EVALUATION OF FOUR CLIMATE CHANGES SCENARIOS ON GROUNDWATER RESOURCES OF THE ESCUSA (CASTELO DE VIDE) AQUIFER, CENTRAL PORTUGAL

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Abstract. In countries with advanced environmental management systems, numerical models often are used in the planning and management of sustainable groundwater resources. Toward that end, we evaluated the influence of climate change on karstic groundwater resources of the Escusa (Castelo de Vide) aquifer using a finite-element discrete continuum flow model, allowing the use of 1-D, 2-D and 3-D finite elements in the same computational mesh, calibrated to regional field measurements. Because this coupled model simulates fluid movement in, and exchange between, multiple domains, it was possible to monitor flow processes such as recharge (diffuse and concentrated infiltration), flux inside the aquifer (quick in caves and conduits and slow in the rock mass), and concentrated discharge (karstic springs) and diffuse discharge to wetlands and other porous hydrogeological units. Four different climate scenarios were analyzed with respect to their influence on future aquifer discharge rates. These scenarios (by the Hadley Centre for Climate Prediction and Research) reflected global and regional climate predictions for 50 and 100 year periods. The variation in groundwater discharge rates from the Escusa aquifer was evaluated in relation with discharge to the Sever River and granitic rocks in contact with the aquifer in its northern part. All the climate-based simulations show a decline in the discharge rates of the groundwater aquifer. Another important finding is that the discharge rates per month change and sometimes it is possible to have an increase in the discharge during the first half of the year and a reduction in the second half of the year.

Keywords: karstic aquifer, modeling, climatic changes