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Multi variate regression model of the water level and production rate time series of the geothermal reservoir Waiwera (New Zealand)

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Water management tools are essential to ensure the conservation of natural resources. The geothermal hot water reservoir below the village of Waiwera, on the Northern Island of New Zealand is used commercially since 1863. The continuous production of 50 °C hot geothermal water, to supply hotels and spas, has a negative impact on the reservoir. Until the year 1969 from all wells drilled the warm water flow was artesian. Due to overproduction the water needs to be pumped up nowadays. Further, within the years 1975 to 1976 the warm water seeps on the beach of Waiwera ran dry. In order to protect the reservoir and the historical and tourist site in the early 1980s a water management plan was deployed. The "Auckland Council" established guidelines to enable a sustainable management of the resource [1].
The management plan demands that the water level in the official and appropriate observation well of the council is 0.5 m above sea level throughout the year in average. Almost four decades of data (since 1978 until today) are now available [2]. For a sustainable water management, it is necessary to be able to forecast the water level as a function of the production rates in the production wells. The best predictions are provided by a multivariate regression model of the water level and production rate time series, which takes into account the production rates of individual wells. It is based on the inversely proportional relationship between the independent variable (production rate) and the dependent variable (measured water level). In production scenarios, a maximum total production rate of approx. 1,100 m^3 / day is determined in order to comply with the guidelines of the “Auckland Council”.

[1] Kühn M., Stöfen H. (2005) A reactive flow model of the geothermal reservoir Waiwera, New Zealand. Hydrogeology Journal 13, 606-626, doi: 10.1007/s10040-004-0377-6
[2] Kühn M., Altmannsberger C. (2016) Assessment of data driven and process based water management tools for the geothermal reservoir Waiwera (New Zealand). Energy Procedia 97, 403-410, doi: 10.1016/j.egypro.2016.10.034