

Complexity versus Simplicity: A comparative analysis of complex geology in hydrogeological modelling

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Abstract

Numerical modelling of hydrogeological systems has progressed significantly with the evolution of technology and the development of a greater understanding of hydrogeology and the underlying mathematical principles. Hydrogeological modelling software can now include complex geological layers and models as well as allow the pinching out of geological features and layers. The effects of a complex geology on the hydraulic parameters determined by numerical modelling is investigated by means of the DHI-WASY FEFLOW and Aranz Geo Leapfrog modelling software packages.

The Campus Test Site (CTS) at the University of the Free State in Bloemfontein, South Africa was selected as the locale to be modelled. Being one of the most studied aquifers in the world, the CTS has had multiple research projects performed on it and as a result ample information is available to construct a hydrogeological model with a high complexity. The CTS consists primarily of stacked fluvial channel deposits of the Lower Beaufort Group, with the main waterstrike located on a bedding-plane fracture in the main sandstone aquifer.

The investigation was performed by creating three distinct hydrogeological models of the CTS, the first consists entirely of simplified geological strata modelled in FEFLOW by means of average layer thickness and does not include the pinching out of any geological layers. The second model was created to be a copy of the first, however the bedding-plane fracture can pinch out where it is known to not occur. The third and final model consisted of a complex geological model created in Leapfrog Geo which was subsequently exported to FEFLOW for hydrogeological modelling.

CV for Anton Lukas

Anton Lukas completed his Honours in Geology at UFS and he is currently studying in a master's degree in Hydrogeology at IGS. Anton describe himself as still a fledgling in this field. Nevertheless as a masters student he is prepared to contribute and share his knowledge with the Groundwater community. The Groundwater Division give opportunity to students to share and develop within the safety of the groundwater community.