Photography encouraged

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DAHM-Reservoir: An agro-hydrological model for agricultural catchment with small water reservoirs

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Occitanie

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Small water reservoirs

- Small dams storing water;
- Capacity less than **1 million m^3**;
- Several modes of water inflow;
- Various uses:
  - **Agricultural irrigation;**
  - Flood prevention;
  - Low-flow support;
  - Leisure;
  - Other uses.

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Operational issues

Development of small water reservoirs have an impact on:

Agriculture: What benefits?

Environment: What impacts on flow regime?

Water management: What strategy in planning dam construction and managing reservoir?

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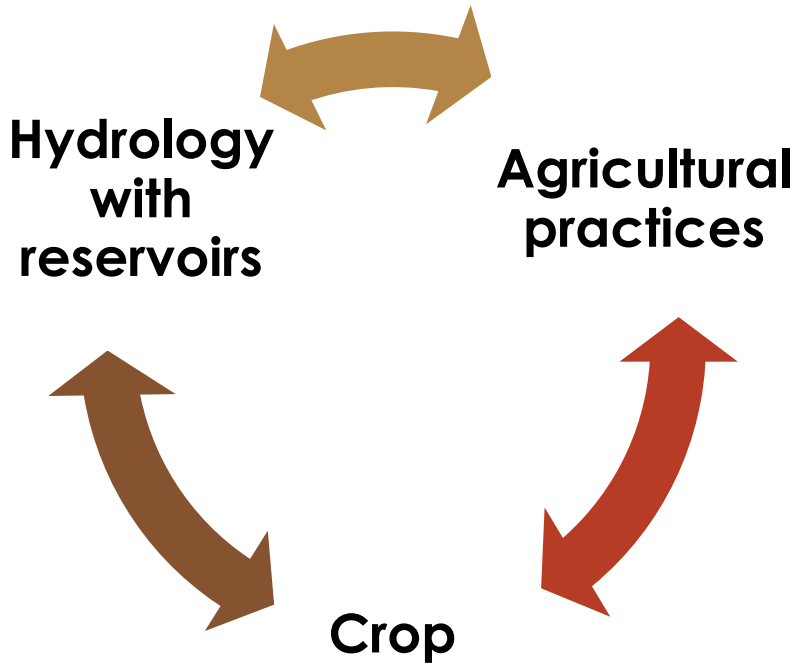
State of the art of models integrating multiple reservoirs



- Agriculture and technical operations (irrigation) taken as forcing variables;
- No explicit spatial relation between reservoirs and crop fields.

Need to study these model limits (Habets *et al.*, 2018).

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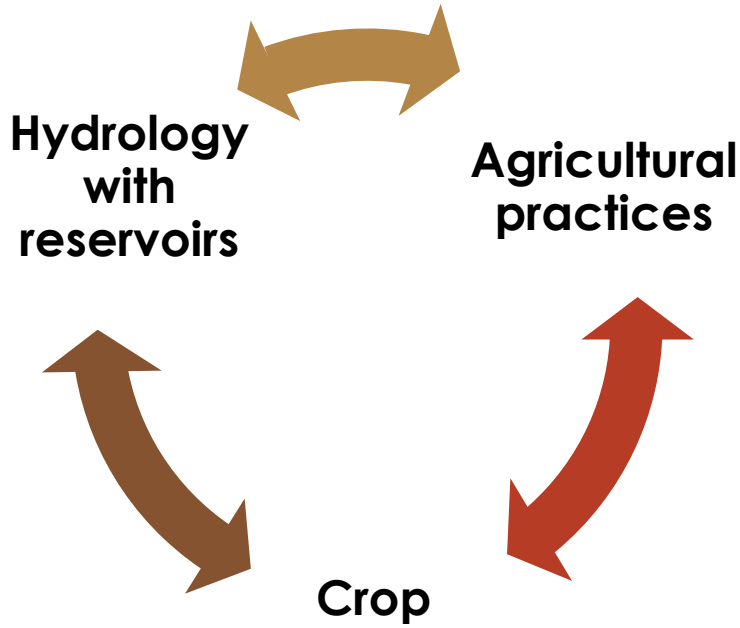
Objectives

