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Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

In-Situ Combustion is a thermal recovery process which uses pressurized air injection to generate spontaneous ignition of oil in an underground reservoir. Numerical simulation of these processes has proven to be challenging due to the coupled nature of the governing equations, the many physical phenomena that need to be considered and the multi-scale nature of the problem. This typically results in a large, ill-conditioned system of equations. We work on the simulation of 1D combustion tube experiments, conducted grid convergence study on multiple test cases to assess the grid sensitivity of the problem. Even at the laboratory scale, we illustrate that achieving converged results in both space and time requires a prohibitively fine resolution, with a block size below one millimeter. Future work will focus on implementing and testing a combustion capability in Stanford's AD-GPRS reservoir simulator. We also wish to reduce the grid sensitivity of the combustion tube simulations, should it be as a sub-grid model or through the use of localization.

Publications

PUBLICATIONS

- **Monte Carlo simulation for uncertainty quantification in reservoir simulation: A convergence study** *Journal of Petroleum Science and Engineering*
Cremon, M. A., Christie, M. A., Gerritsen, M. G.
2020; 190
- **Multi-Stage Preconditioners for Thermal–Compositional–Reactive Flow in Porous Media** *arXiv*
Cremon, M. A., Castelletto, N., White, J. A.
2019
- **Monte Carlo Simulation For Uncertainty Quantification In Reservoir Simulation: A Convergence Study** *ECMOR XVI - 16th European Conference on the Mathematics of Oil Recovery*
Cremon, M. A., Christie, M., Gerritsen, M. G.
2018
- **Modified Athy-Law Compaction to Account for Porosity Generation and Preservation from Kerogen Conversion in Terzaghi-Like Models of Petroleum Source Rocks** *AAPG Annual Convention & Exhibition*
Cremon, M. A., Burnham, A. K., Liu, Y., Lapene, A.
2017