

# Towards a digital twin of the terrestrial water cycle

Oscar M. Baez-Villanueva, Luca Brocca, Christian Massari, and Diego Miralles (on behalf of the project consortia)

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We urgently need high precision decision-support systems to monitor and predict water-related environmental disasters and manage proactively our water resources

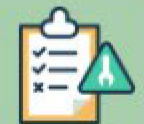
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Strive towards information-based decision-making processes



Optimise resources management



Evaluate synthetic scenarios

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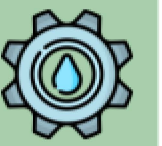
Evaluate synthetic scenarios

- Reliable data and information
- High-performance computing
- Advanced modelling strategies
- Accuracy

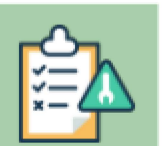
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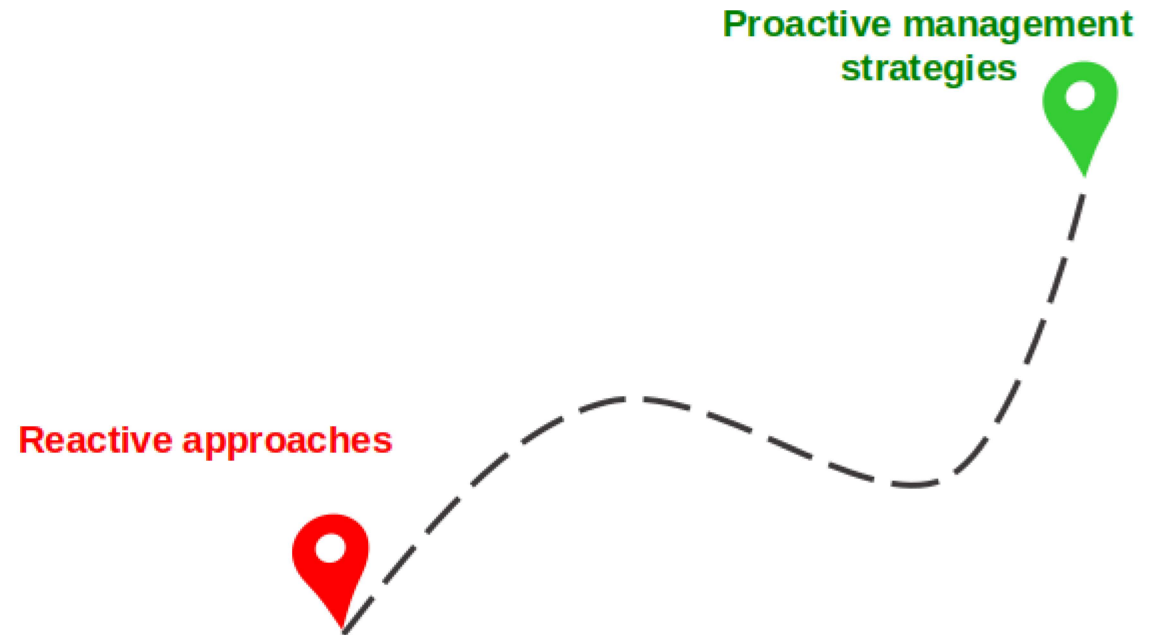


Optimise resources management



Evaluate synthetic scenarios

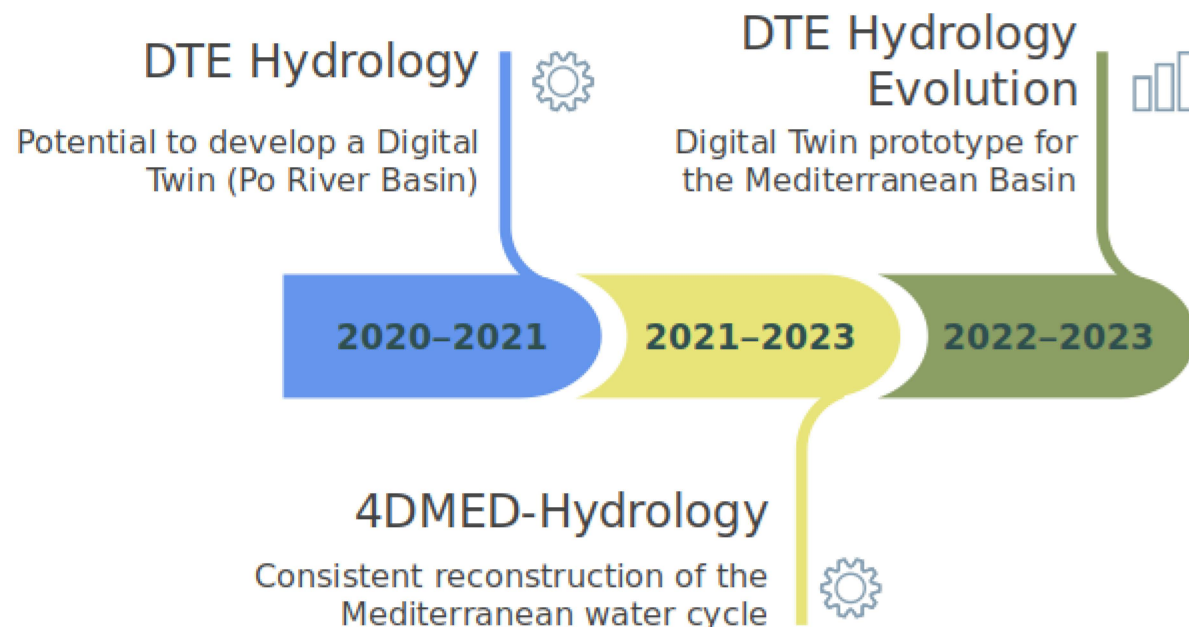
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## The Road so Far

Reconstruction of the hydrological cycle at high spatial and temporal resolution (Mediterranean region)

