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“Application of Hydrological Simulation models to solve pollution impacts in the water management decision-making processes. Measures for the recovery of Mar Menor sea lake and “Campo de Cartagena” aquifer (Spain)”

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The use of fertilizers and pesticides in agriculture activity is a worldwide extended practice since decades for improving crops performance, which can cause, however, with excessive dosage rates, aquifers’ pollution and water quality problems, like the study case hereby presented of Mar Menor sea-lake waterbody and “Campo de Cartagena” aquifer, in the southern coast of Spain.

Due the agricultural practices, the Campo de Cartagena aquifer presents in this moment high values of nitrate, around 150 mgNO_3 / l, appearing also these high values of nitrogen in soil in this area. This situation produces a great contribution of nitrogen to the Mar Menor lake, by two mainly processes, firstly, continuously through groundwater returns to the waterbody’s surface and secondly, through the precipitation events when a large amount of nitrogen is washed from soil by the rainfall. Finally, the large amount of nitrogen incomes to the Mar Menor sea lake contributes to deteriorate the status of this waterbody and also promotes the eutrophication processes that have been taking place during last years.

A large watershed scale nitrates’ transport simulation model, Patrical Model (Perez-Martín et al., 2016), is used to estimate the measures to recovery the “Campo de Cartagena” aquifer. The model establishes, mathematically, the relationship between nitrogen application, nitrogen surplus (excess), and nitrate concentration in groundwater and surface waterbodies.

Model results show that it is necessary to reduce around 80% of the current nitrogen surplus in the “Campo de Cartagena” aquifer to recovery the good status in the aquifer. This reduction of nitrogen surplus can be obtained by reducing the fertilizers dosage and consequently the nitrates contribution, with a maximum dose of nitrogen applied by farmers of 170 kgN /ha. Applying this measure could reduce significantly the nitrogen retained in soil in 1-2 years, so the nitrogen contribution during rainfall events also could be reduced significantly. Nitrogen levels in groundwater will gradually decrease in the following years, reaching values around 50 mgNO_3 / l in 7-9 years after the application of these measures.