

MAR to Mitigate Intensive Aquifer Exploitation

Insights From Los Arenales Aquifer (Spain)



PRESENTER:
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BACKGROUND

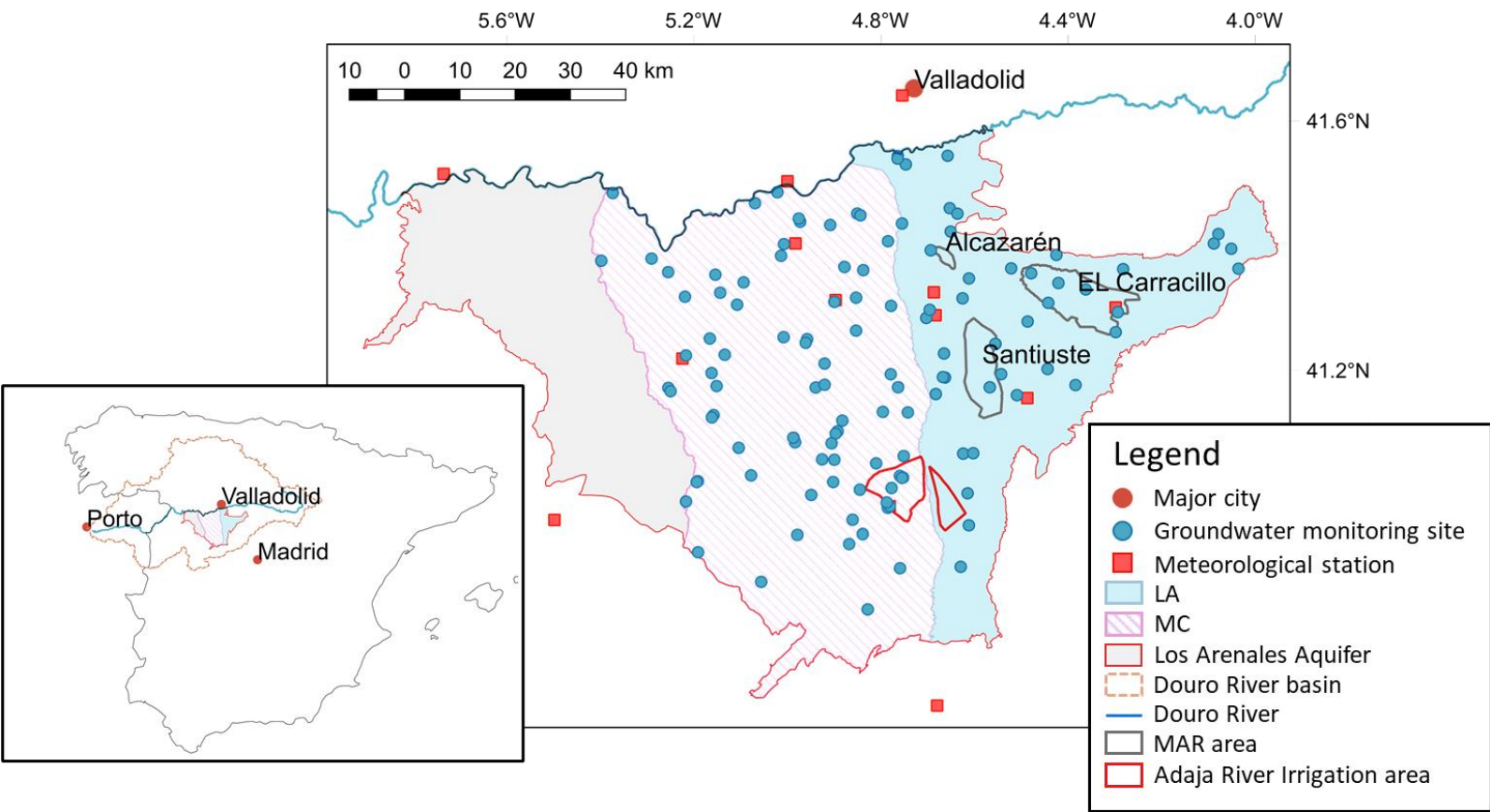
Los Arenales Aquifer has been intensively exploited for agricultural irrigation since the second half of the 20th century (up to -1.1 m/year)

OBJECTIVE

Evaluate if managed aquifer recharge (MAR) has helped palliate groundwater stress in Los Arenales Aquifer

METHODS

Compared groundwater level evolution between two water management regions within Los Arenales Aquifer: Los Arenales (LA) (implemented MAR in 2002) and Medina del Campo (MC) (No MAR before 2020)