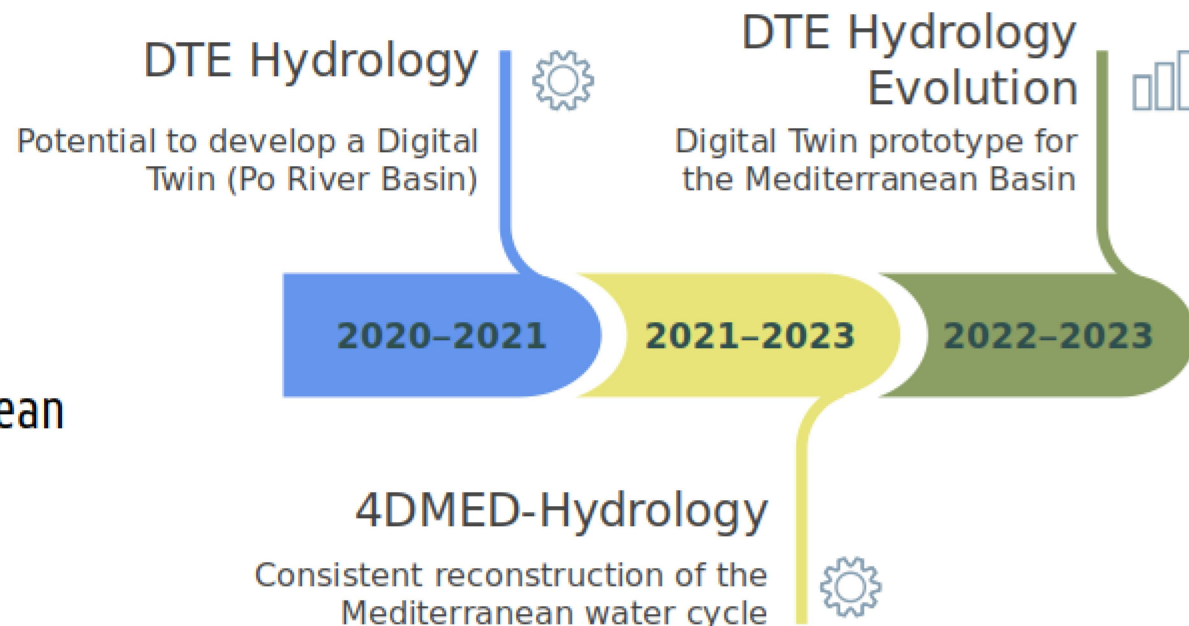


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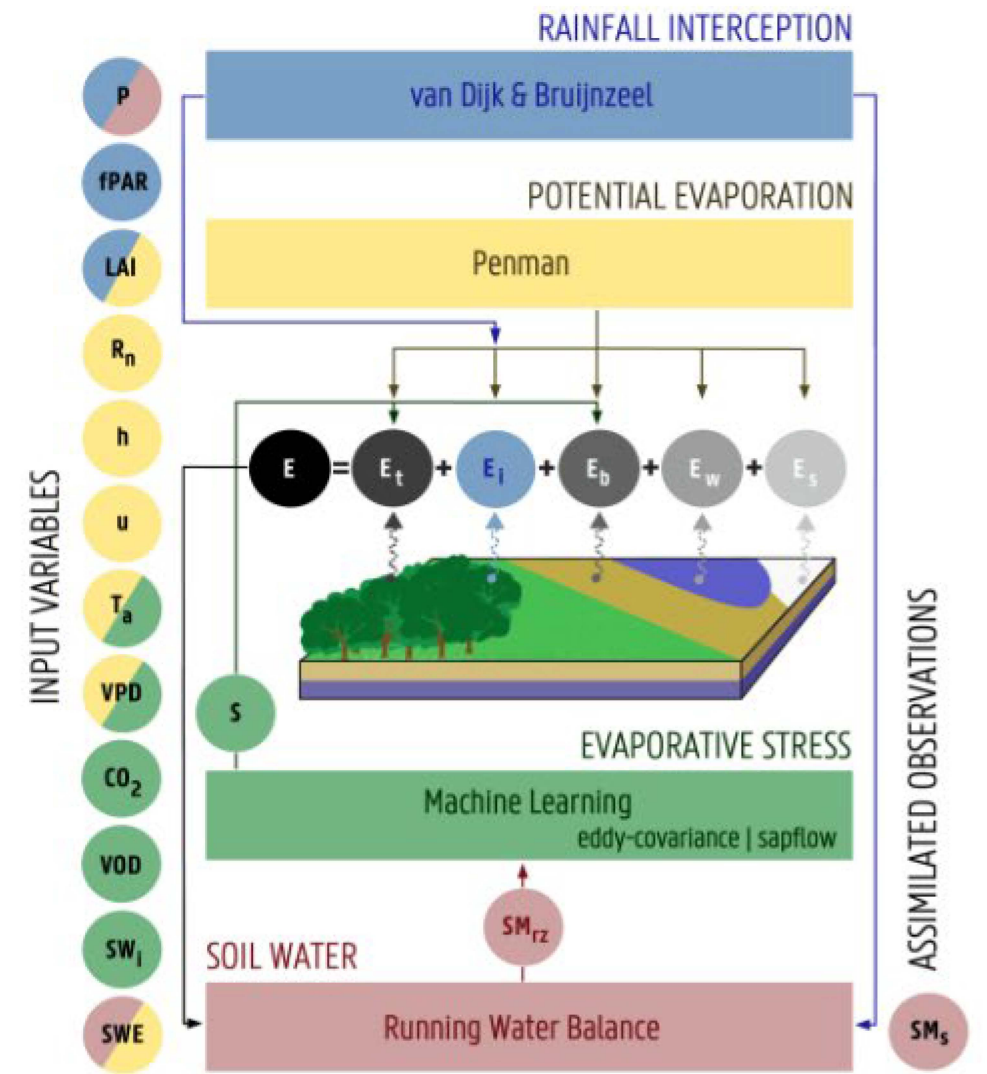
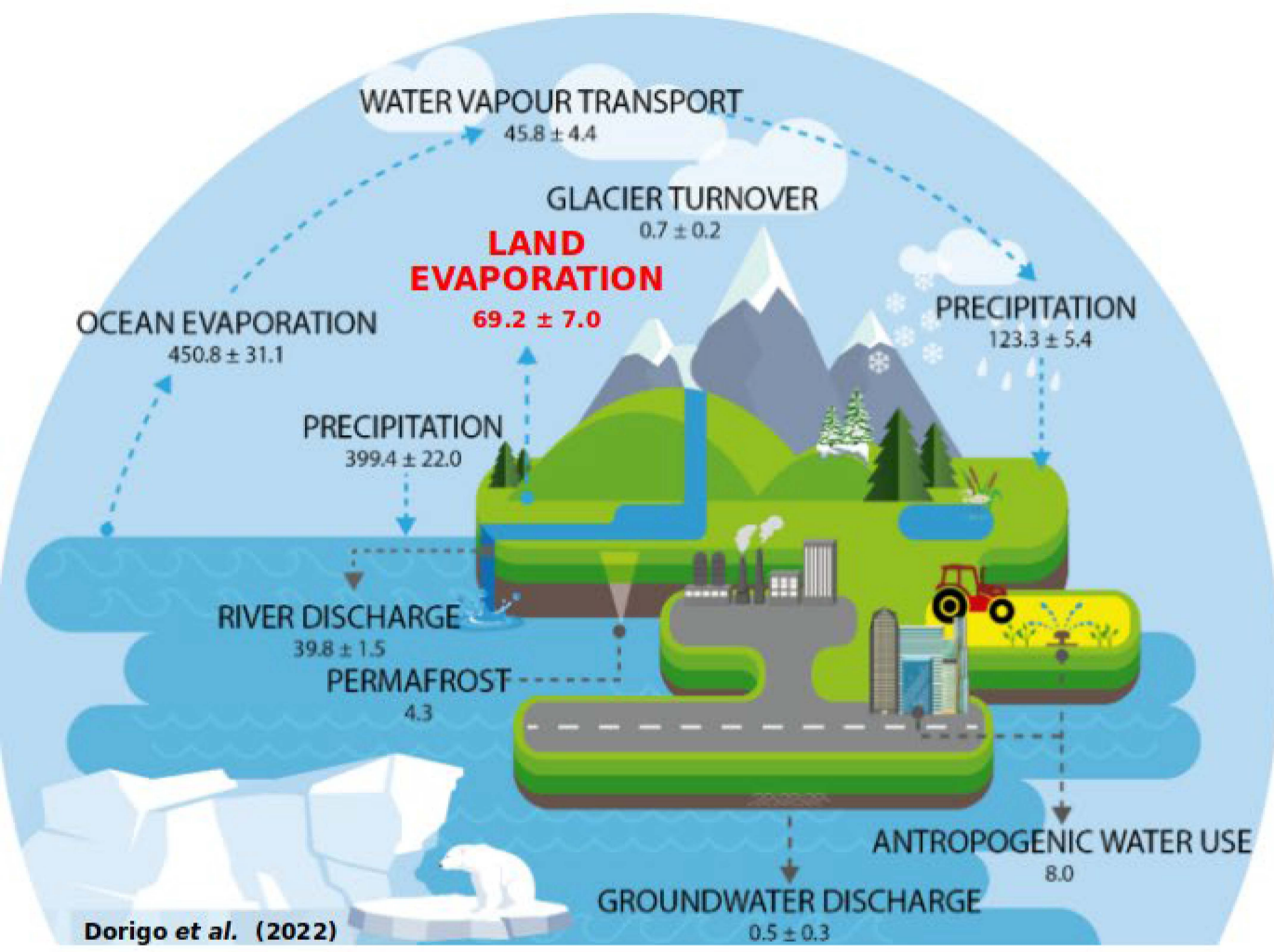
Digital Twin prototype for the entire Mediterranean basin, which can be used for the:

