UNIVERSIDAD DE MÁLAGA

SMART WATER MANAGEMENT WITH INTEGRATED DSS

# Flood Risk DSS
# BeDam: Dam management module

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Co-funded by the seventh framework programme (FP7), under grant agreement no. 619132, within the Water Inno & Demo-1

# BeDam - overview

- Objectives: support dam managers decisions in flood episodes using:
  - Simulation of management policies applied to a single dam.
  - Synthesis of maneuvers for single dam management.
- Adapted to Guadalhorce river basin in floods:
  - Model of Guadalhorce + Guadalteba as a single dam.
  - Model of Conde del Guadalhorce.

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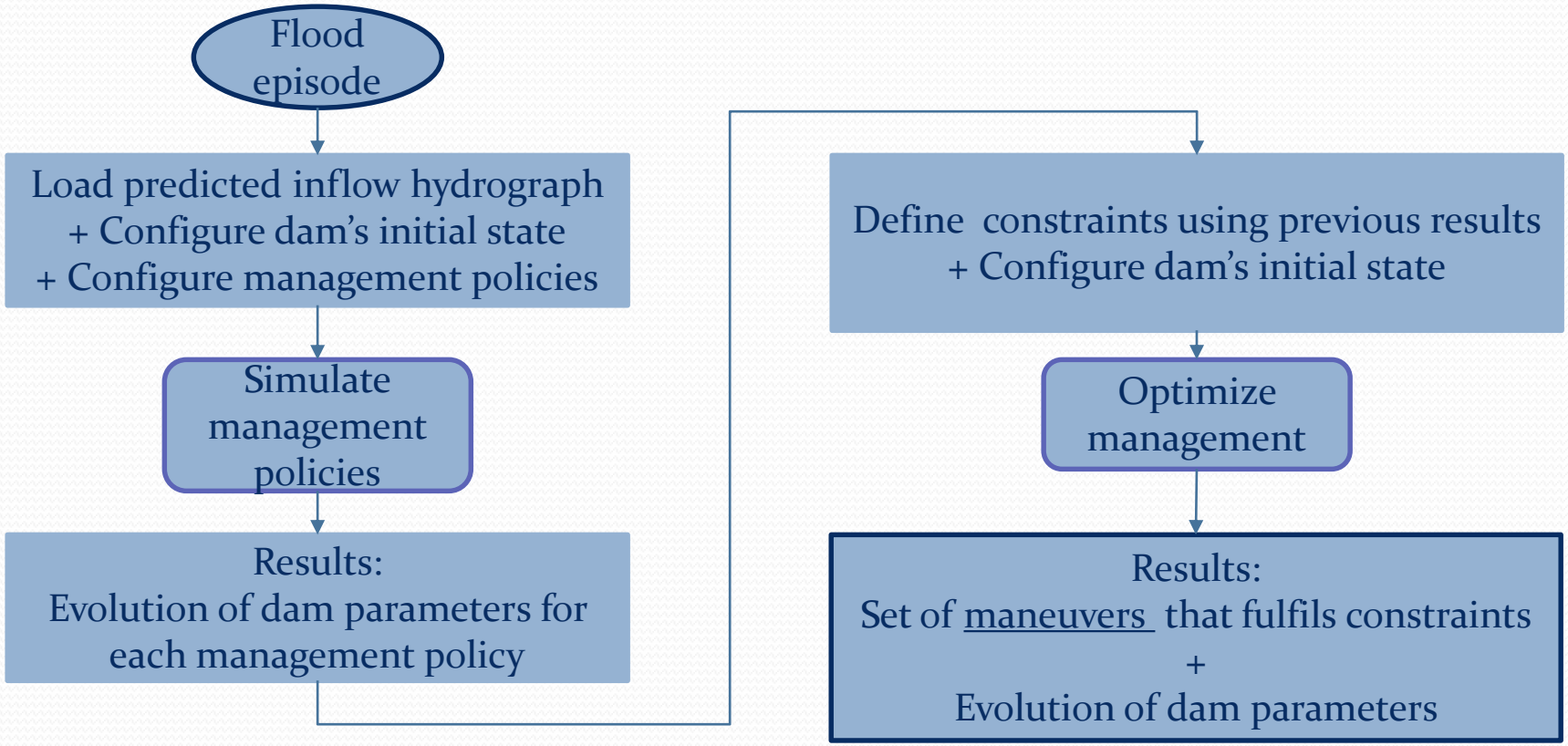
# BeDam – How it works

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# BeDam- features

- Available functionality:
  - Visualization of sensor data (manually loaded).
  - Simulation of discharge policies.
  - Synthesis of maneuvers  for dam management.
- Hydrograph format compatible with Hydroview (import/export).
- Results can be exported as images or files (internal format).
- GUI and help in Spanish and English, configurable by the user.
- Desktop application with multilingual support.

