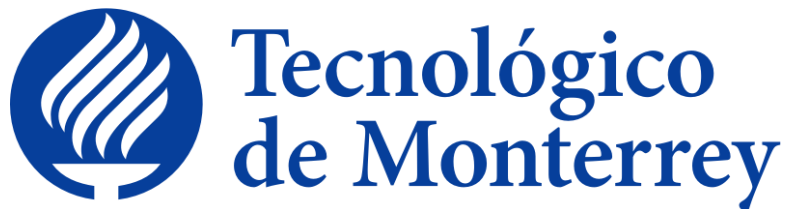


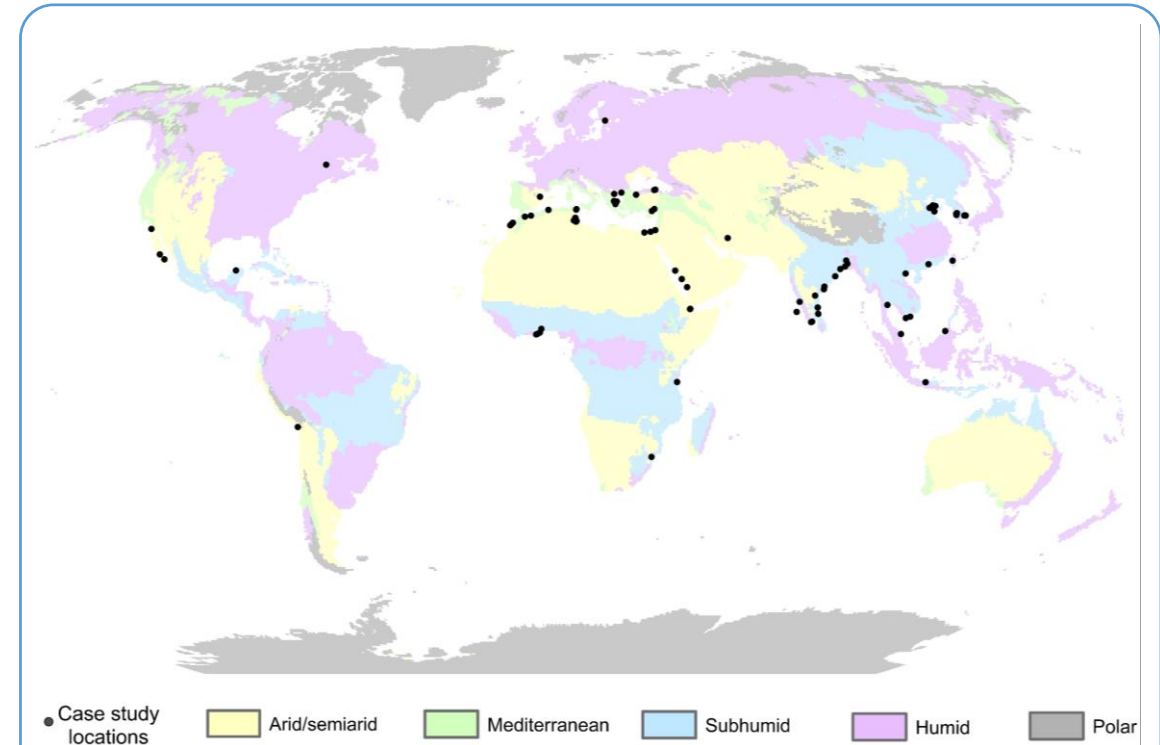
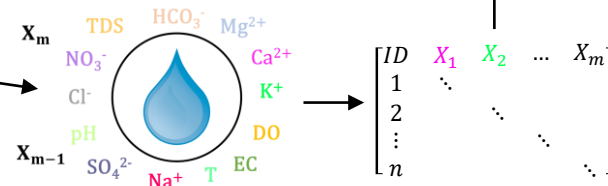
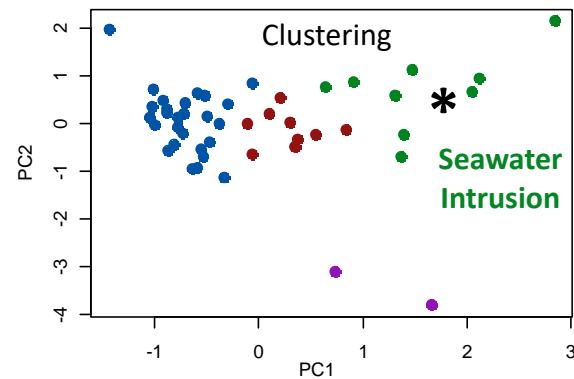
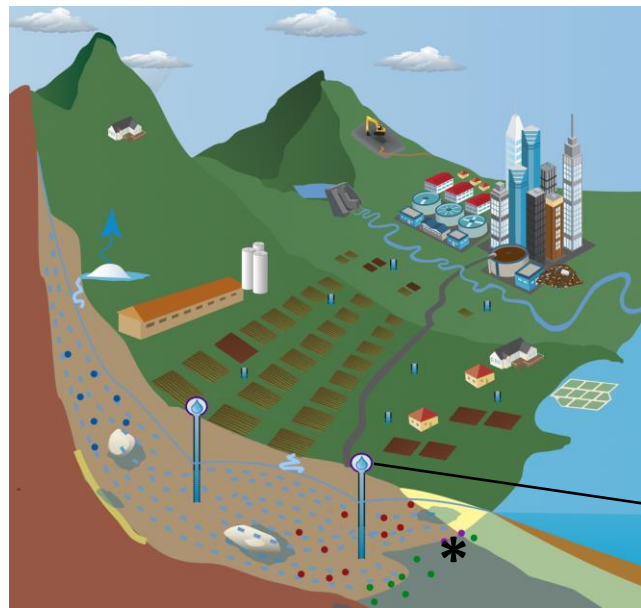
Coastal groundwater pattern recognition supported by cluster analysis