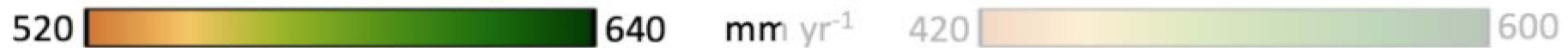
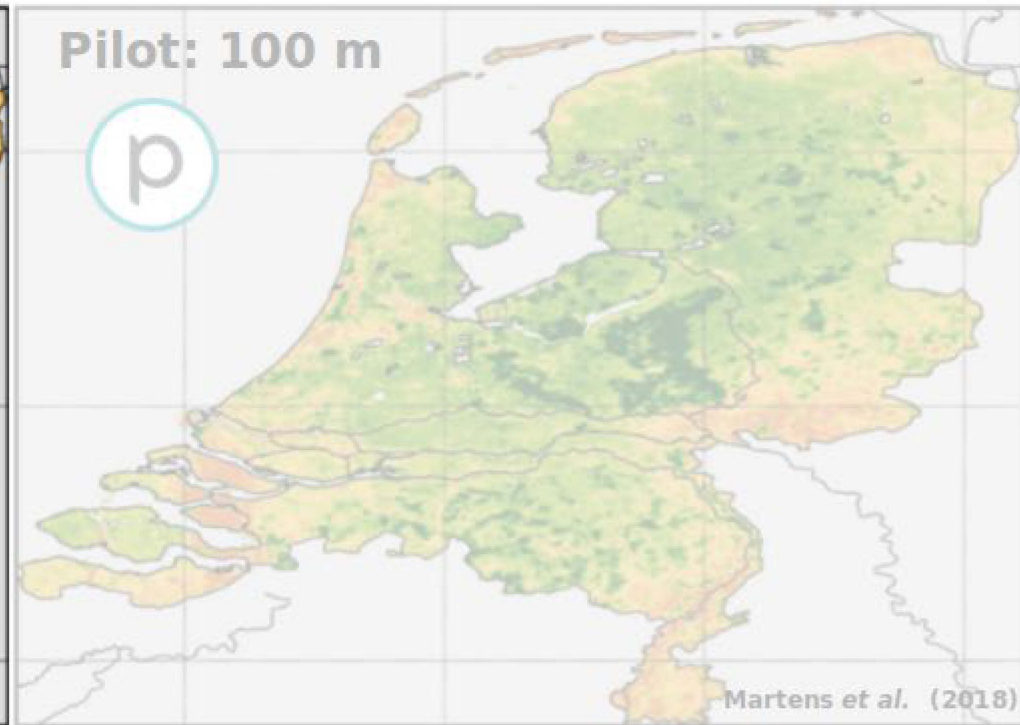
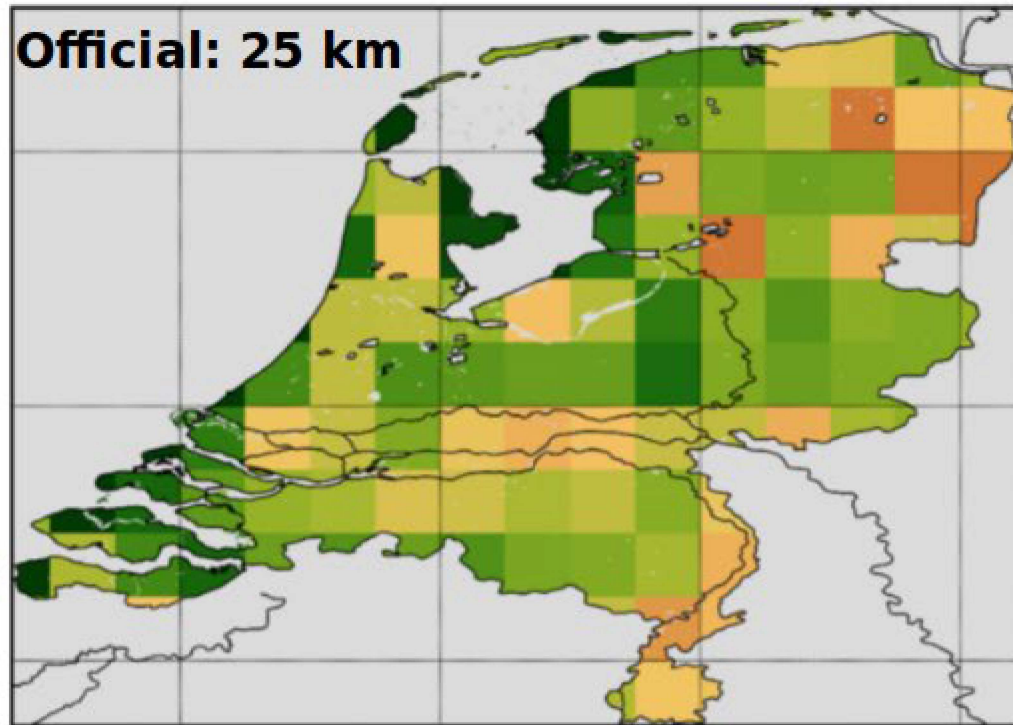
- a) Prediction of hydrological extremes
- b) Analysis of plausible changes in the system
- c) Development of proactive water management strategies