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# Simulation of discharge policies

- Objective: evolution of dam parameters when specific policy is applied.
- Inflow hydrograph (from *.hdr file).
- Initial dam state.
- Policy configurable parameters (if any).
- Set of discharge policies applicable to each dam:
  - MEV, optimum discharge, adaptive optimum, and Current State.
- Simultaneous simulation of all discharge policies using the same initial state of the dam.

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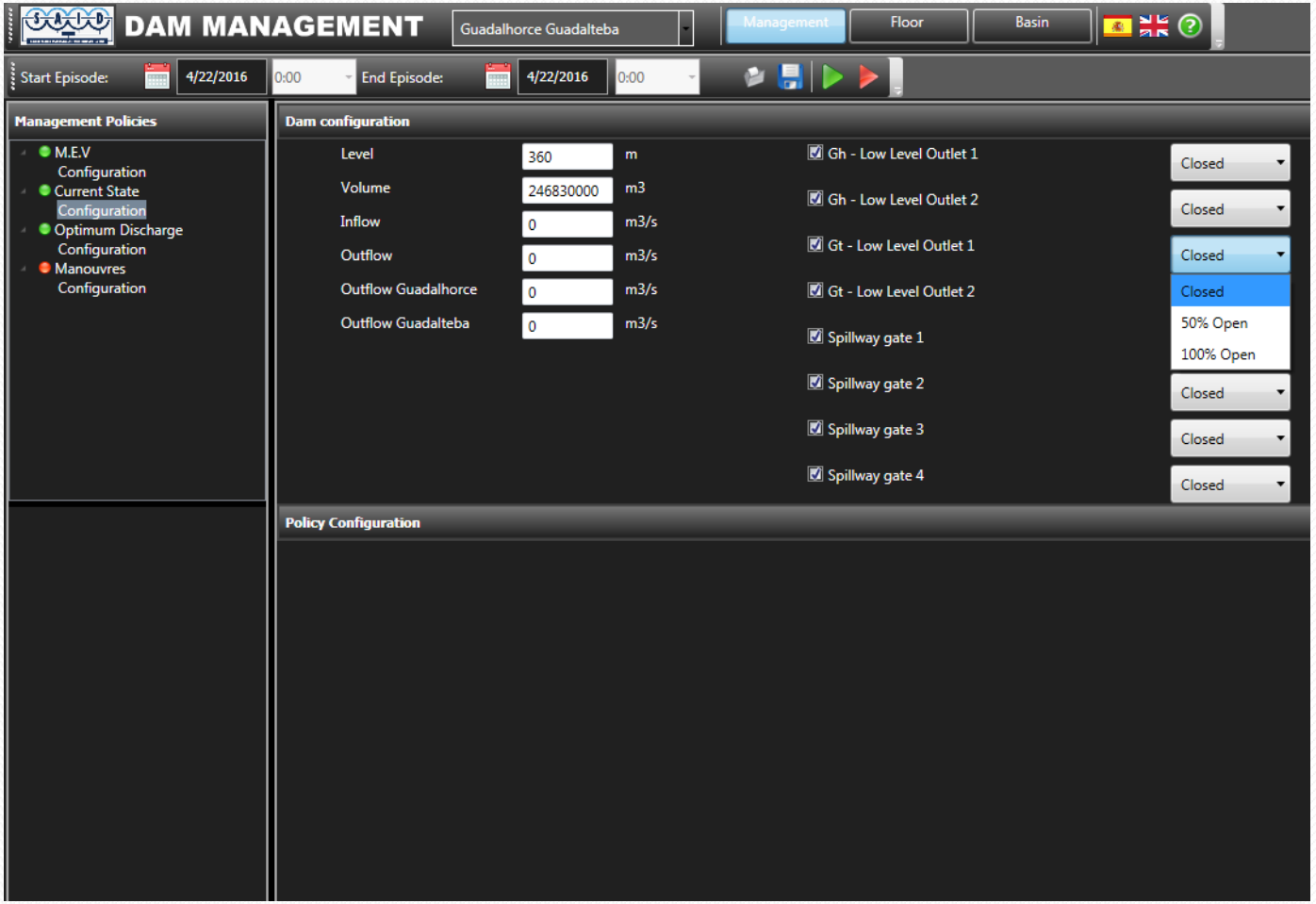
# Simulation of discharge policies

