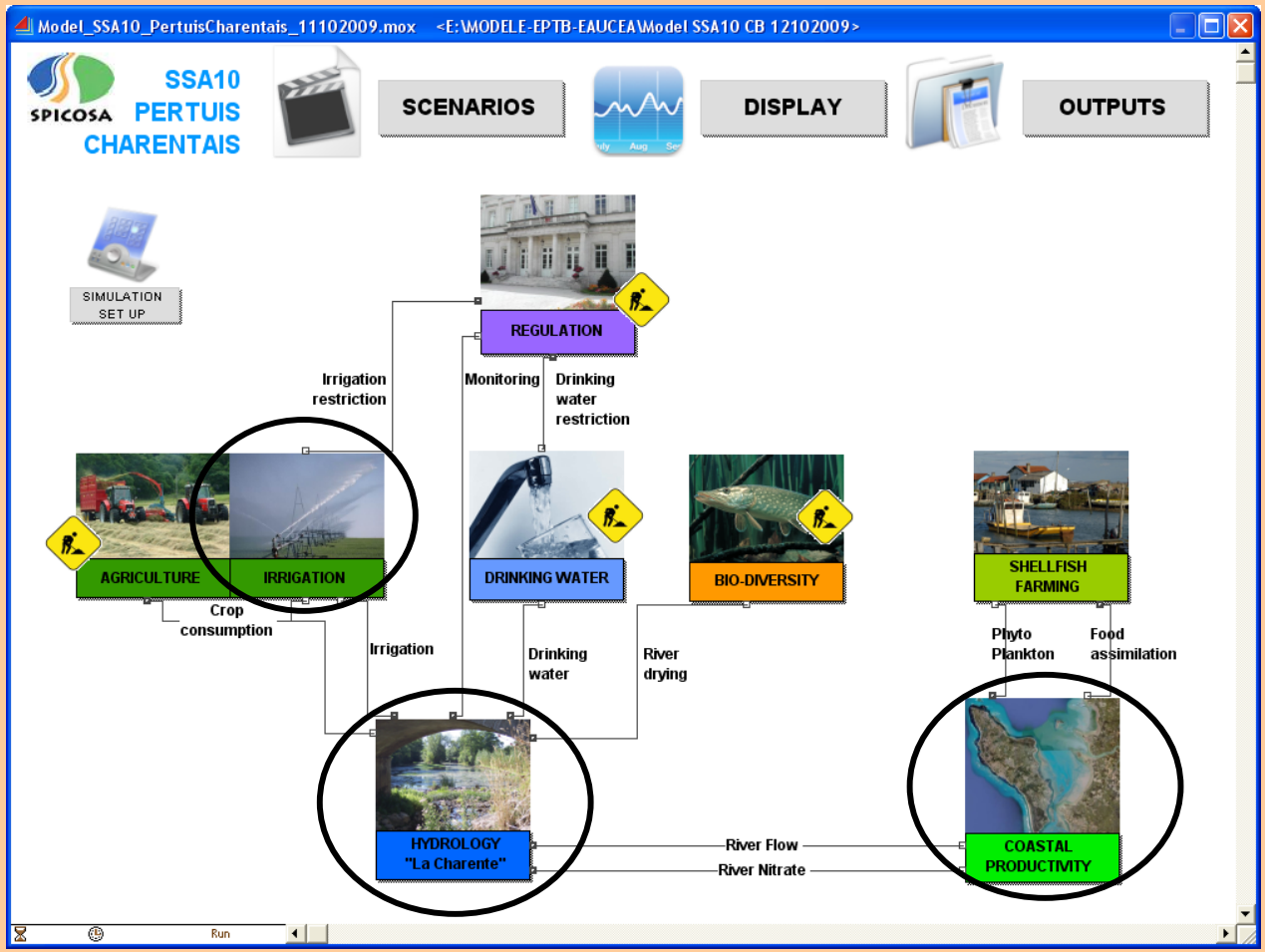
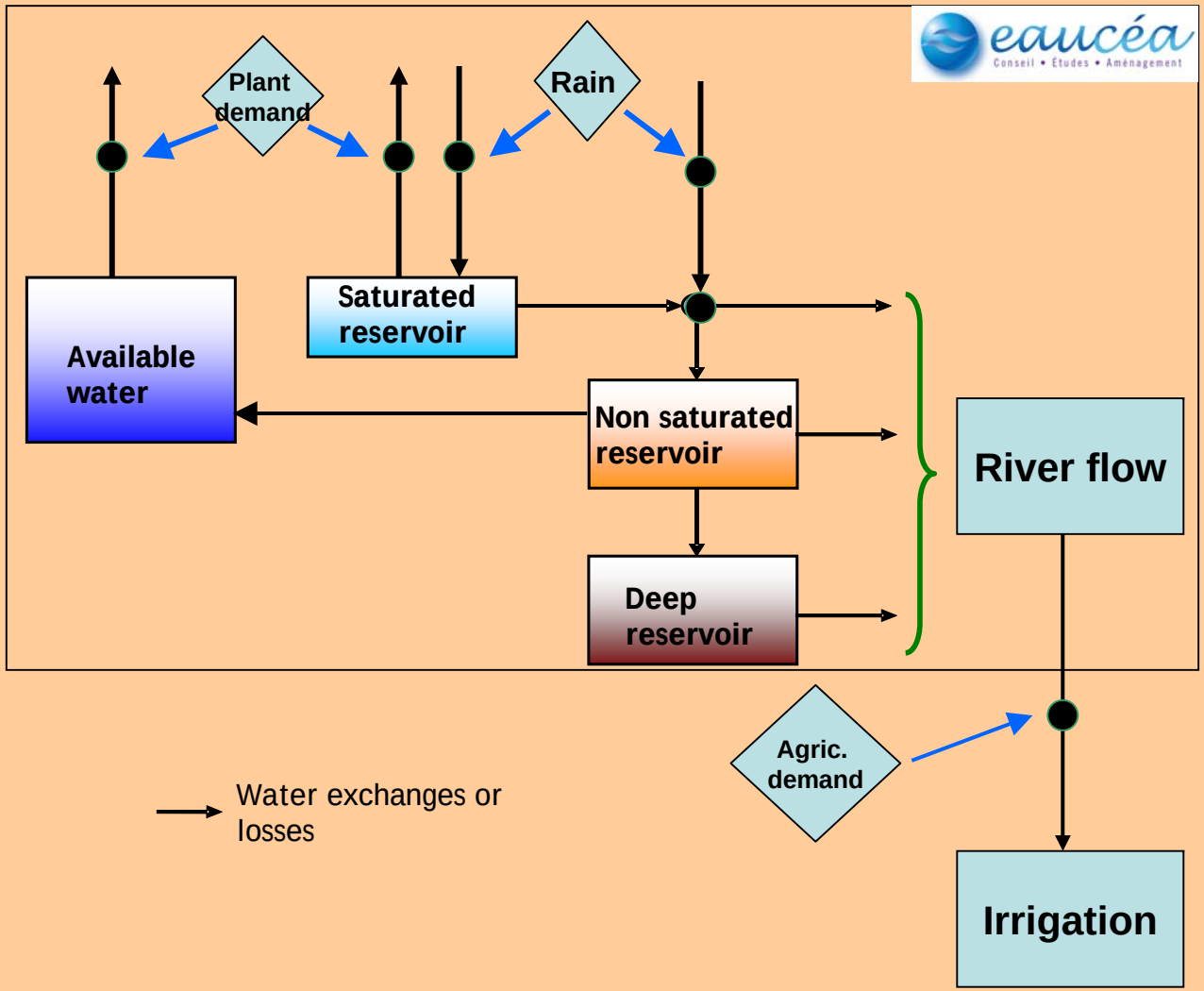
Hydrology and Coastal Productivity modules

