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Efficient Time Parallel Simulation of a Class of Single-Phase Sub-Diffusion Models

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It has been recently observed that single- and multi-phase fluid flow in complex porous media are best modeled using anomalous sub-diffusion models. Such models can be described by a class of non-local in time fractional derivative partial differential equations (FPDEs). Understanding the long-time behavior of processes governed by such models is crucial from early design phase to production phase in various applications such as reservoir management. The standard time-stepping approach for models involving non-local operators lead to computational bottleneck for long-time simulation and for resolving fine scale spatial structures in the models. We develop and implement an efficient time parallel simulation approach for a class of single-phase FPDEs.