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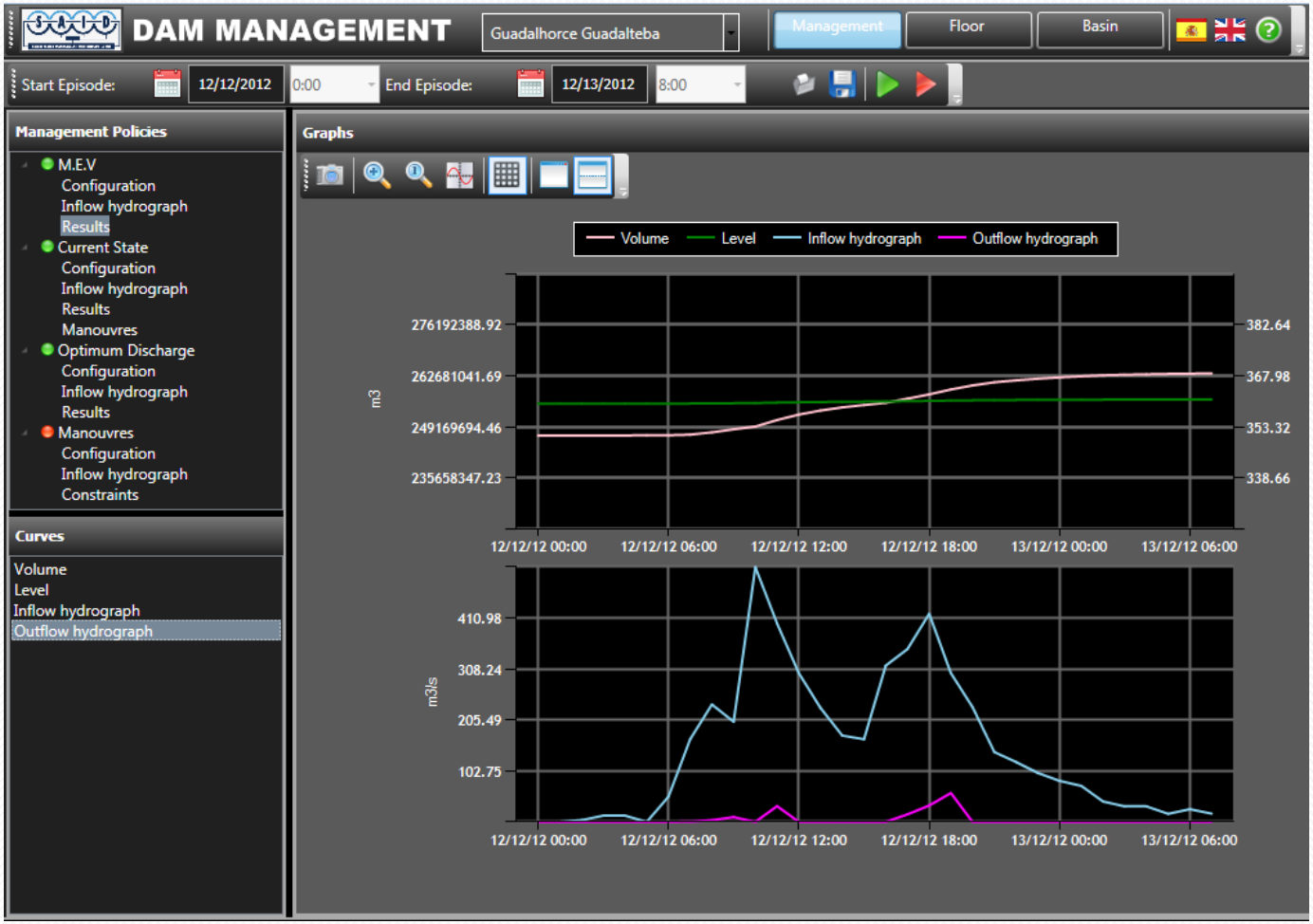
# Simulation of discharge policies