Christian Narvaez-Montoya, Jürgen Mahlknecht, Juan Antonio Torres-
Martinez, Abrahan Mora, Guillaume Bertrand



Clustering in costal groundwater pattern recognition

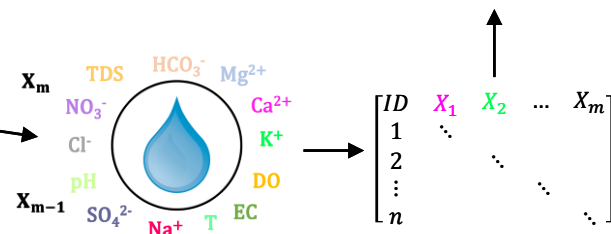
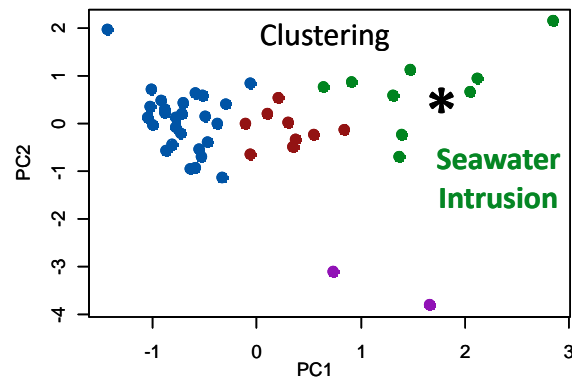
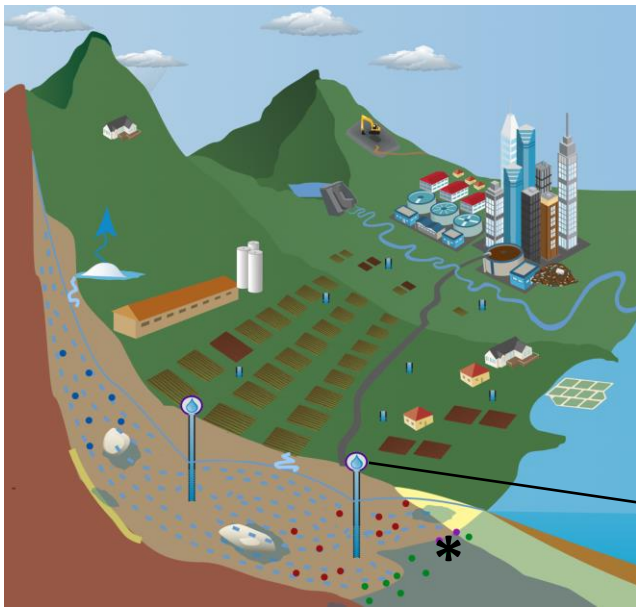
Groundwater management and policies depend on the **understanding** of the sources and mechanism of groundwater systems.



81 case studies was got from a systematic review (PRISMA method) from 2000 to 2022.

Clustering in costal groundwater pattern recognition

Groundwater management and policies depend on the **understanding** of the sources and mechanism of groundwater systems.