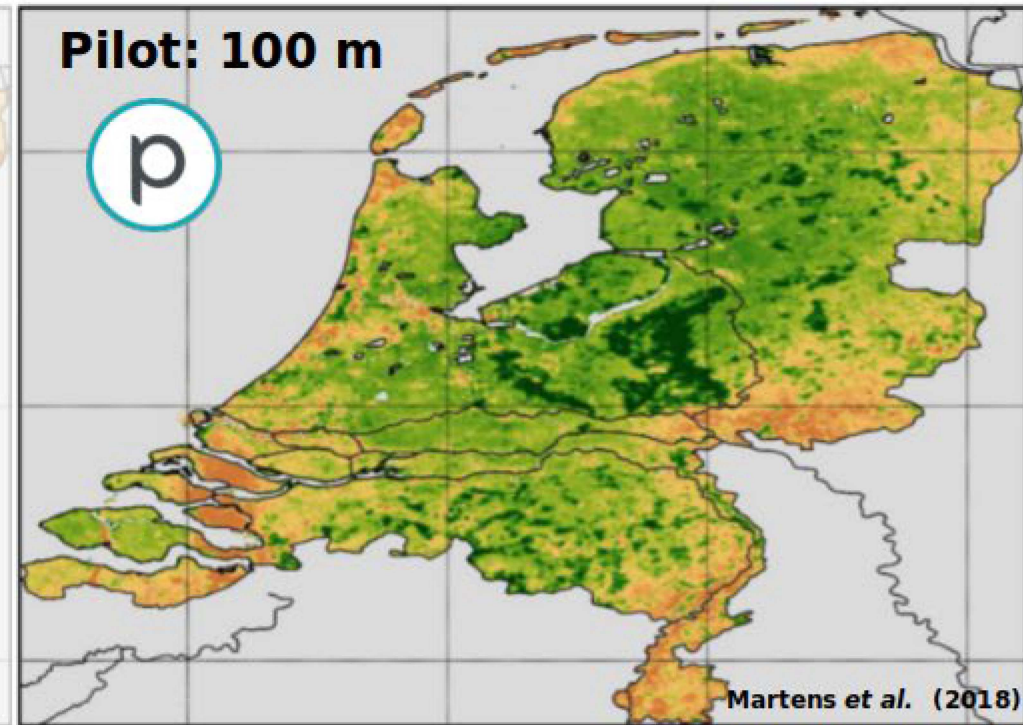
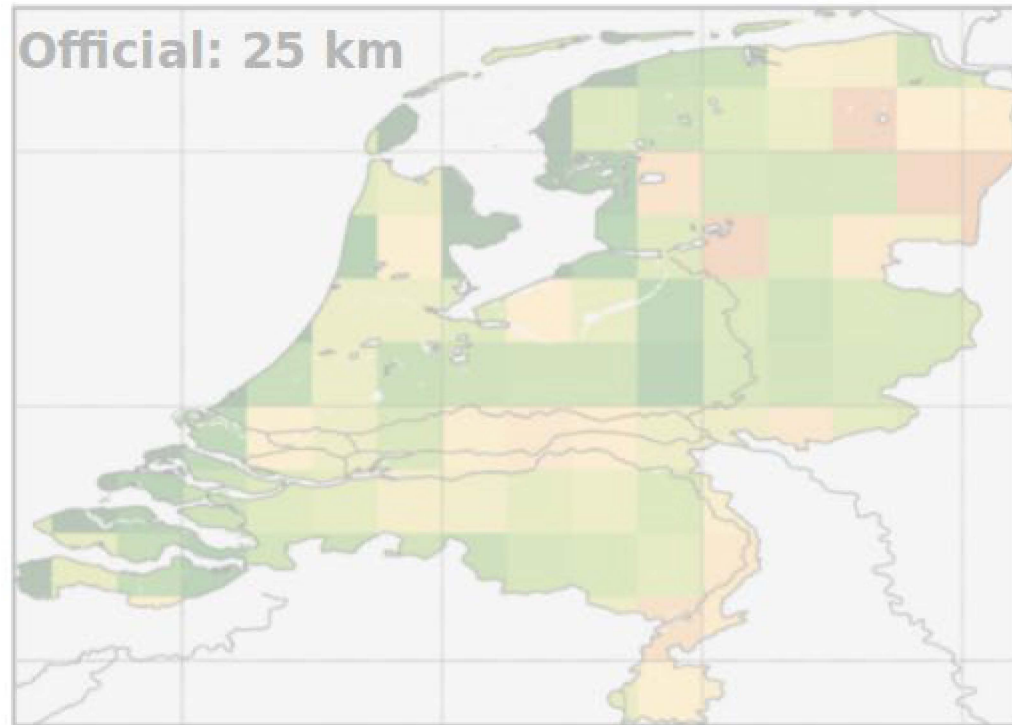