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# Optimization of dam management

- Objective: set of maneuvers that make the dam evolve as desired.
- Based on a previous simulation of a discharge policy.
- Constraints:
  - describe the desired dam evolution
  - restrict one or more dam parameters (level, outflow, etc.)
  - Types of constraints:
    - Maximum and minimum constant values.
    - Maximum and minimum deviation with respect to the original curve.
  - Constraints in the complete episode or in regions (time interval).

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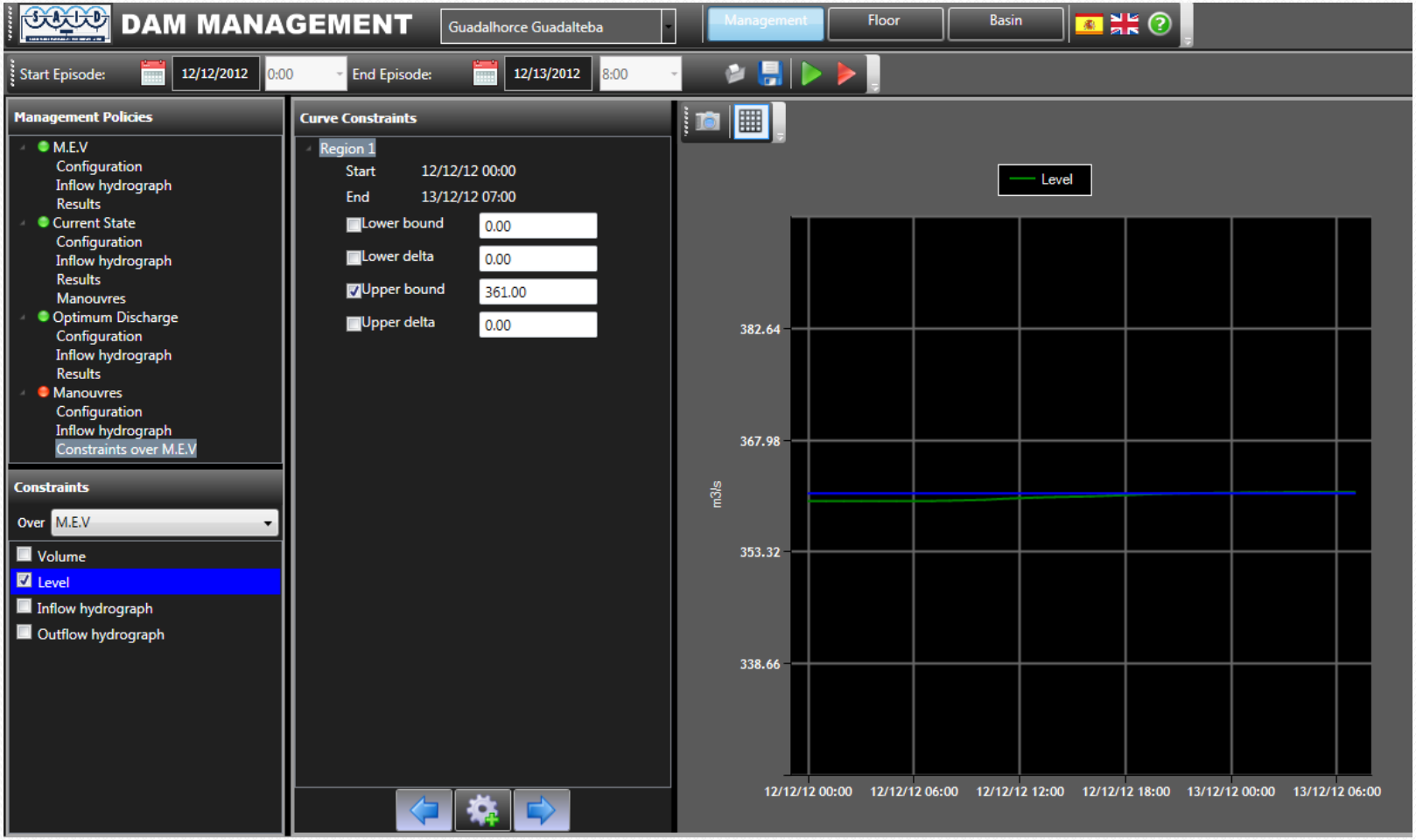
# Optimization of dam management

