Identification of groundwater storage change patterns in the western Mediterranean region

Stock photo : https://unsplash.com/photos/mUhSEdDk_qg

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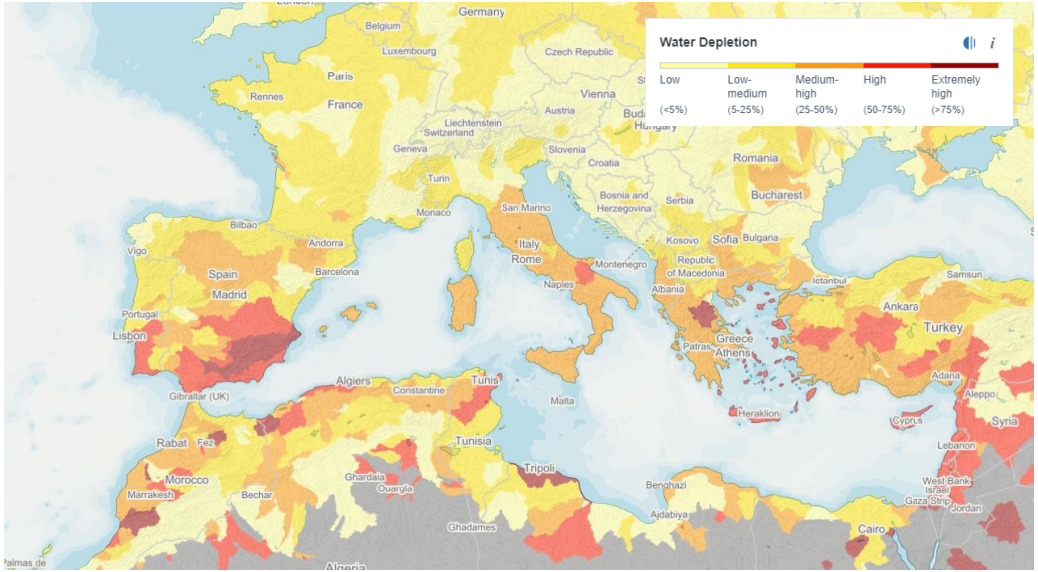
Groundwater in the Mediterranean region
Current state

- Increasing water demands from all sectors and limited water resources (Allam et al., 2020). Expecting longer dry spells and decreased annual precipitation (Cramer et al., 2018).

- Groundwater data availability has a poor distribution in the region (Leduc, 2017)

- Objectives:

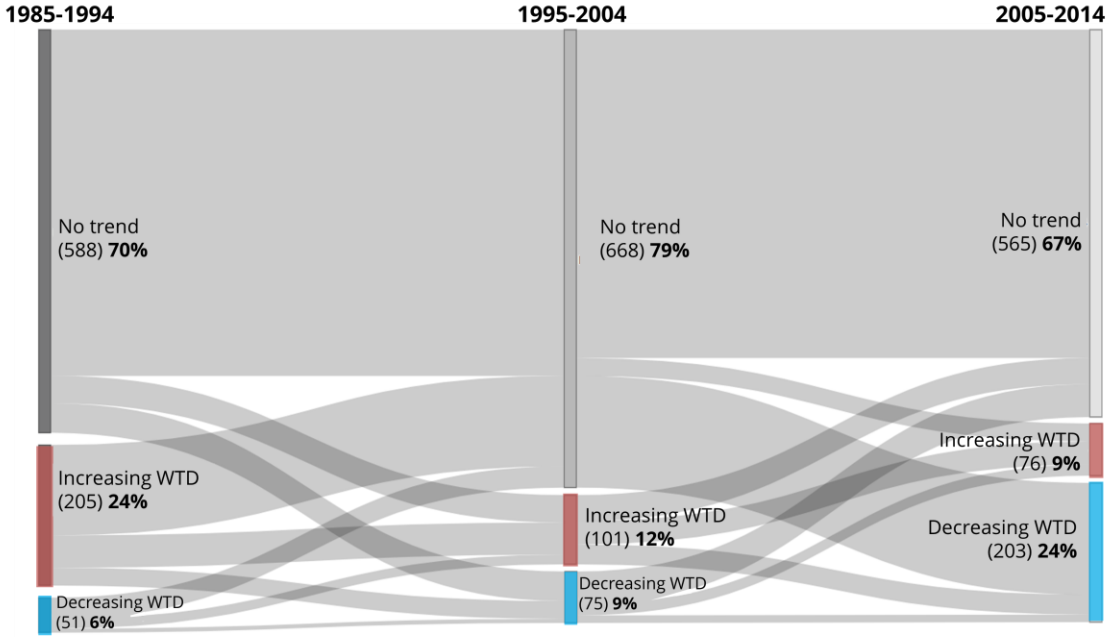
1. Characterize spatial and temporal **patterns and trends** in groundwater levels
2. Understand the influence of climatic and geologic variables as **drivers** of groundwater storage changes at regional scale