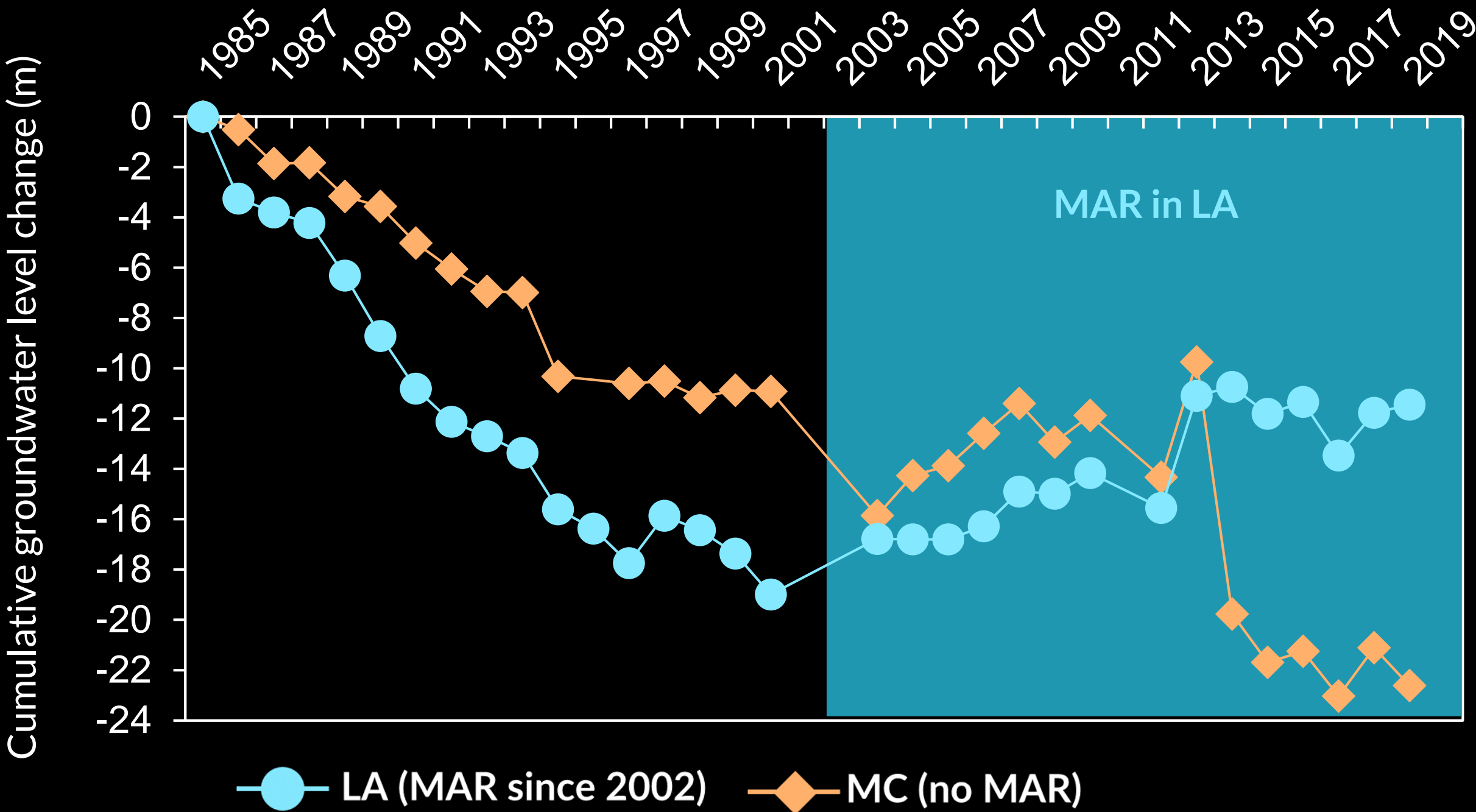


Analysis of **groundwater level trends** and variables that could explain the observed changes in groundwater levels: **MAR, groundwater abstractions, land use, cropping patterns, and water governance dynamics**

MAR in LA: three major areas (Santiuste, El Carracillo and Alcazarén)

- Main water source: winter river surpluses
- 21 infiltration basins
- ~50 km of infiltration channels
- Six artificial wetlands (improve water quality)

MAR contributes replenishing stressed aquifers thanks to additional recharge and water governance dynamics



MAR in LA

Supplies more than 10% of irrigation demands



MAR irrigation communities

- Cooperate to control water demand
- Ease innovation to cope with dry years, avoiding groundwater overdraft

RESULTS

From 1985 to 2001, ~100% of statistically significant **groundwater level trends** decrease in LA and MC. From 2012 to 2020, ~75% of the trends in LA are increasing, while ~75% of the trends in MC are decreasing

MAR provides at least 10% of irrigation demands in LA. Annual **groundwater abstractions** in LA are below recharge + returns since at least 2009, reflecting more control on water demand. No relevant changes in **land use** or **cropping patterns** were found

Water governance dynamics:

Two irrigation communities (gather farmers exploiting a common water source) created in **LA** to benefit from MAR. These communities foster:

- Direct communication with the local water authorities
- Negotiation of water rights (abstractions)
- Information transfer

The lack of irrigation communities in **MC** results in:

- Farmers acting on their own
- More illegal abstractions
- Less influence of the local water authority to introduce innovation, transfer knowledge, and control demand (Giordano et al., 2021)

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REFERENCES

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- Giordano, R., Máñez Costa, M., Pagano, A., Mayor Rodriguez, B., Zorrilla-Miras, P., Gomez, E., Lopez-Gunn, E., 2021. Combining social network analysis and agent-based model for enabling nature-based solution implementation: The case of Medina del Campo (Spain). Science of The Total Environment 801, 149734.
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