Data clustering



Pattern recognition

Geographical map
Compositional plots
Descriptive statistics



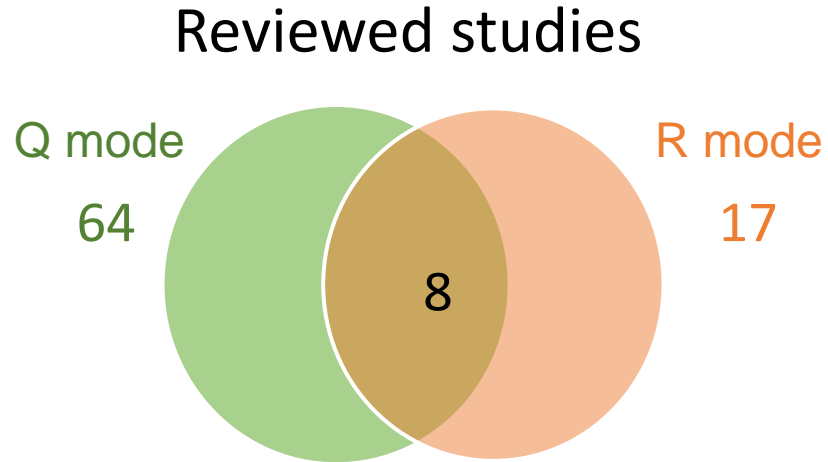
Sources identification &
Pollution outbreaks



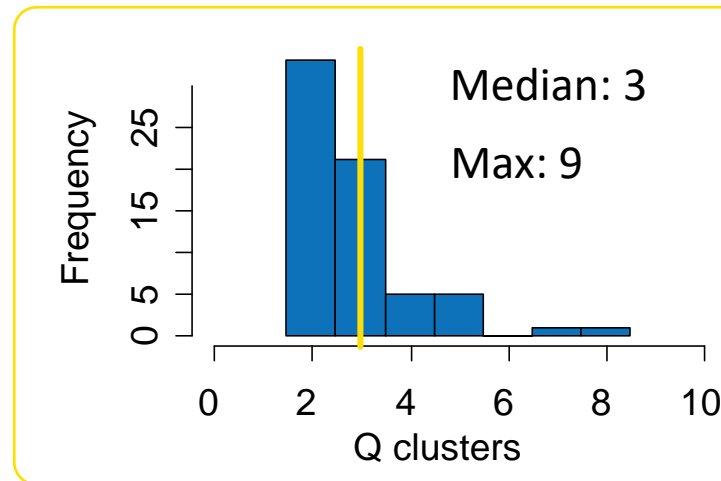
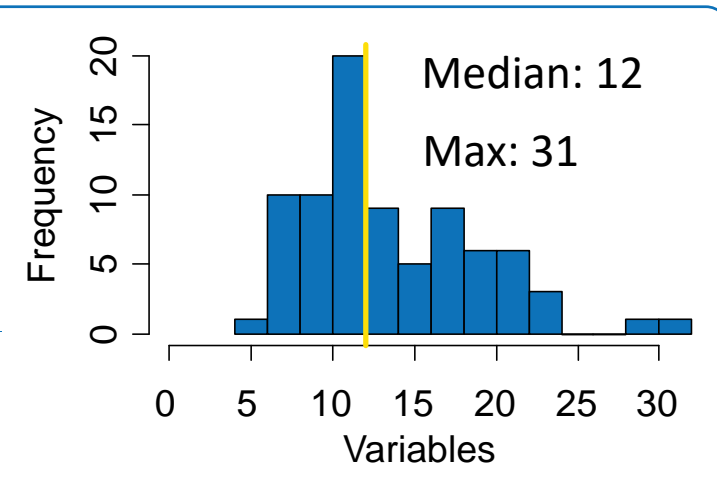
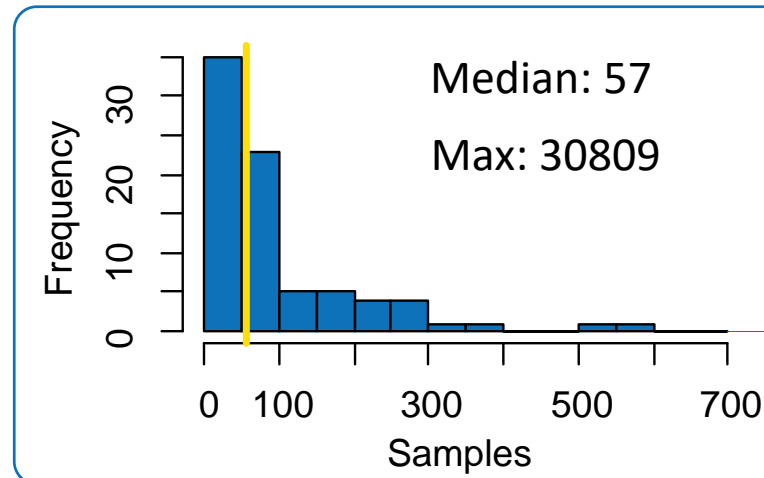
Water management
Decision-making



