

## **Modeling subsidence induced by groundwater extraction in Milano (Italia)**

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The great quantities of water extracted from the subsurface of Milano (Italy) in the late 1970s produced a strong deepening of the water table. This caused several problems, not only for the quantity and quality of available water, but also for some episodes of subsidence, which caused structural problems to some monumental buildings.

A groundwater flow model has been developed for the aquifer system, which consists of four permeable layers separated by discontinuous silt and clay layers with lower conductivities, which can be considered as aquitards. The decrease of pore water pressure in the aquitards is the expected main cause of subsidence.

The results of the groundwater flow model are then used to compute the subsidence between 1950 and 1974; for this period two topographical surveys were realized, so that it was possible to compare the results of our model with the observations. The fit is satisfactory, since the trend of the observations is well reproduced by the model, but for an area located at the north-east border of the town. There, some big factories were active and extracted great volumes of water, thus contributing to a deepening of the water table and a reduction of pore water pressure in the aquitards. However the thickness of the aquitards was estimated to be quite small and as a consequence modeled subsidence is rather small. Well data that were acquired recently have instead shown that this thickness is greater and this explains the discrepancies between the subsidence model and the observations. As a general remark this hints that the subsidence model is more sensible to the hydrogeological scheme than the flow model.