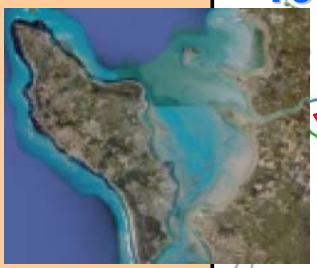


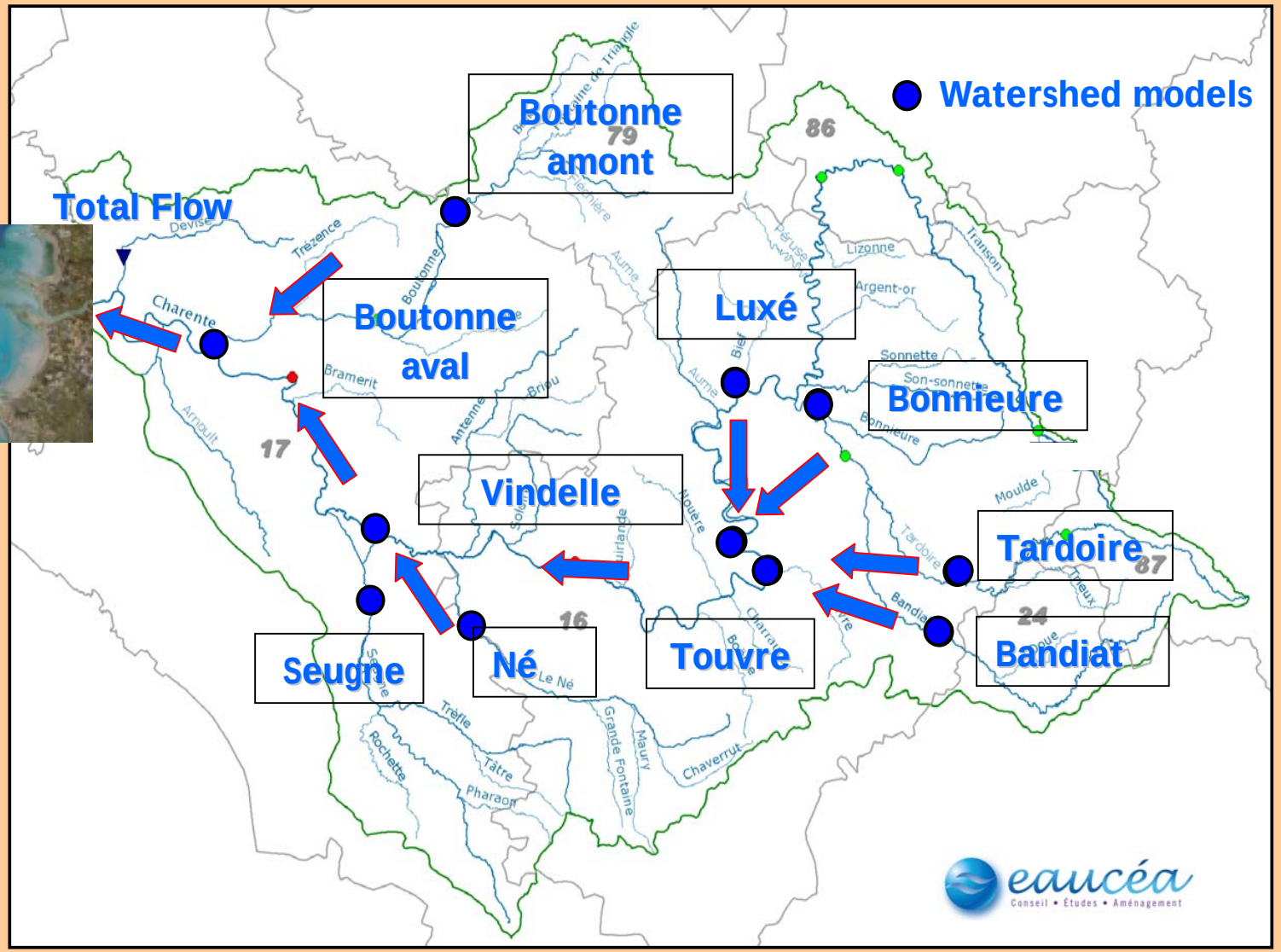
Hydrology – model structure

- Objective: simulate water flow of Charente river depending on climatic forcing and human activities (irrigation/agriculture, regulation, shellfish farming)
- Spatial dimension and discretization: 10 watersheds
- Inputs: evapo-transpiration, rain, cultivated area
- State variables: reservoir (flows or levels)
- Outputs: river flow, water levels at monitoring sites (see governance)
- Time step: one day
- Calibration/validation: model derived from an existing operational model