😊 Climate change diagnosis

😊 Hydroclimatic extremes

😞 Water resources management

😞 Agricultural practices and food security



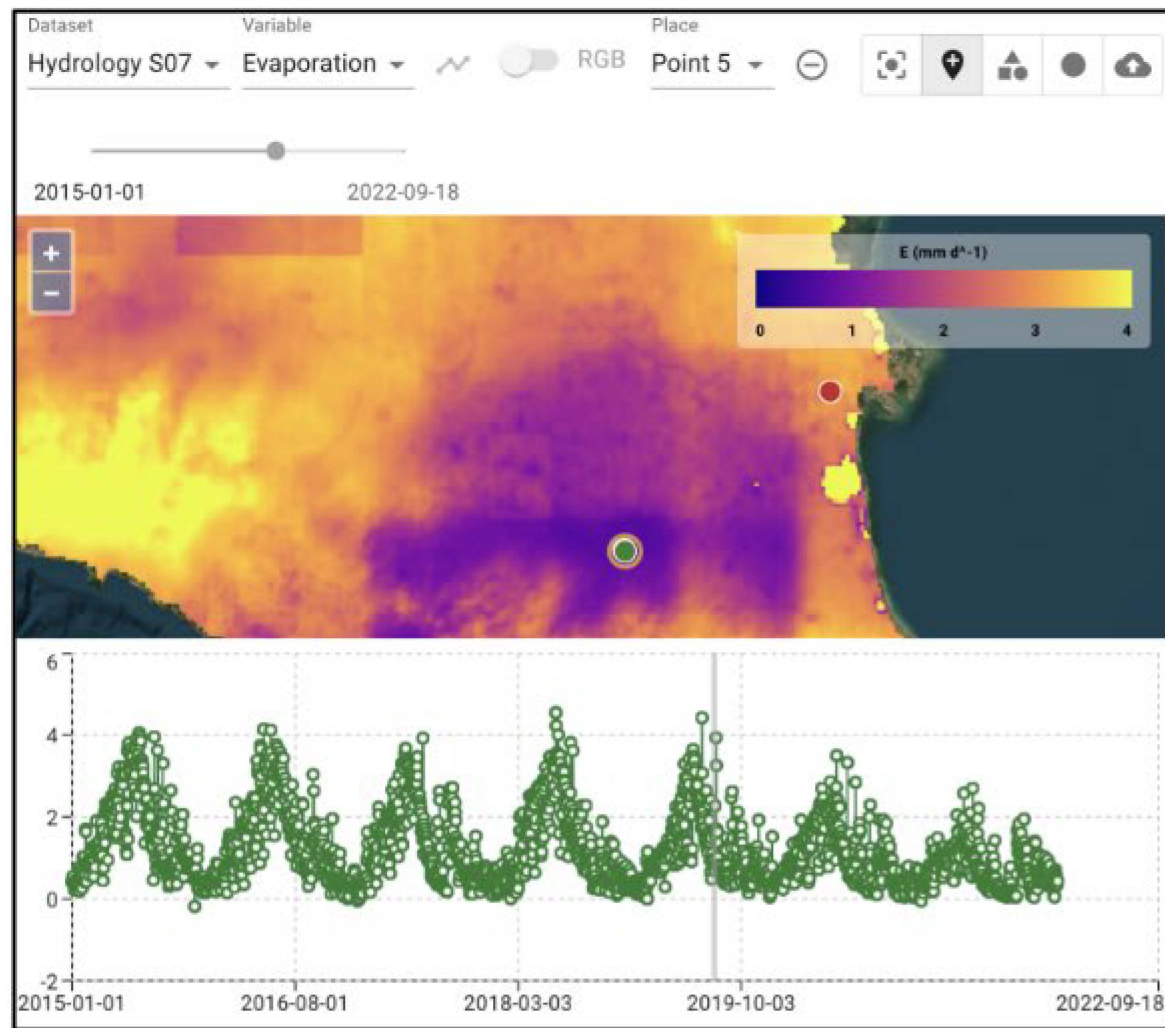
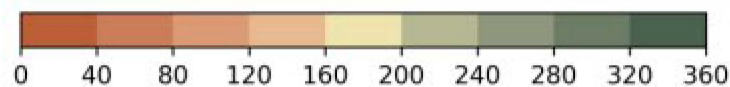
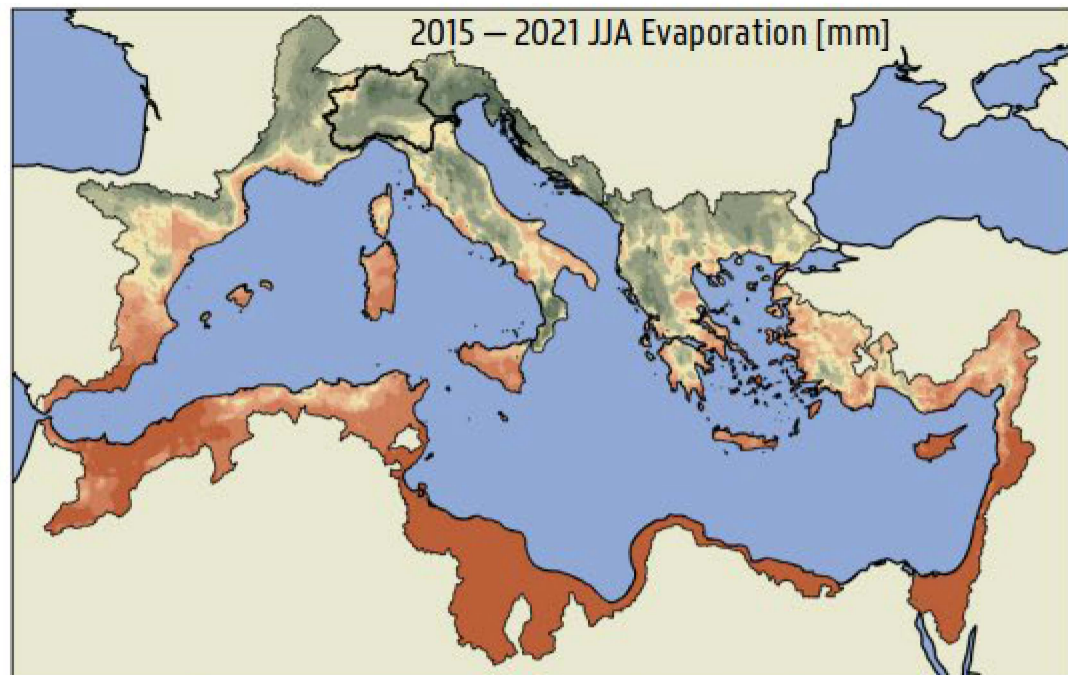
520 640 mm yr<sup>-1</sup> 420 600

