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# Unravelling the hydraulic properties of the chalk in Limburg, the Netherlands, using artificial neural networks

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## ABSTRACT

Thick layers of unconsolidated Cenozoic deposits are present in large parts of the Netherlands. These deposits form important aquifers and aquitards and have been the main focus of hydrogeological research. In the eastern and southeastern most part of the Netherlands however consolidated Mesozoic deposits surface. In South-Limburg these deposits partly consist of Paleocene and Late Cretaceous chalk, the main aquifer in this area. The hydraulic properties of this aquifer are poorly understood.

Exposures of the chalk, especially in quarries, show that the upper part of the chalk is karstified. This together with flow measurements in wells have led to the assumption that hydraulic conductivity is high at the top and that it rapidly decreases with depth. For the national 3D hydrogeological model REGIS II five zones of varying thicknesses have been distinguished with hydraulic conductivities ranging from 100 to 0,01 m/d. The current approach however tends to overestimate hydraulic conductivity, especially in the northern part of South-Limburg where the chalk aquifer is covered by Cenozoic deposits. Apart from hydraulic conductivity varying with depth and the depth of the groundwater table other factors might be of importance that have not been considered so far, such as thickness of the Cenozoic cover layers, the geological formation, lateral facies changes within the chalk, vicinity of fault zones. Due to these many factors and the absence of a precise model combining all of these factors, research is being conducted to find out if artificial neural networks can be used to estimate better the hydraulic conductivity of the chalk aquifer. The neural network is trained by using the results of pumping and well tests as target data and the (hydro)geological information at these test sites as input data. It will be investigated whether the trained neural network gives improved results as compared to the current simple model overestimating hydraulic conductivity.