Present an agro-hydrological catchment model, distributed (at field resolution) coupling:



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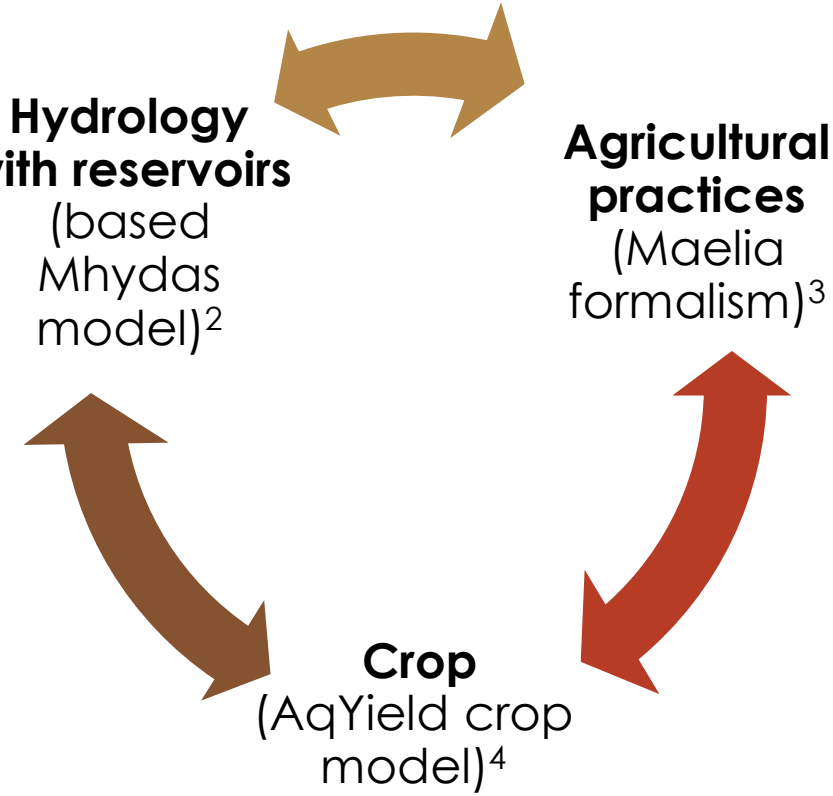
DAHM-Reservoir: a Distributed Agro-Hydrological Model for Reservoir

OpenFLUID
Software Environment
for Spatial Modelling in Landscapes

Developed on OpenFLUID platform[1]