Reviewed studies: techniques and data



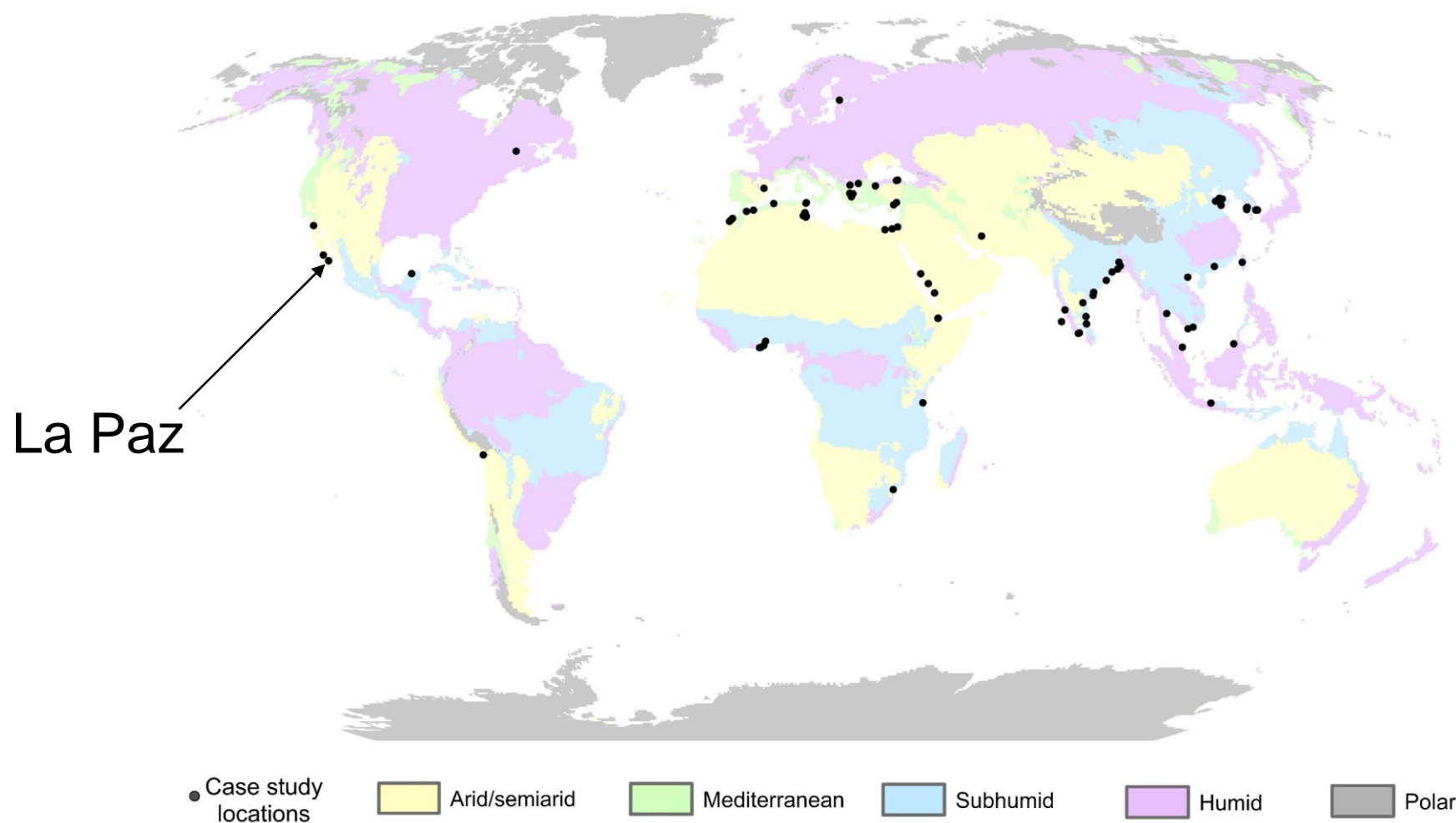
- Hierarchical clustering (HCA)
- K-means
- Fuzzy C-means (FCM)
- Self-Organizing map (SOM)



Number of Q clusters?

