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Climate change and groundwater management in the Upper Guadiana Basin

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The Upper Guadiana Basin is a semi-arid region located in the centre of Spain. From a morphological point of view it is a very flat region. Rivers just have ephemeral streams which usually infiltrate into the aquifers. So groundwater flow plays an important role in this basin.

Since late in 1970s intensive water abstractions have been carried out in the basin. These abstractions have been especially significant in the West Mancha aquifer, the main aquifer of the region. This fact extended over the years has caused a widespread water-table lowering. No corrective measures have been taken over the years, and the situation has got worse. Just by January 2008, the Spanish Government has approved the Special Plan for the Upper Guadiana, an ambitious project to solve the situation. The Plan has a time window of actuation of 20 years. So, it takes into account different possible scenarios that can occur during this period depending on the success of the measures developed.

Our research group is working on the development of a groundwater flow model of the Upper Guadiana Basin. The model is thought as a tool which will help with the Water Management of the Basin. In these terms, the model is being used to evaluate the optimal way in the application of the different strategies described on the Special Plan for the Upper Guadiana; and to simulate how they can affect on the long term response of the system. The potential effect of the climate change has been also considered in the modelling. The climate change has been introduced into the model by assuming several scenarios of climate, which represent plausible situations of precipitations and temperatures. Also the possible changes of land use in the basin have been taking into account to make the simulations. These changes would be related to the climate change and to the new policy of extractions described in the Plan. The MODFLOW code is used for modelling.