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Modelling the influence of mussel farming on the biogeochemical composition of the water column in the northern Adriatic shelf (Mediterranean Sea)

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In the last decade, mussel production in Italy has been steadily increasing, reaching 10^5 tonnes in 2003. This trend is mainly due to the increase in landings from mariculture, which in 2002 accounted for about 70% of the country annual production. Approximately half of the whole country production comes from the long-line suspended cultures located along the north-western Adriatic coast. Farming sites act as sinks of plankton and particulate matter and sources of dissolved nutrients, but, in turn, their biomass and, therefore, economic yield, depends on ecosystem resources. Therefore, the ecological and economical sustainable management of this activity ask for the environmental impact assessment and the estimation of the ecosystem carrying capacity at both a local and regional scale.

In this work, the influence of suspended mussel farms on the spatial distribution of particulate and dissolved compounds in the water column was studied, at the locale scale, by means of a numerical model. The model is made up of a 3-layer transport-reaction model, which simulates the dynamics of DOC, POC, nitrate, ammonia, reactive phosphorous and silicates, phytoplankton and zooplankton, coupled with an individual-based growth model of the mussel. Preliminary model results showed a decrease in phytoplankton biomass, and an increase in the dissolved ammonia concentration while approaching the core of the cultivation site. Furthermore, biomass yield was found to be sensitive to the rearing density and the seasonal evolution of the forcing function of planktonic productivity.