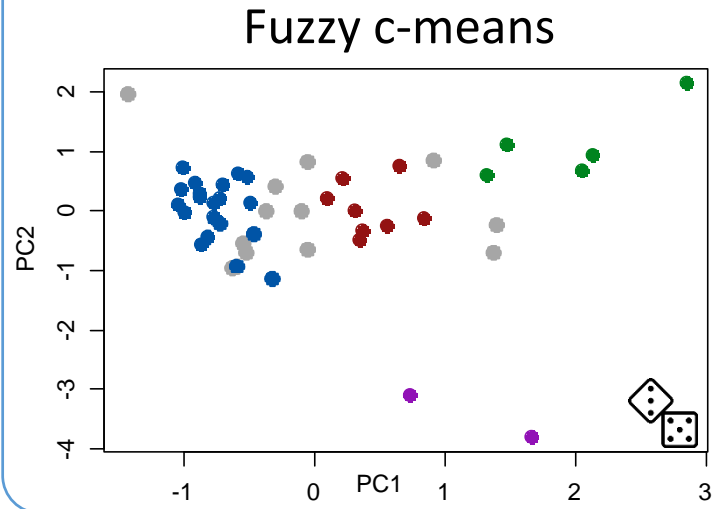
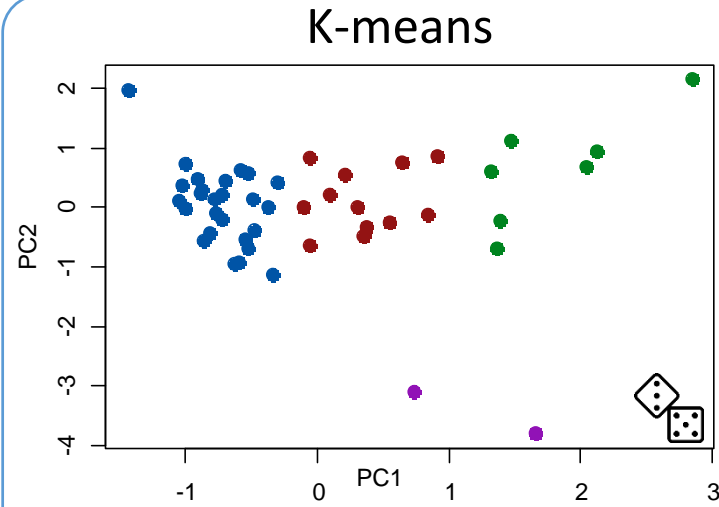
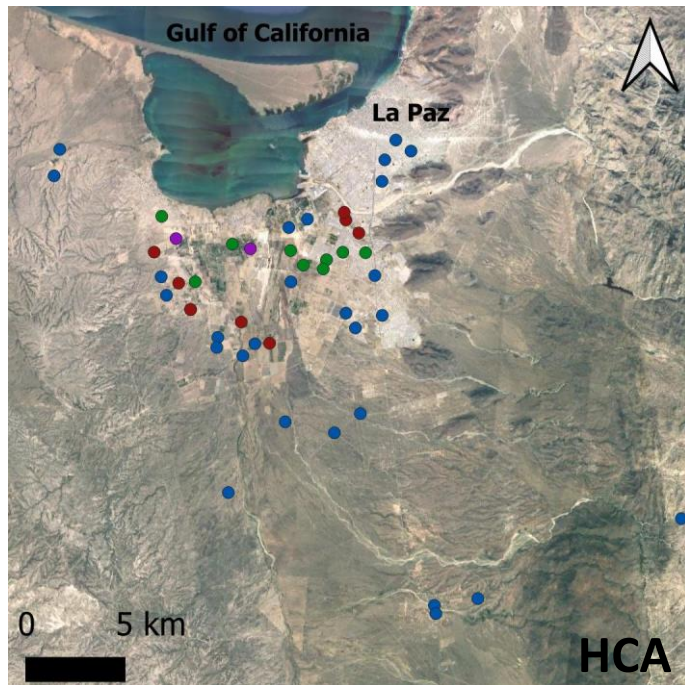
Researches' judgment

Clustering comparison (La Paz case study)

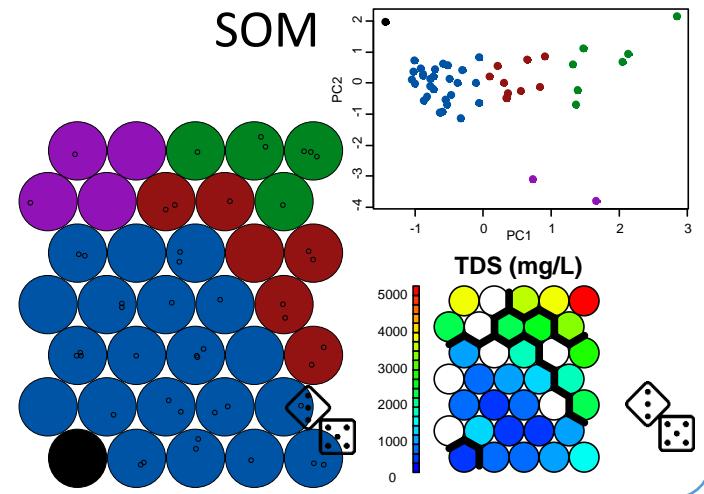
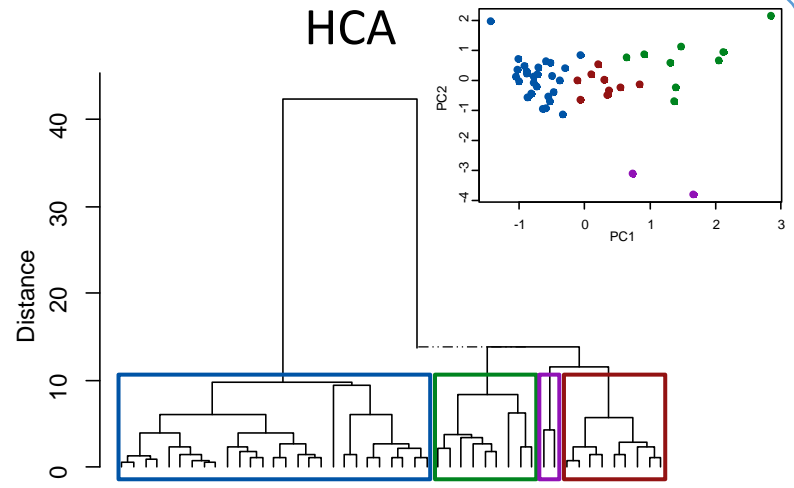