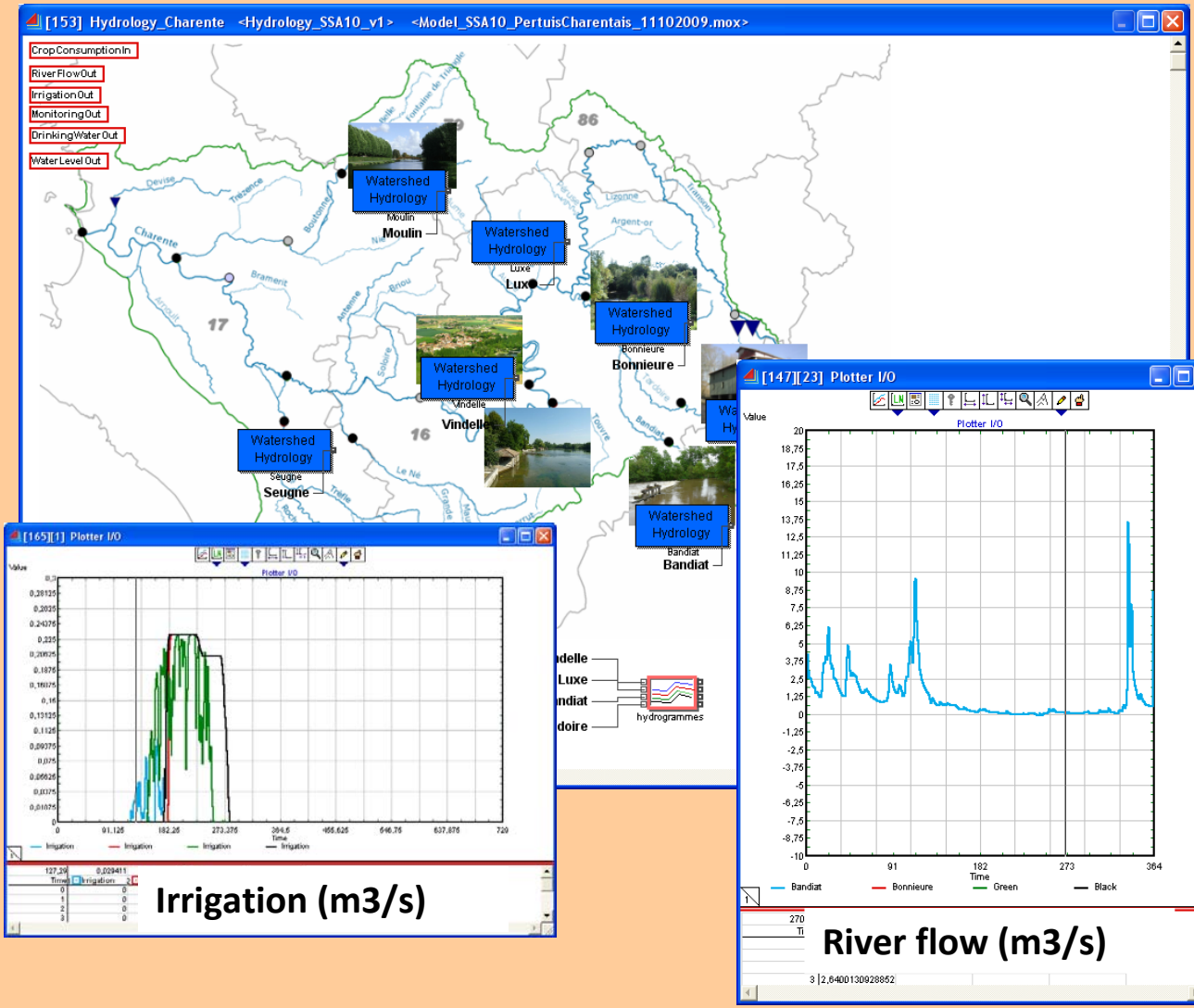
Hydrology - linkage between watershed submodels