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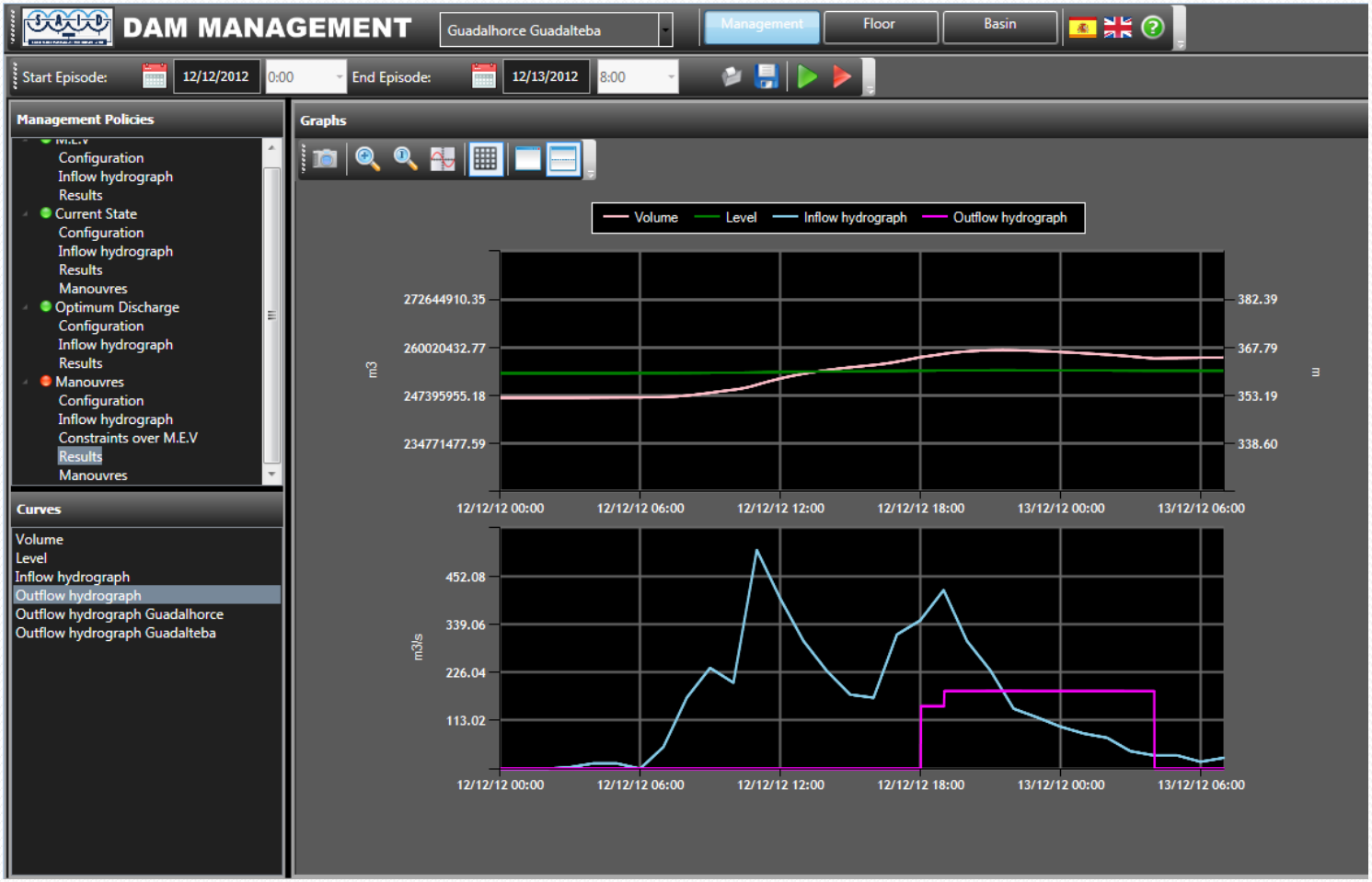
# Optimization of dam management