1. Fabre *et al.*, 2010; 2. Moussa *et al.*, 2002;
3. Therond, 2018; 4. Constantin *et al.*, 2015

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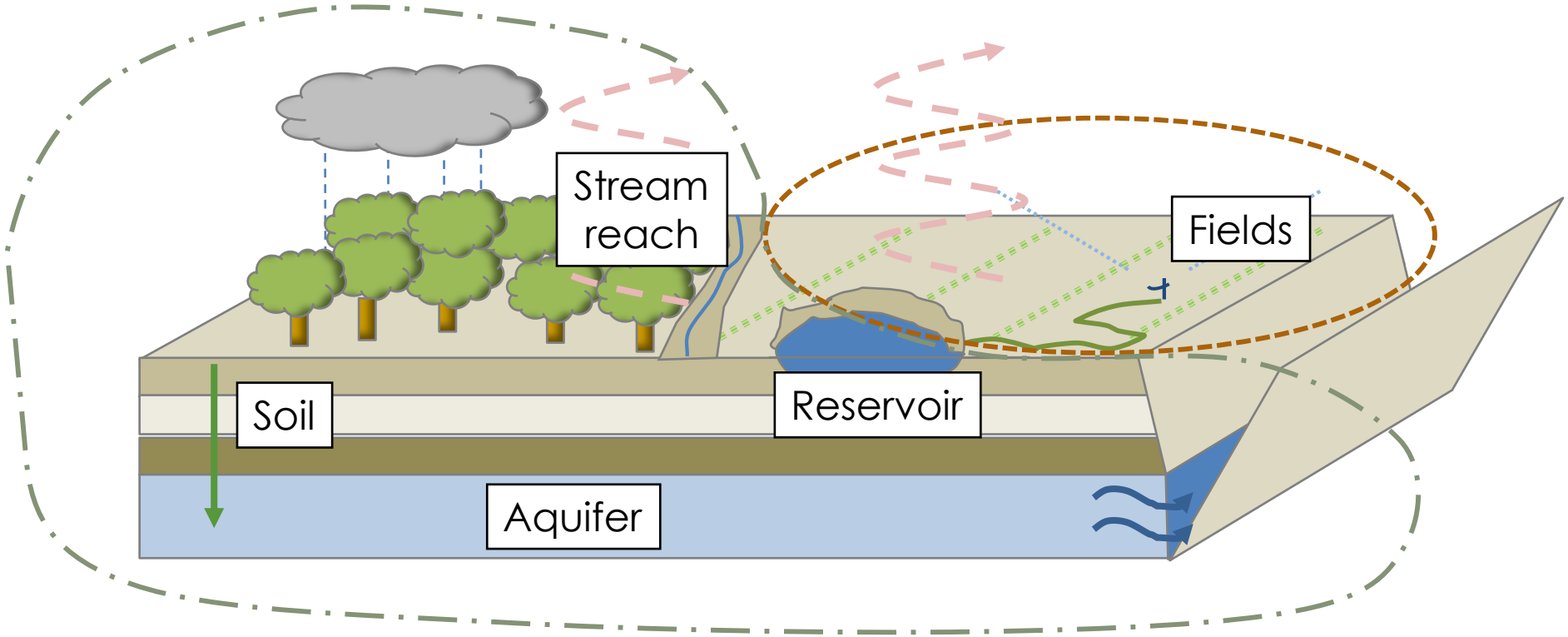
DAHM-Reservoir: Catchment component



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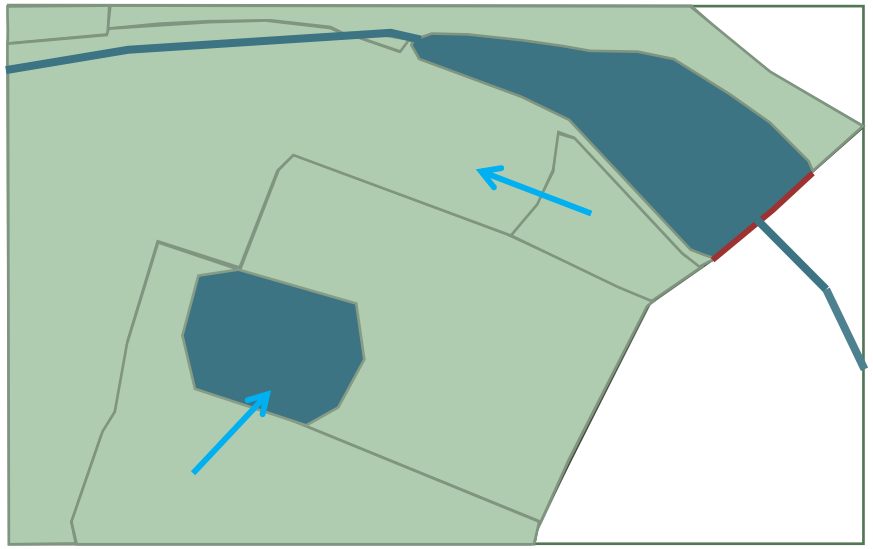
DAHM-Reservoir: Hydrological water flow

- Field → Field (runoff);
- Field → Reservoir (runoff);
- Reservoir → Stream reach (flow, overflow);
- Reservoir → Field (overflow);
- Field → Aquifer (infiltration, percolation);
- Field → Stream reach (runoff);
- Stream reach → Reservoir (flow);
- Stream reach → Stream reach (flow);
- Aquifer → Stream reach (baseflow).