Clustering comparison (La Paz case study)

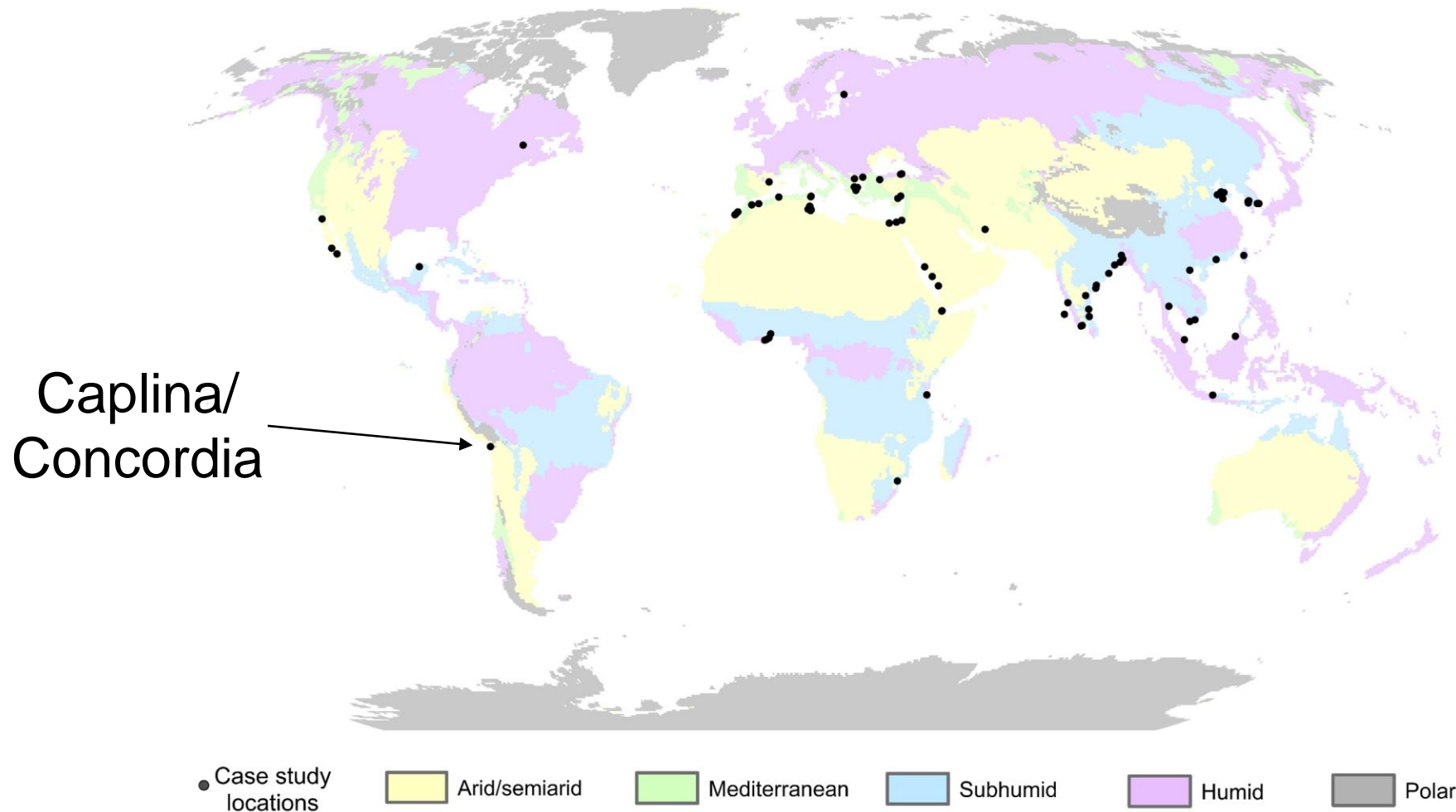
2013 sampling campaign
47 samples, 13 variables:
Ph, major ions, TDS, EC