Ratio of total water consumption to available renewable water supplies
World Resources Institute (2019) Aqueduct, www.wri.org/aqueduct

Trend analysis – 1985 to 2014

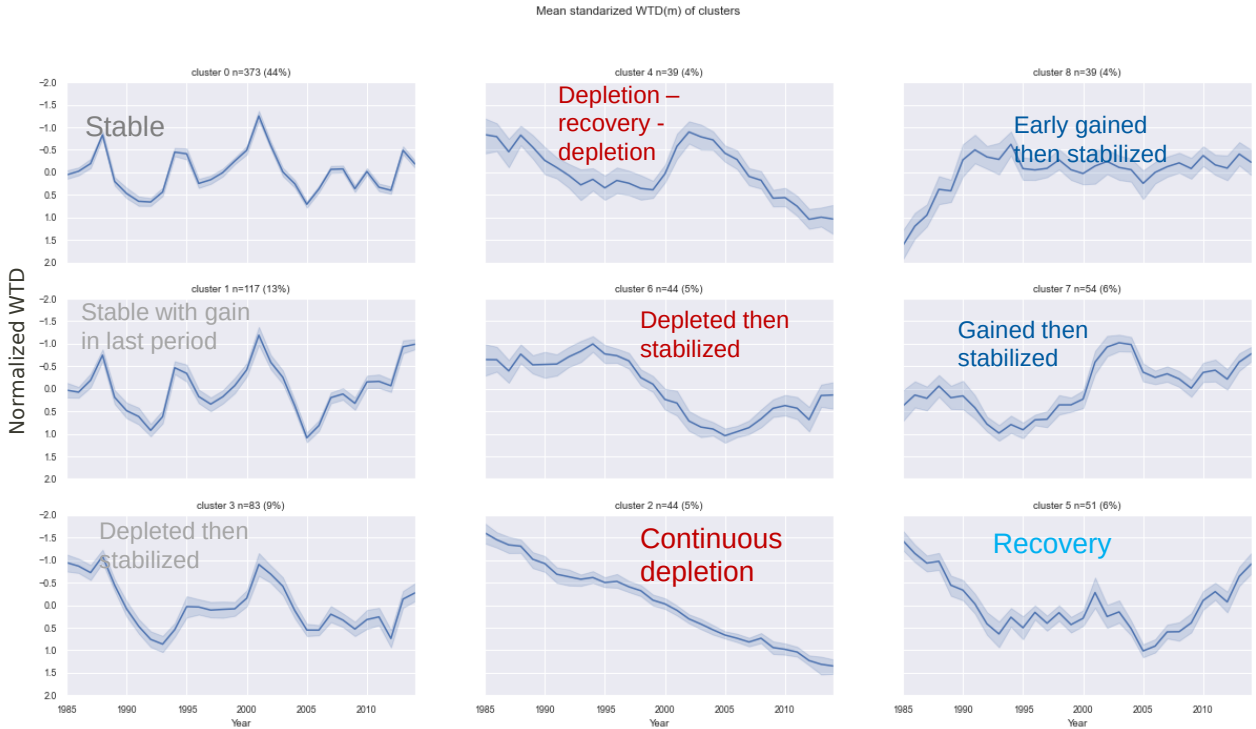
- To compare in the same time period, trend was analyzed in 844 time series with enough data in three segments (1985-1994, 1995-2004, 2005-2014).
- The majority of piezometers didn’t have trends in the studied periods.