☺ Climate change diagnosis

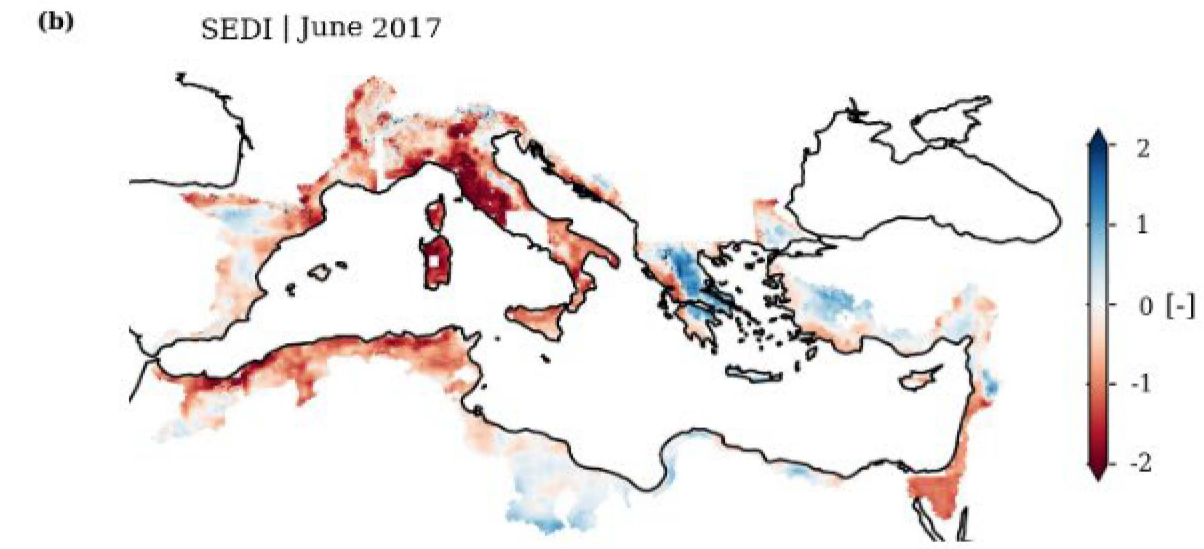
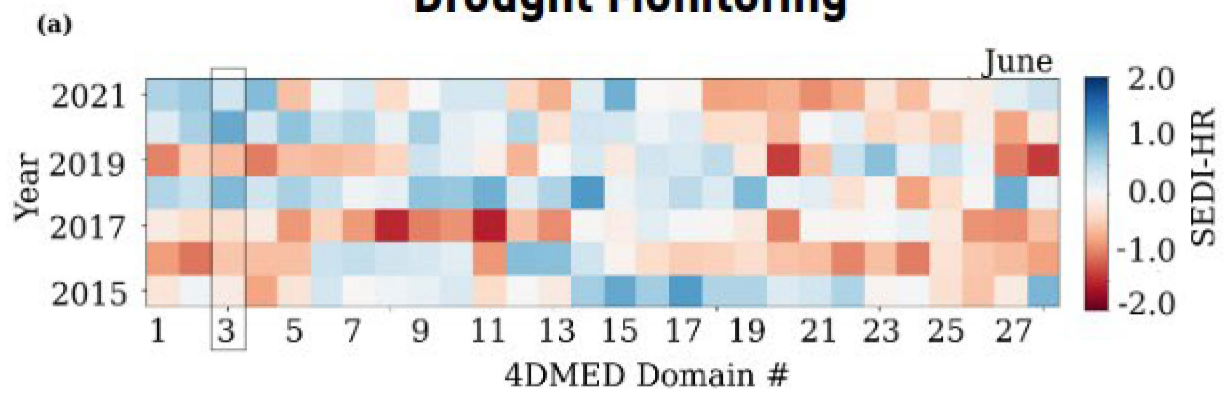
☺ Hydroclimatic extremes

☺ Water resources management

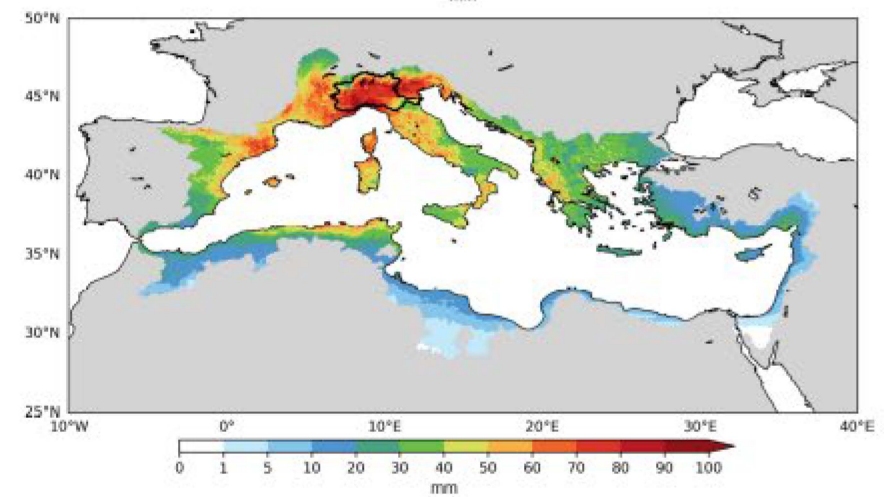
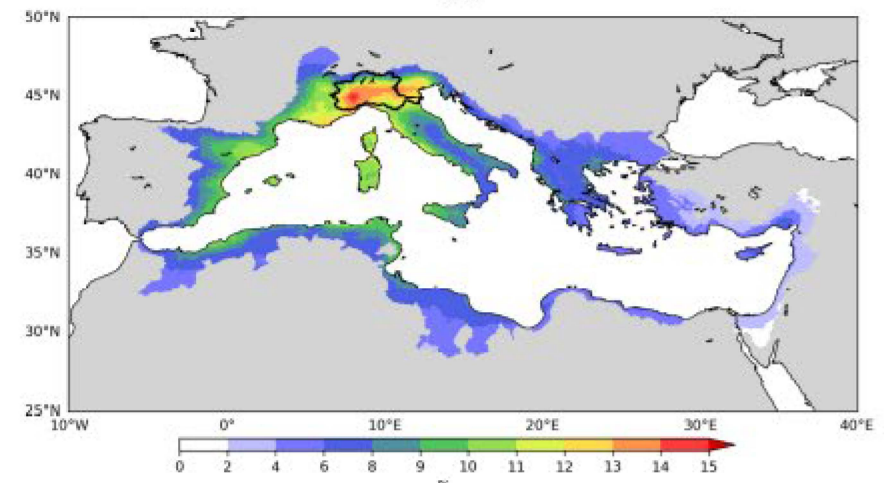
☺ Agricultural practices and food security



