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Improving the groundwater numerical model of the Almonte-Marismas aquifer (SW Spain) introducing a hydrofacies geostatistical simulation.

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The need to manage groundwater involves the use of mathematical models to understand the groundwater-wetland dynamics, in order to calculate the water resources and to simulate the effects of their use and exploitation. The Almonte-Marismas aquifer system (Spain), declared a Biosphere Reserve by UNESCO, is an area of high ecological biodiversity that depends on the health of wetlands. Numerous hydrogeological investigations have been developed by the Spanish Geological Survey since the seventies at the Almonte-Marismas aquifer, which hosts the Doñana National Park. Now, the main aim is to improve the mathematical model considering the geological information that has never been used before. Introducing a new column of hydrofacies, which represents the hydrogeological properties of each geological unit, the model will more closely represent the real dynamics of this complex sedimentary system. Once the hydrofacies have been defined and the known geology has been translated to hydrofacies, interpolation and geostatistical simulations have been carried out in order to define each hydrofacies domain in 3D.
The restructuring of the Almonte-Marismas aquifer sedimentary system into seven hydrofacies could contribute to a more realistic characterization of the geological properties of each unit in the model, leading to a more natural behavior of the model. Previous hydrological models, created in classic versions of MODFLOW, did not allow a detailed description of the units in the vertical discretization. This new model, using these seven hydrofacies, is intended to be used with the HUF (Hydrogeologic-Unit Flow) package, recently added to Modelmuse software (USGS), to solve the complex groundwater flux which is related to the complexity of the Almonte-Marismas system.

Keywords: mathematical model, geostatistical simulation, hydrofacies, modflow.