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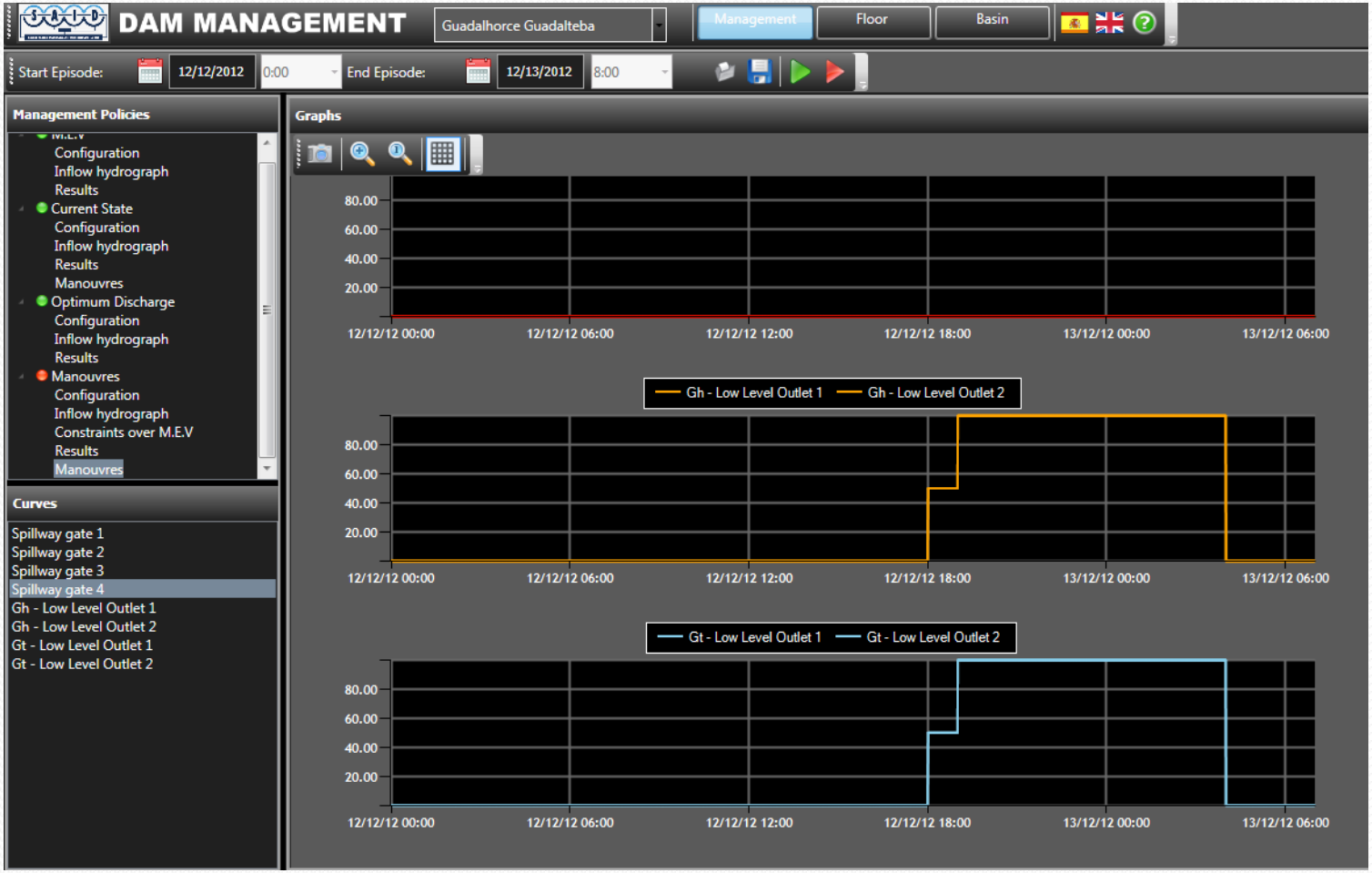
# Optimization of dam management

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# Customization

- Modular architecture to incorporate new dams and discharge policies.
- UMA modeling tools:
  - For dam and discharge policies.
  - Reduce modeling time.
  - More reliable models.
- Web service version ready for integration of all DSS.