- C1
- C2
- C3
- C4
- C5
- Fuzzy

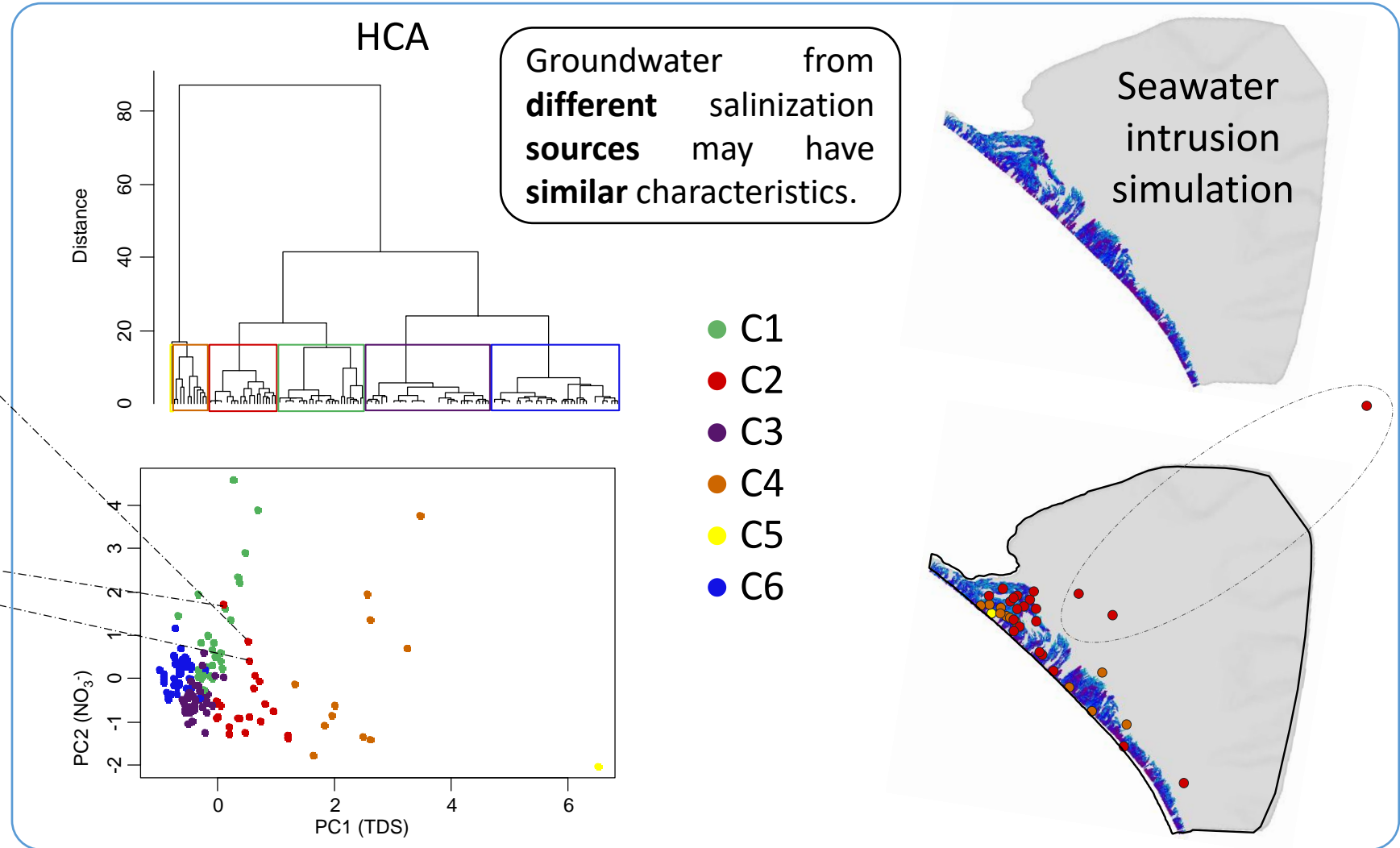
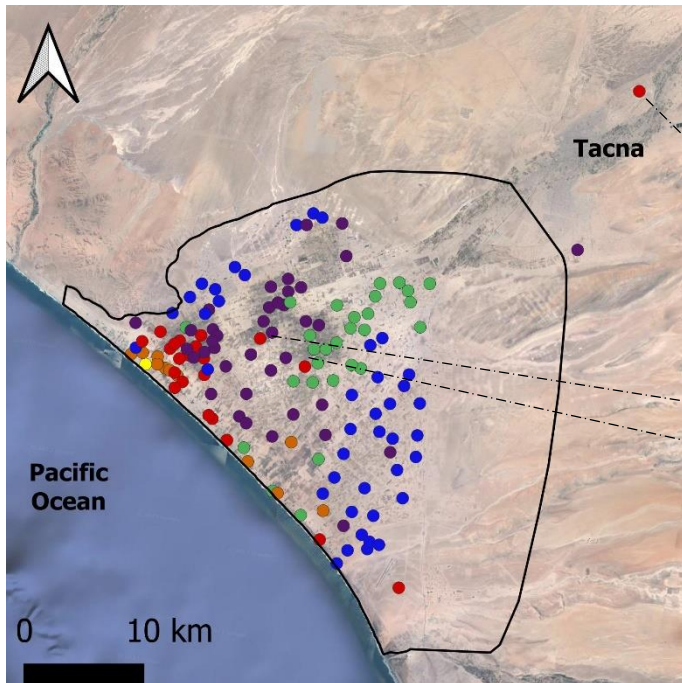


