

## Abstract SimHydro 2010

### Assessment of *Escherichia coli* contamination in the Thau lagoon (France) : combined use of physically based modelling and geostatistics

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The yearly oyster harvest on Thau lagoon represents 10 % of the French shellfish production. The microbiological quality of shellfish is regularly impacted by several sources of faecal pollution, leading the Administration to impose the purification of oysters before marketing, and to forbid temporarily their marketing. The objective of the OMEGA THAU project is to improve the microbiological quality of the lagoon, by the implementation of works program on the watershed targeted on the most critical sources of microbiological pollution.

To identify the most critical sources according to their impact on the quality of lagoon water, the hydrodynamics model "Mars 3D" was coupled with models of *Escherichia coli* mortality in seawater. The calibration and the validation of this coupled model use a data base which was collected simultaneously on the watershed and on the lagoon, after four rainfall events (2007-2009). Measurements include punctual samples of water quality and hydrological parameters (salinity, turbidity, temperature), together with dynamic sampling procedures with a towed multi parameters measurement device (alias Easyfish). Observed and simulated freshwater plume and *Escherichia coli* levels in the water were compared spatially and temporally in order to choose the optimal parameters of both hydrodynamics and biological models. Dealing with parameters that are spatially and temporally structured (not random), this comparison is based on geostatistical techniques and accounts for the uncertainty attached to observations and their spatial variability. Statistical bias and discrepancies between measurements and model outputs have been observed and led to review some assumptions about input parameters for the physical model.

Before rainfall events and periods without wind, simulations show a high stratification of water column, improving the horizontal dispersal of freshwater plume and increasing *Escherichia coli* levels in water and the surface of areas impacted. Finally, the spatio-temporal variability of *Escherichia coli* concentrations found in the lagoon was best explained by constant mortality rate (T90) values between 24 and 48 hours.

The paper presents this methodological framework and its application to real events on the Thau lagoon. The work achieved on calibration and validation authorizes the use of this model i): to prioritise the pollution sources on watershed according to their impact on the water and shellfish quality and to optimise the public investment on the watershed (sanitation system, stormwater network, etc.). ii): to provide an early warning system for lagoon users (shellfish farmers, cities).