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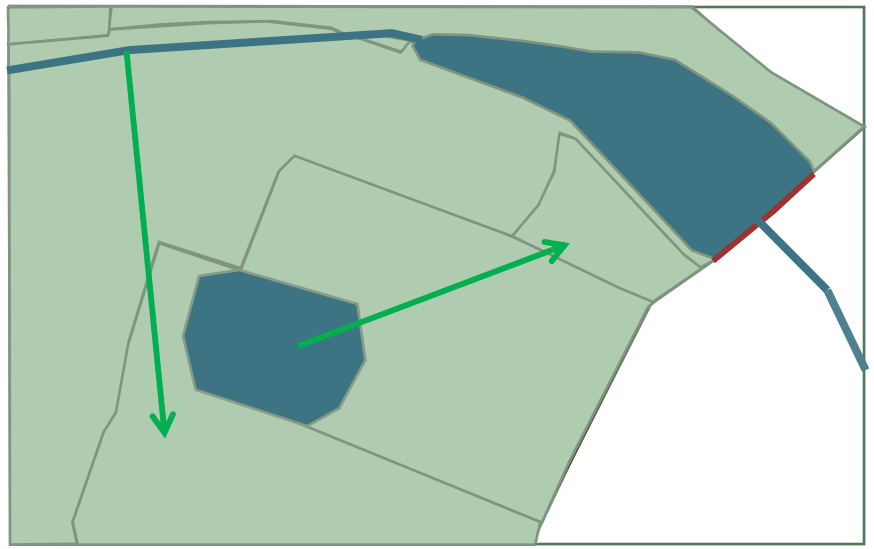
DAHM-Reservoir: Agricultural water flow



Field

Small water reservoir

Stream reach

- Reservoir → Field (irrigation);
- Stream reach → Field (irrigation).

Irrigation depends on simulated crop demand, available water and agricultural practices.

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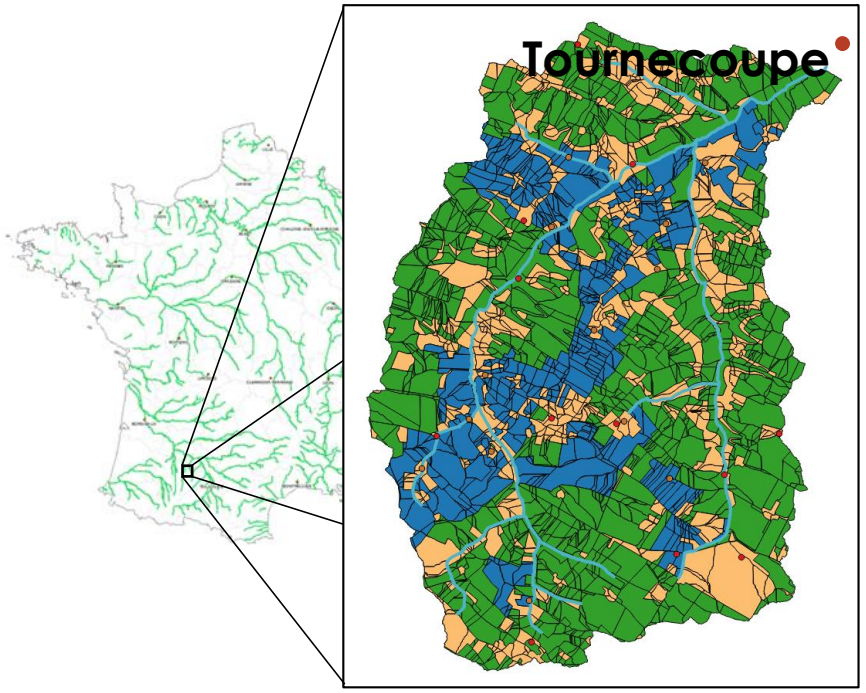
Illustration of DAHM-Reservoir benefits

Test characteristics:

- Catchment of 19.5 km^2 with:
  - 25 reservoirs, 13 of which used for irrigation;
  - 544 irrigated fields;
  - 1122 non-irrigated fields;
  - 736 uncultivated fields;
  - 365 stream reach.
- Rainy season.



