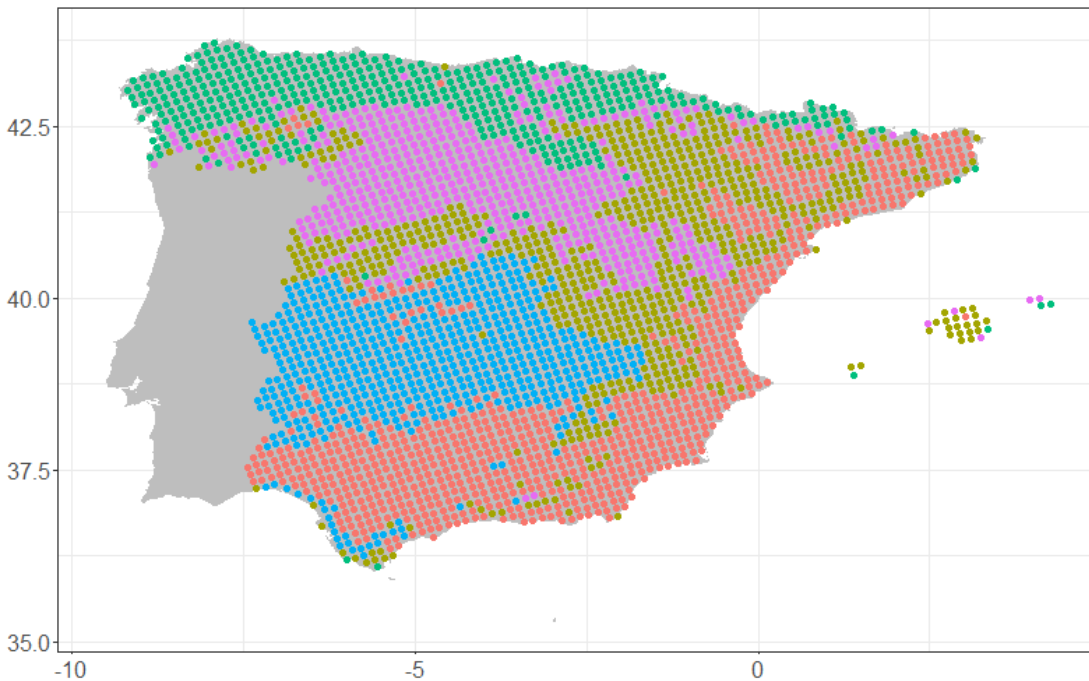
Regionalization (3 groups)

- Regionalization is based on differences in VPD values and their seasonality
- Main climate regions are detected.
- High variability of summer values in each cluster. 3 is **too low**



Regionalization (5 groups)

- Higher detail of differences among regions.
- Region 1 covers the whole mediterranean region, and it shows higher variability in summer than the rest of the regions.



Regionalization (7 groups)

- We are planning to use these 7 regions as the basis for our regional bias correction

