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A quasi three dimensional model of water flow in the subsurface of Milano (Italy): the stationary flow

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Abstract. A quasi three-dimensional model is developed to simulate the behaviour of the aquifer system which is the resource of drinkable water for the town of Milano (Italy). Non continuous semipermeable layers locally separate permeable levels in a multilayered system, consisting of a phreatic and three confined aquifers. The numerical model is a conservative finite difference scheme based on the discretisation of the water balance equation for stationary flow. The grid spacing is 500 m and has been chosen, taking into account the distribution of the data in an area of about 400 km².

The model has been calibrated with a "trial and error" procedure, by comparison of the results of the model with the observations for three years (1950, 1974 and 1982) which correspond to different flow situations. Once calibrated, the model has been used as a predictive tool, to forecast the behaviour of the aquifer system for other years of the 20th century; the comparison between the model forecasts and observations is good. The model is capable of describing both the strong drawdown of the water table in the 1970s, when the water demand for domestic and industrial needs was very high, and the rise of the water table in the 1990s, when water extraction decreased. The results of the model confirm that the phreatic level is controlled largely by the local extraction of water; moreover, the aquifer system reacts to an increasing water demand with a small increase of the inflow and with a strong decrease of the outflow from its boundaries.

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