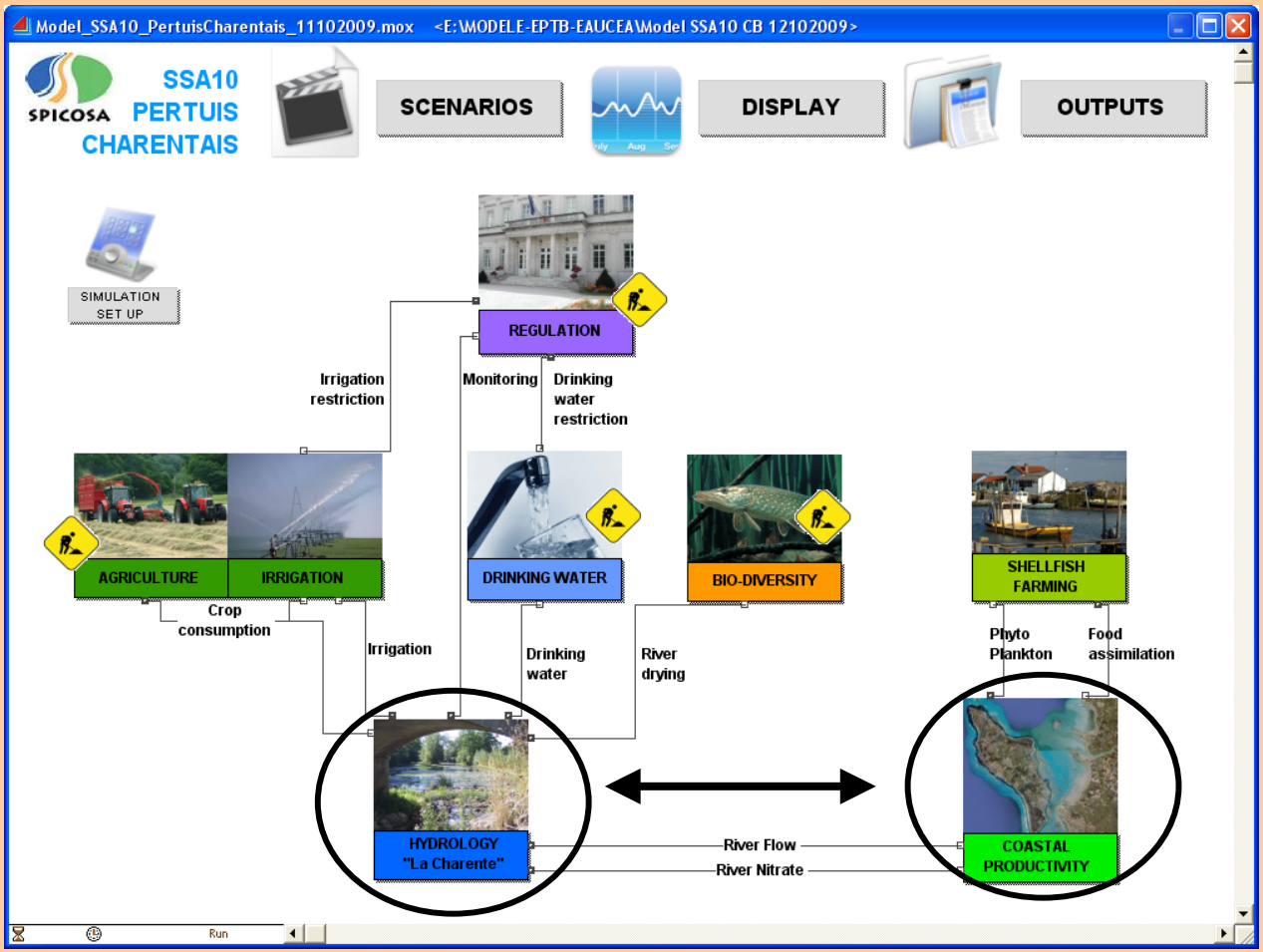


Hydrology - simulations

- Model library: custom blocks, hierarchical blocks (see Johanna)
- Database: parameters, forcing, outputs for each watershed
- Exchange of information between hydrological blocks: use of database (write/read at each time step)
- Test simulations: year 2004 for comparison with Eaucea model predictions (irrigation and water flow at monitoring sites)