Evolution of trend results of Water Table Depth in piezometers over three decades
From annual WTD values of 844 measuring wells in France, Portugal and Spain

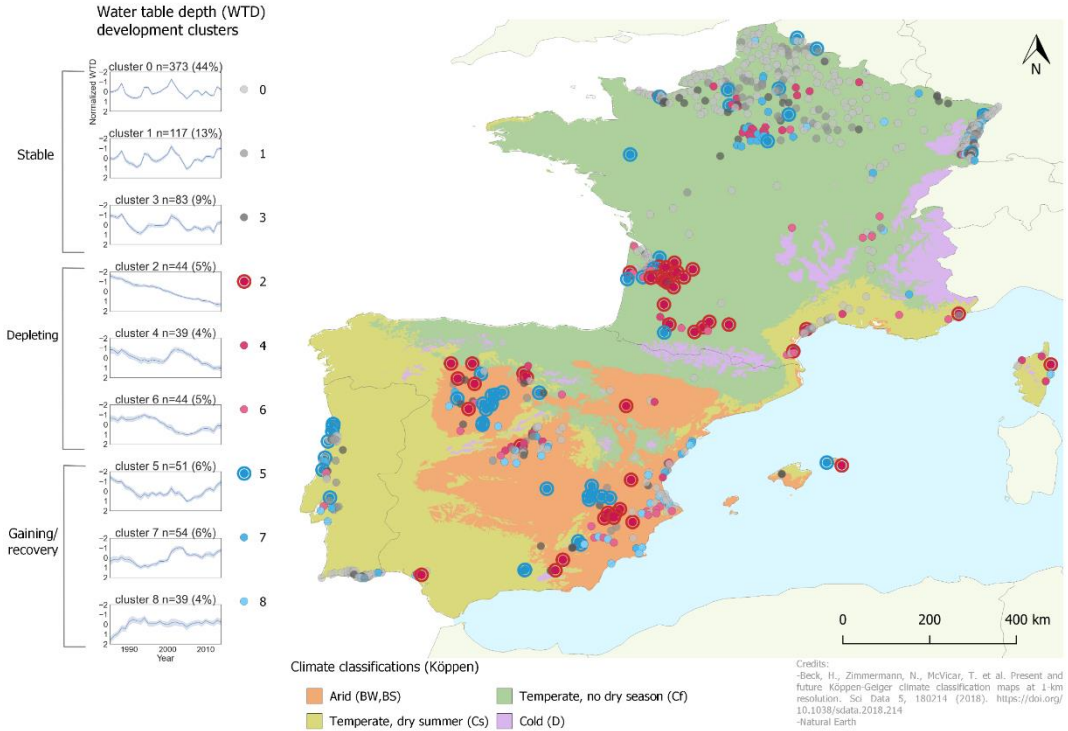
Trend analysis - clustering results

- K-Means clustering - trend result and Sen slope for each period in each piezometer.
- Elbow method and silhouette coefficient, 9 clusters were chosen.
- Distributed in the region. Recovery is more frequent in Spain. Stable more frequent in France.



Average of normalized WTD time series for all piezometers belonging to each cluster.

Drivers



Spatial distribution of cluster types by climate classification

Climate types

- Stable ones more present in the temperate without dry season, while recovery is more frequent in the arid and temperate with dry summer

Available precipitation (P-PET)

- Time series from “stable” clusters have a stronger relationship with P-PET time series at an annual scale

Hydrogeology

- “Stable” clusters are more frequent in fissured aquifers than porous by 13%

Thank you for your attention!

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