### Drought Monitoring



### Moisture Recycling



## Overall objective:

To yield a first-of-its-kind, high-resolution, high accuracy, gap-free, evaporation and root-zone soil moisture dataset over the Meteosat Disk that considers the influence of irrigation



Two STEREO projects

ET-Sense

HERMES

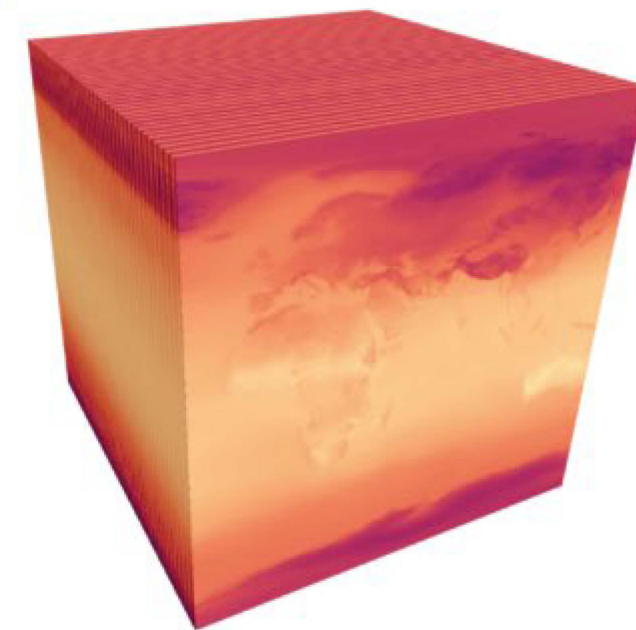


Coverage:  
Meteosat disk

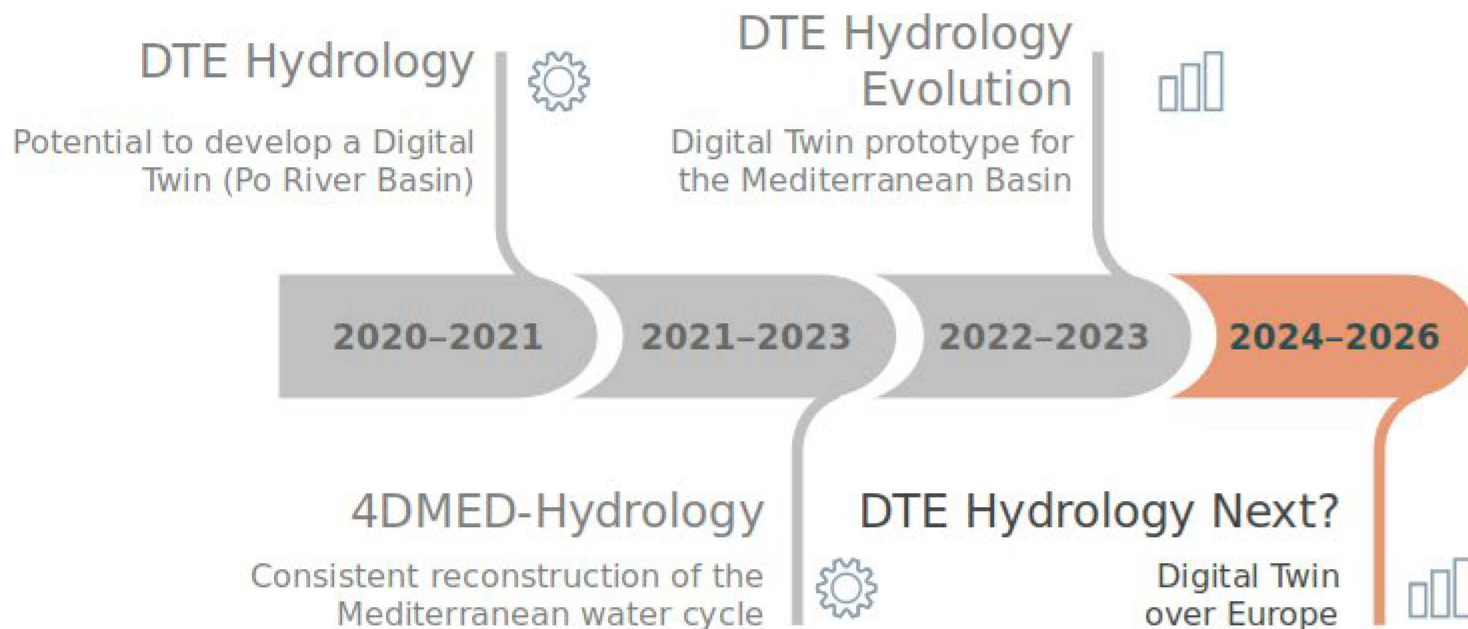
Lon: 80°W – 80°E  
Lat: 80°N – 80°S

Temporal resolution:  
Daily

Spatial resolution:  
1 kilometer



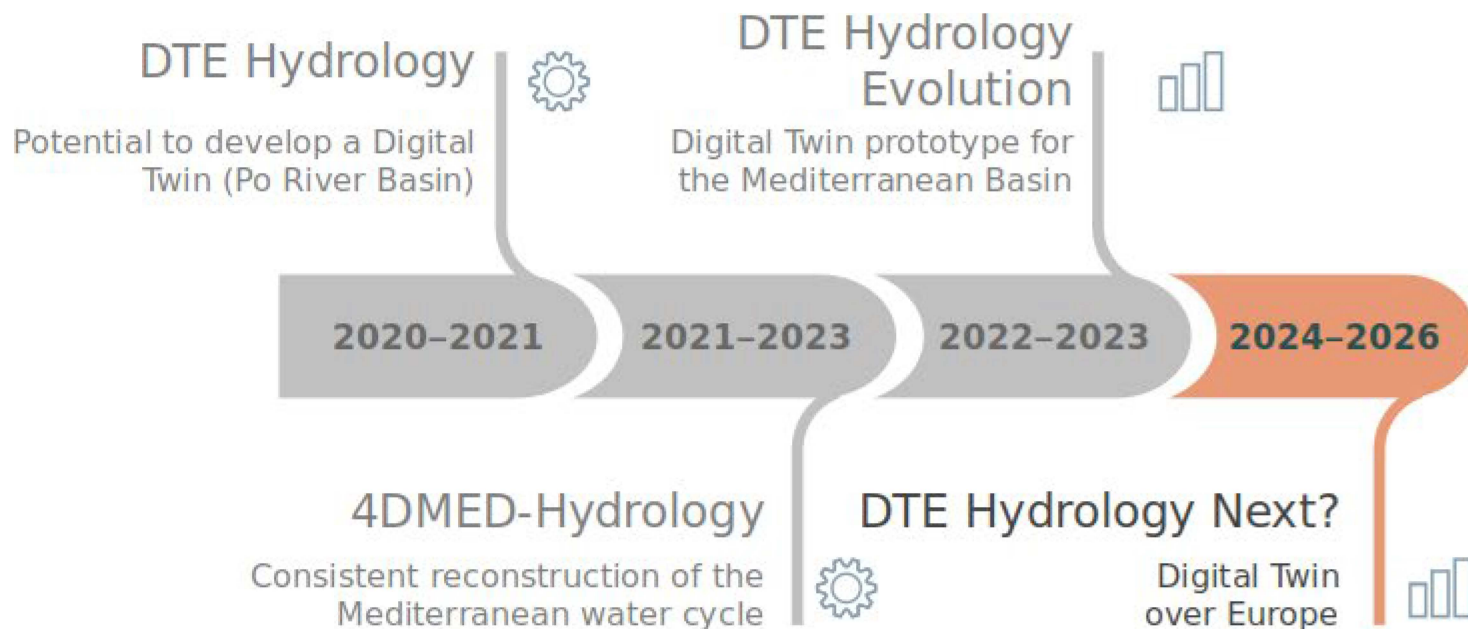
