Contribution ID: **988** Type: **Oral Presentation**

Deep Learning for Parameterization and Calibration of Subsurface Flow Models

Wednesday, 24 May 2023 15:40 (30 minutes)

Calibration of subsurface flow models often leads to underdetermined inverse problems, where limited data is used to estimate spatially distributed hydraulic properties of geologic formations at high resolution. The problem is usually solved by using a given model of geologic continuity to constrain the expected distribution and connectivity patterns of the solution. For non-Gaussian problems, imposing the specified model of continuity is not trivial. Low-dimensional parameterization methods are commonly adopted to improve problem ill-posedness and to capture and preserve the expected spatial connectivity patterns in the solution. Deep learning offers a new perspective for low-dimensional parameterization and calibration of complex high-dimensional flow models. Using training data with diverse and complex spatial connectivity patterns, deep learning models can learn a nonlinear mapping from high-dimensional spatial distribution of properties onto a low-dimensional latent space that provides a compact description of model calibration parameters. The resulting latent space can be used to parameterize the inverse problem and to facilitate the search for solutions that are geologically plausible and that reproduce the observed flow response data. More complex architectures can be developed by jointly constructing low-dimensional parameter and data latent spaces, and a direct inverse mapping from the data latent space to the parameter latent space, to perform regression. Alternative parameterization, inversion and data assimilation formulations that exploit latent space representations of model parameters and data are presented and discussed with examples to illustrate the performance of these methods.

Participation

In-Person

References

MDPI Energies Student Poster Award

No, do not submit my presenation for the student posters award.

Country

USA

Acceptance of the Terms & Conditions

Click here to agree

Primary author: JAFARPOUR, Behnam (University of Southern California)

Presenter: JAFARPOUR, Behnam (University of Southern California)

Track Classification: (MS24) Invited and Plenary Sessions