Contribution ID: **166** Type: **Oral Presentation**

Physics-informed machine learning application for heterogeneous permeability estimation in 3D sandbox experiments

Monday, 22 May 2023 15:15 (15 minutes)

Hydrogeological properties are very important to enhance the modeling of physical and chemical processes related to various geoscience and environmental applications such as geologic carbon storage, subsurface energy recovery, and environmental fate and transport. One critical component of subsurface characterization for prediction of flow and reactive transport is how accurately we can estimate heterogenous permeability (and porosity) fields. In this work, we will compare physics-informed machine learning methods such as physics-informed neural network (PINN) and Bayesian PINN to estimate heterogenous permeability fields with spatial and temporal observation data of tracer concentrations in 3D sandbox experiments. Emphasis will be placed on comprehensive state-of-the-art datasets obtained using magnetic imaging resolution approach that provide non-reactive tracer transport over time in well controlled laboratory sandbox experiments. This work will provide outstanding benchmark datasets that can be used for validation of machine/deep learning approaches.
SNL is managed and operated by NTESS under DOE NNSA contract DE-NA0003525.

Participation

In-Person

References

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Primary author: YOON, Hongkyu (Sandia National Laboratories)

Presenter: YOON, Hongkyu (Sandia National Laboratories)

Session Classification: MS15

Track Classification: (MS15) Machine Learning and Big Data in Porous Media