Irrigated field

Non-irrigated field

Uncultivated field

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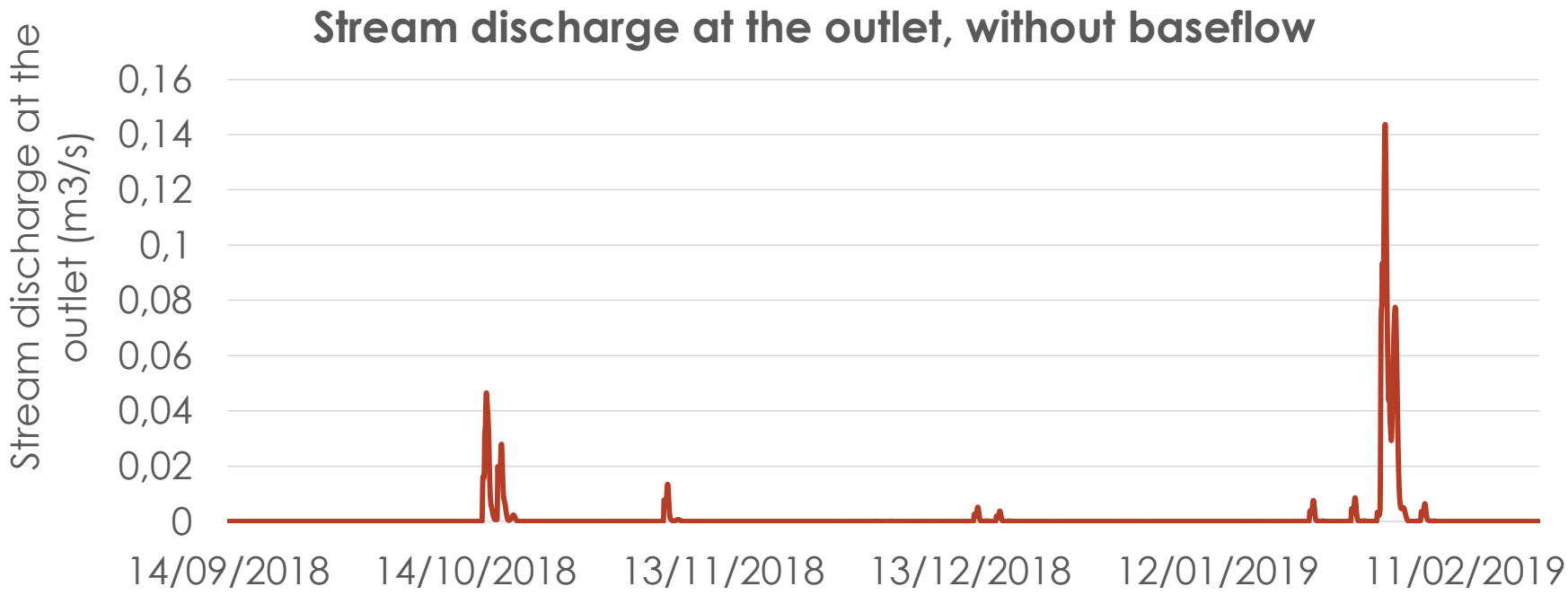
Illustration of DAHM-Reservoir benefits



Verified water balance.

