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Type: Oral Presentation

# The Method Of Solving incompressible Two-phase Seepage Equation In Porous Media By Deep Neural Networks

Thursday, 2 June 2022 13:30 (15 minutes)

**Abstract:** A method is proposed to solve incompressible two-phase seepage equation in porous media, based on the Physical-informed Neural Networks(PINN) combined with the Implicit Pressure Explicit Saturation method(IMPES method). Different from the conventional PINN model, this approach implicitly solves the pressure field and then explicitly solves the saturation field by combining the operator splitting technique of numerical calculation. The neural networks loss function is composed of spatial well-bottle pressure and production data matching, PDE residual, initial conditions, boundary conditions, and other measurable prior knowledge. By minimizing the loss function, the neural network parameters that not only fit the data but also adhere to the governing equation are obtained. This method provides a general, efficient, and robust methodology to solve the nonlinear flow equation with a source and sink term. The results show that this method can accurately solve the oil-water two-phase seepage equation. Compared with the numerical simulation method, the determination coefficients of the model pressure field and saturation field prediction can reach more than 0.95.

**Keywords:** Physics-Informed Neural Networks, Surrogate Modeling, Reservoir Numerical Simulation

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## Country

China

## References

## Time Block Preference

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

## Participation

Online

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**Session Classification:** MS15

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