Geophysical Research Abstracts
Vol. 14, EGU2012-1730, 2012
EGU General Assembly 2012

Comparison of first order analysis and Monte Carlo methods in evaluating groundwater model uncertainty: a case study from an iron ore mine in the Pilbara Region of Western Australia

G. Firmani and J. Matta

Rio Tinto Iron Ore, Level 6 152-158 St Georges Tce, Perth, 6000, Western Australia. Australia
(giovanni.firmani@riotinto.com)

The expansion of mining in the Pilbara region of Western Australia is resulting in the need to develop better water strategies to make below water table resources accessible, manage surplus water and deal with water demands for processing ore and construction. In all these instances, understanding the local and regional hydrogeology is fundamental to allow sustainable mining; minimising the impacts to the environment. An understanding of the uncertainties of the hydrogeology is necessary to quantify the risks and make objective decisions rather than relying on subjective judgements.
The aim of this paper is to review some of the methods proposed by the published literature and find approaches that can be practically implemented in an attempt to estimate model uncertainties. In particular, this paper adopts two general probabilistic approaches that address the parametric uncertainty estimation and its propagation in predictive scenarios: the first order analysis and Monte Carlo simulations.
A case example application of the two techniques is also presented for the dewatering strategy of a large below water table open cut iron ore mine in the Pilbara region of Western Australia. This study demonstrates the weakness of the deterministic approach, as the coefficients of variation of some model parameters were greater than 1.0; and suggests a review of the model calibration method and conceptualisation.
The uncertainty propagation into predictive scenarios was calculated assuming the parameters with a coefficient of variation higher than 0.25 as deterministic, due to computational difficulties to achieve an accurate result with the Monte Carlo method. The conclusion of this case study was that the first order analysis appears to be a successful and simple tool when the coefficients of variation of calibrated parameters are less than 0.25.