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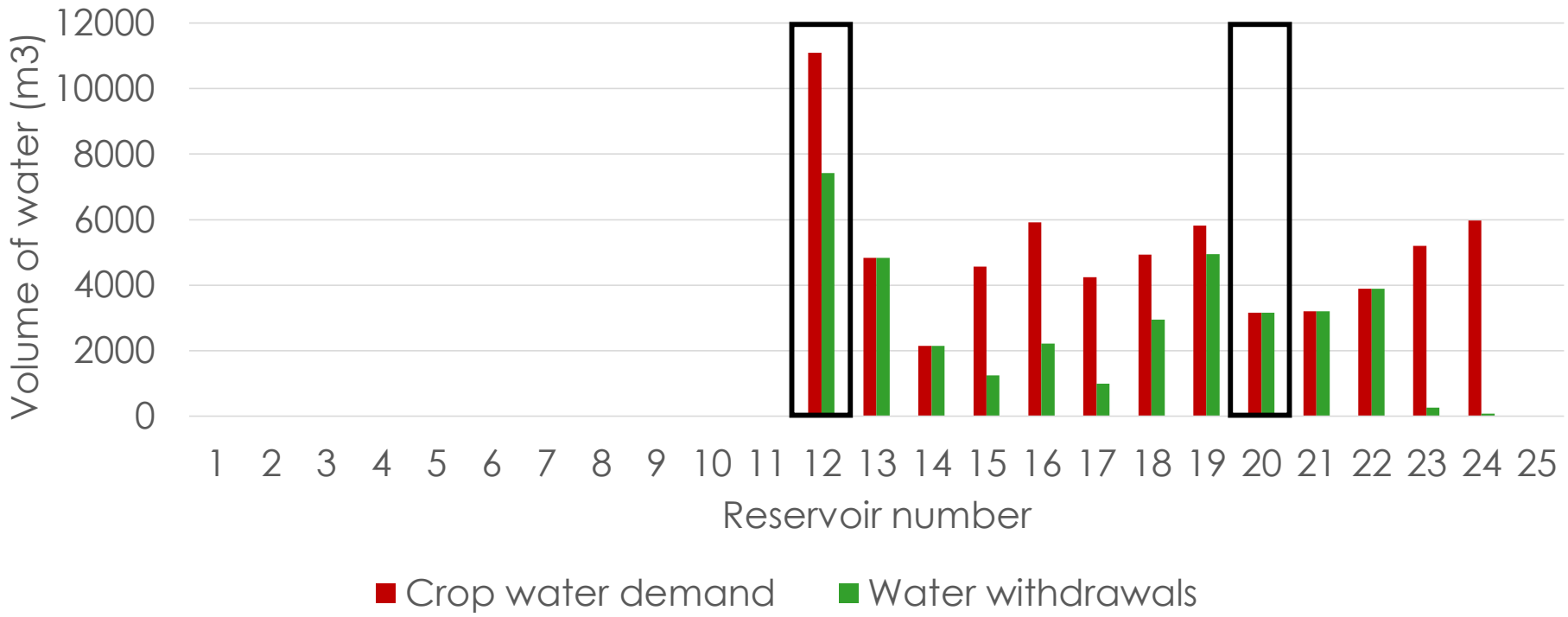
Illustration of DAHM-Reservoir benefits



Five reservoir can meet the water demand.

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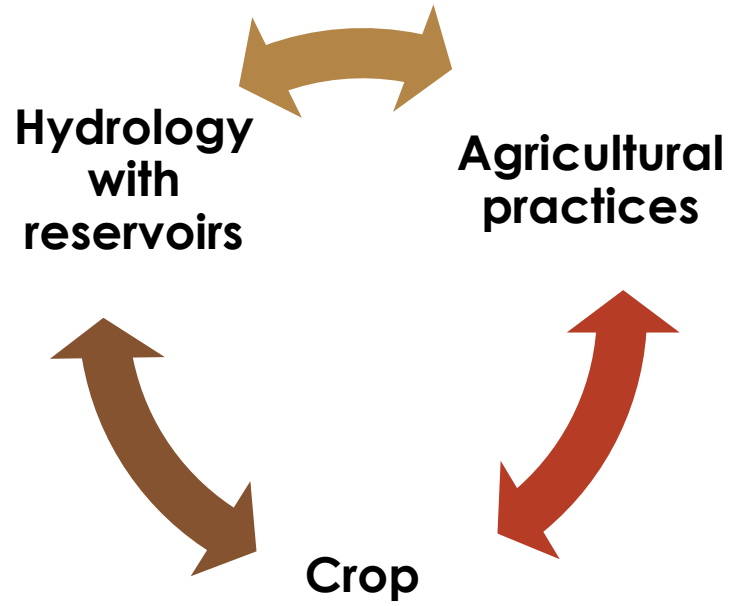
Conclusion and perspectives

Done:

- Development and test of DAHM-Reservoir, a new distributed model with:



Next steps:

- Sensitivity analyses;
- Calibration and validation of the model;
- Develop scenario evaluation (crop distribution, irrigation practices, reservoir density…).

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Thank you for your attention

This study was made possible thanks to:

https://www.openfluid-project.org/

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