## Development of a Digital Twin of the water cycle over Europe





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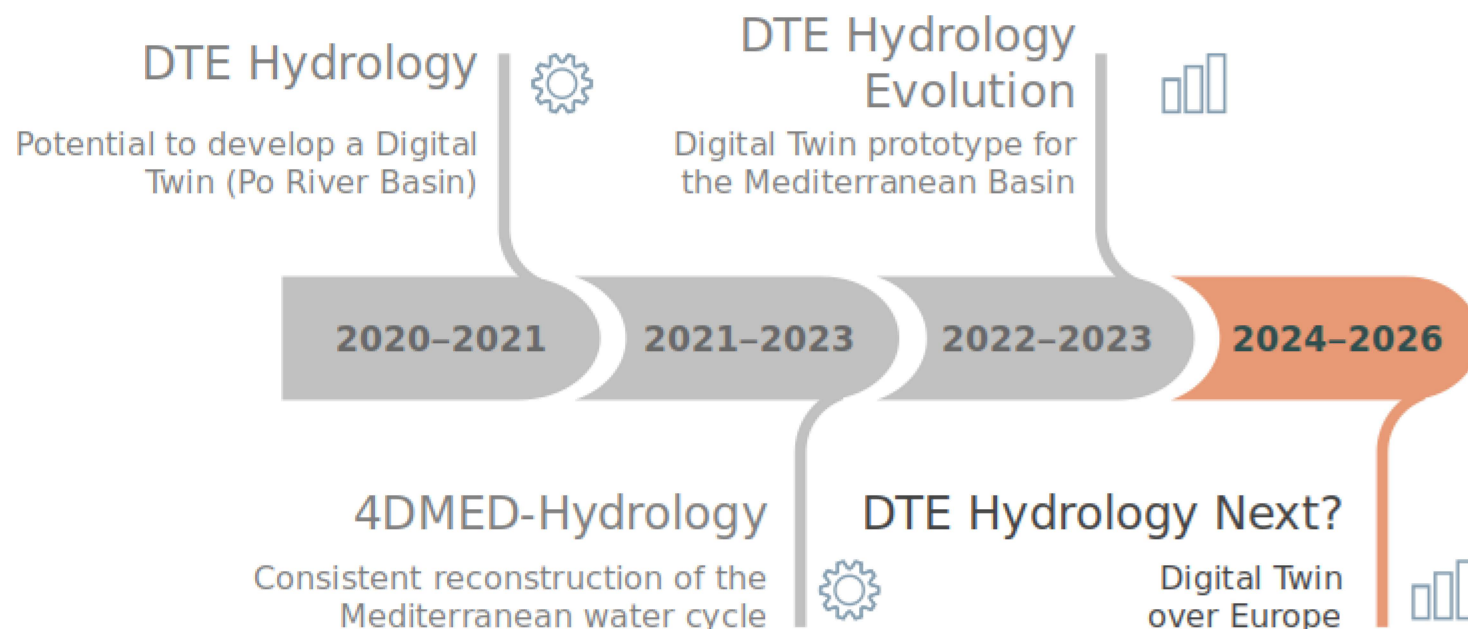
Additionally, test the framework in case studies of Africa and Central America



Development of a Digital Twin of the water cycle over Europe

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Cloud-based infrastructure for retrieval of datasets, visualisation purposes, and full interaction with simulations





Hasselt, Belgium  
14 | 05 | 2024

# Belgian Earth Observation Day 2024

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