

Highlights

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1. Performed a model order reduction (*upscale*) of a permeability field using singular value decomposition (SVD)
2. Reduced order model (ROM) for SVD was implemented in the principal component space (PCS)
3. Benchmarked the SVD model by comparing with Arithmetic mean, Harmonic mean and probability density function (PDF) models
4. A novel high-order accurate control volume FEM multiphase flow simulator also compared the simulations from all the models
5. The SVD model presented a better representation compared to the other models