The similarity issue (Caplina/Concordia case study)



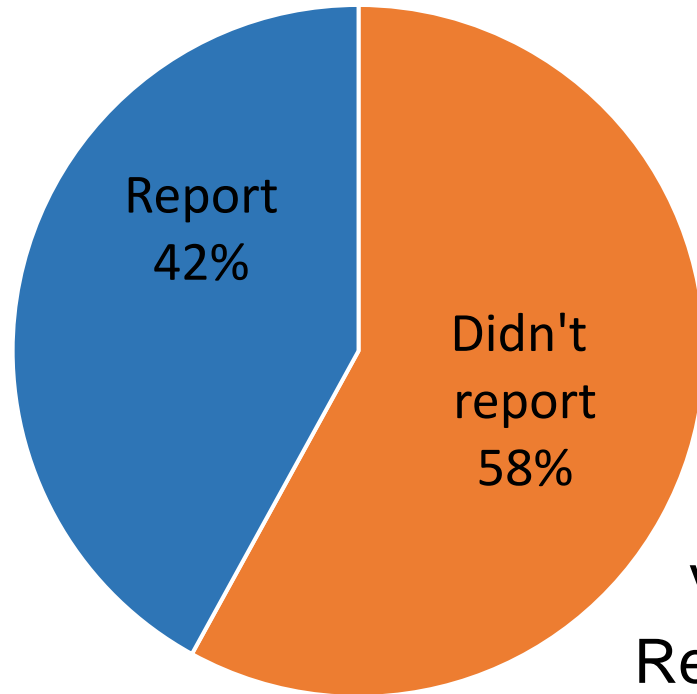
The similarity issue (Caplina/Concordia case study)

2016 sampling campaign
47 samples, 9 variables:
Major ions

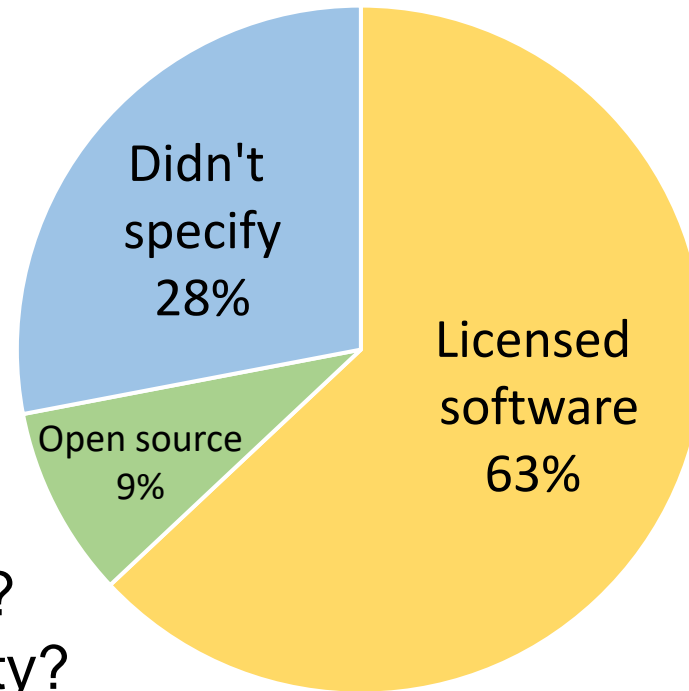


Open research

Data

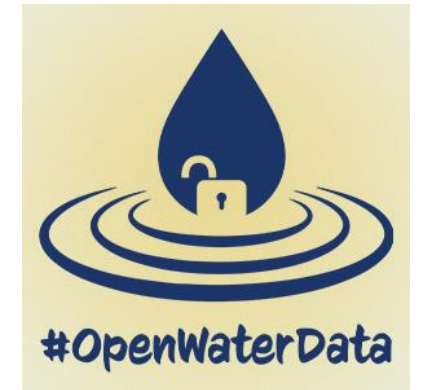


Methods



Verifiability?
Reproducibility?

Support management plans
without access to the information?



Thank you



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Review

Seawater intrusion pattern recognition supported by unsupervised learning: A systematic review and application

[Christian Narvaez-Montoya](#)^a, [Jürgen Mahlknecht](#)^a  ,
[Juan Antonio Torres-Martínez](#)^a, [Abrahan Mora](#)^b, [Guillaume Bertrand](#)^{c d}



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