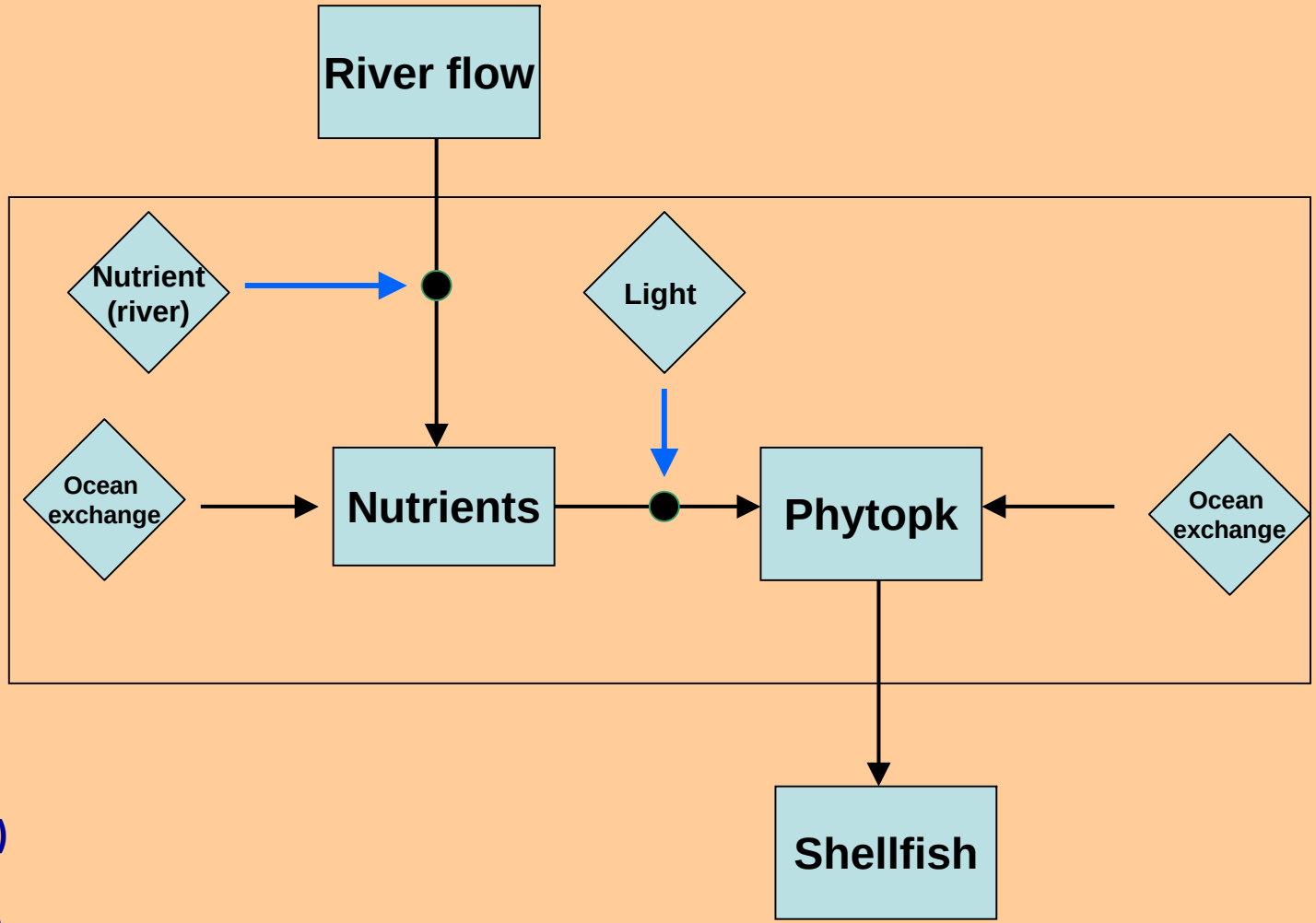


Coastal Productivity Module



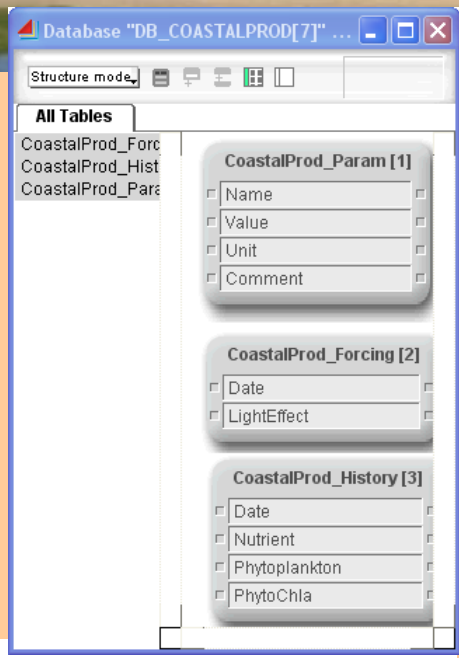
Coastal Productivity – model structure

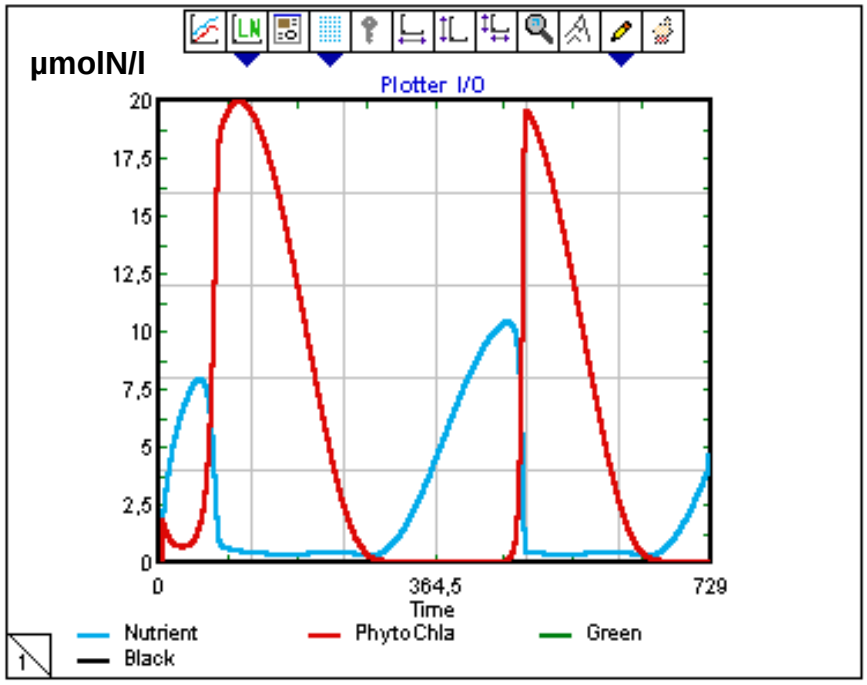
- Objective : simulate primary production depending on river flow and in connection with the shellfish cultivation module
- Inputs:
  - river flow (Hydrology Module), light limitation,
  - residence time,
  - nutrient concentration in the river,
  - consumption by shellfish (Shellfish Module)
- Outputs: nutrients, phytoplankton concentrations
- Spatial dimension and boundaries: Marennes-Oléron Bay, no spatial discretization
- Calibration: Raillard and Menesguen (1994), Struski (2005), Struski and Bacher (2006)
- Model library: custom blocks, hierarchical blocks (see Johanna)



Coastal productivity - simulation

- Database: parameters, forcing, model outputs
- Coupling with hydrological and shellfish blocks: use of database (write/read at each time step)
- Test simulation: nutrients and phytoplankton concentrations during 2 years without shellfish
- Further work
  - Validation using extensive datasets of nutrients and phytoplankton (every month during 30 years)
  - Coupling with Hydrology and Shellfish modules





Conclusion

- Technical issues:
  - Use of custom blocks and databases: powerful tool to manage connections between modules
  - Hydrology blocks are saved in a library and are reusable: parameters and forcing variables can be changed easily using the databases automatically generated
  - Genericity : different from object oriented programming, where state variables can be managed independently and communicate with each other (methods, properties) – here phytoplankton/nutrient are embedded in a single custom block
- Spatial and temporal scales are consistent with SSA10 objectives, available knowledge (existing models), other modules (governance, shellfish, agriculture) and scenario definition (see Remi)
- Scenarios : climate change, evolution of freshwater uses
- Hydrology and Coastal Productivity modules are being tested and validated separately. Next step : fully coupling between these modules
- Indicators under construction: lack of water for agriculture due to restriction of irrigation


The SSA10 Participants