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Numerical Simulation of Coupling Darcy and Forchheimer Flow in the Carbonate Reservoir

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The carbonate reservoir is one of the important reservoir types, while they are different from the conventional reservoirs. They are very complex and are characterized by serious heterogeneity and multi-scales, the porosity scale is from the millimeter level to the meter level, thus there is not only the Darcy flow but also nonDarcy flow in the subsurface. It means it is hard to simulate the fluid flow in them only using the Darcy equation or Forchheimer equation. It is necessary for the researcher to develop a linkage model which can be used for the coexistence of the Darcy stream and the Forchheimer stream. We develop the coupling model in which the Darcy flow and Forchheimer flow are all considered. The Darcy equation and the Forchheimer equation are different and they have the different ranges of applicability. To integrate simultaneously Darcy flow and Forchheimer flow, they should satisfy the boundary condition on the interface of the boundaries: the pressures should be equal, and the fluid flow should be conservative. We built the governing equation of coupling model through the coupling boundary conditions, and the numerical simulation is realized by using Control-volume method. It has been verified the validity and correctness of the coupling boundary condition from two aspects: theory and numerical solution. The numerical simulation results prove not only the correctness and feasibility of the coupling model, but also the advantage of the coupling model in the carbonate reservoir.

Time Block Preference

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

References

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Primary authors: Dr WANG, Yueying; Prof. GEIGER, Sebastian; Prof. YAO, Jun

Presenter: Dr WANG, Yueying

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