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# Thank you for your attention

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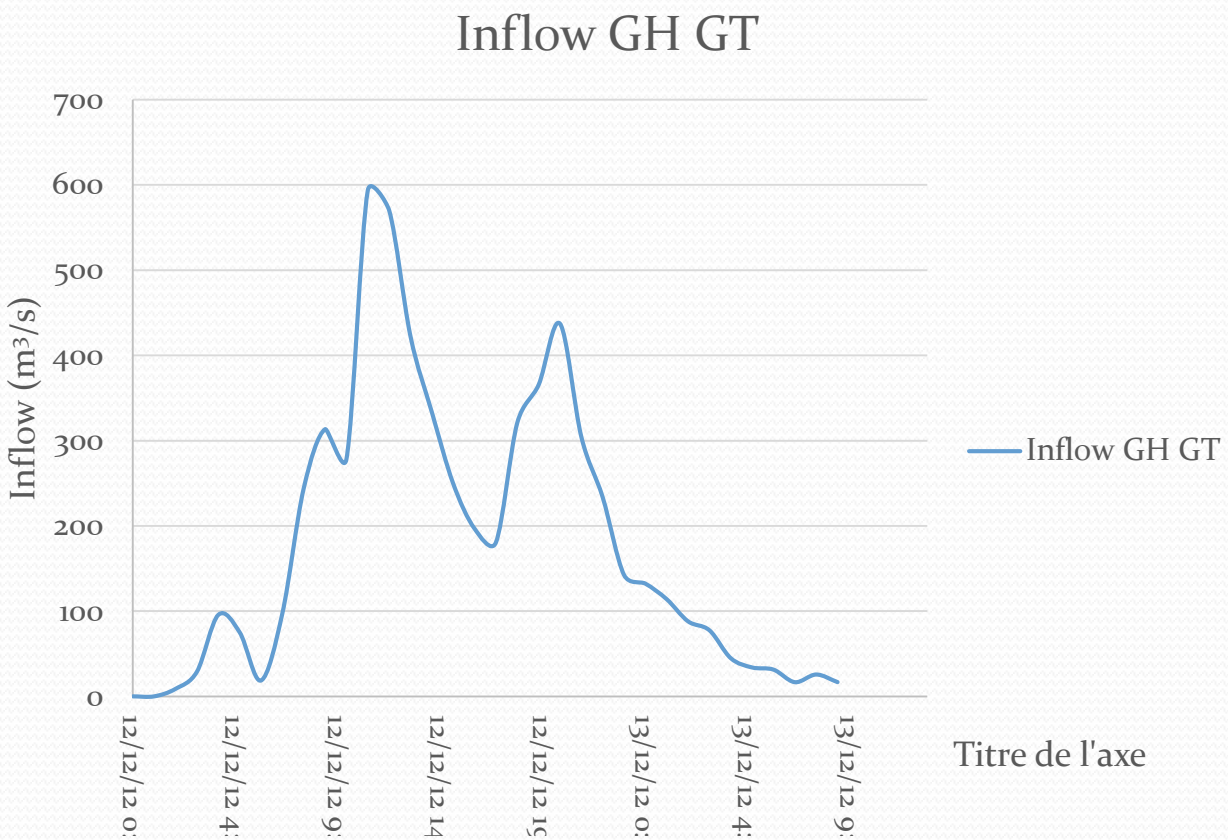
# Live Demo

- Hydrograph file:

gh+gt_121212.hdr

1st Simulation

2nd Optimization

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# Simulation

- Init dam state:
  - all gates closed
  - Volume: 249887240.00 $m^3$
  - Level: 360.219 m.a.s.l
- MEV (default configuration):
  - End level: 360

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# Optimization (I)

- Constraints over MEV results
  - 1 Region (the complete flood episode)
  - Level: Upper boud 361.5 m.a.s.l.
  - Outflow: Upper bound 160 $m^3/s$

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# Optimization (II)

- Constraints over MEV results
  - Level: Upper bound 361.5 m.a.s.l.
  - Outflow - 2 Regions:
    - Region 1 (00:00 – 16:59)
      - Upper bound 160 $m^3/s$
    - Region 2 (16:59 – 09:59)
      - Upper bound 100 $m^3/s$

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