Contribution ID: **92** Type: **Poster (+) Presentation**

Data assimilation for reducing uncertainty of subsurface flow modeling using meshless method

Wednesday, 2 June 2021 10:00 (1 hour)

Since the parametric and predictive uncertainty are inherently inevitable in subsurface flow modeling, various data assimilation methods have been increasingly implemented to constrain the numerical models over the past decade. For example, the Bayes-based ensemble Kalman Filter (EnKF) has been efficaciously applied to updating model pressure state together with hydraulic conductivity by observed pressure data for groundwater modeling, employing uncertainty quantification information based on Monte Carlo or moment equation (ME) method. However, as integrating newly-collected observation data, modelers usually should remesh or refine their original grids to deal with the irregular locations of observation wells. Therefore, the practicality of EnKF may be hindered from tackling a real-world problem due to the lack of numerical method's flexibility. The present study filled the technical gap by utilizing the meshless Generalized Finite Difference (mGFD), which enabled modelers to honor irregular positions by spatially and temporally arbitrary placing computational nodes. The capability of coupled ME-mGFD-EnKF was experimented using scenarios of a two-dimensional transient hypothetical field with pumping tests. The measured conductivity ($\ln K$) data were conditioned via simple kriging to obtain initial inputs, i.e., mean and covariance of $\ln K$; and the mean and covariance of head were calculated by ME-mGFD; then the observed head data were integrated by EnKF to update the so-called augmented state vector, including the mean and covariance of both lnK and head field at each time step. The results show that the parametric and predictive uncertainty can be reduced by using EnKF. Moreover, the results show that present coupled ME-mGFD-EnKF is flexible and promising to accomplish the goal of building a real-time updating subsurface flow modeling for real-world applications.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

Acceptance of Terms and Conditions

Click here to agree

Newsletter

Student Poster Award

Primary authors: Mr CHEN, Shang-Ying (National Cheng Kung University, Taiwan); Prof. HSU, Kuo-Chin (National Cheng Kung University, Taiwan)

Presenter: Mr CHEN, Shang-Ying (National Cheng Kung University, Taiwan)

Session Classification: Poster +

Track Classification: (MS14) Uncertainty Quantification in Porous Media