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Flow Diagnostics for Optimization and Interactive Visualization

Flow diagnostics refers to a family of numerical methods that compute quantitative (and detailed) information about the flow behaviour of full 3D reservoir models within a few seconds. The starting point is a flow field, extracted from a previous multiphase simulation or computed by solving a simplified pressure equation with fixed mobilities. Time-of-flight (TOF) and stationary tracer equations are then solved to determine approximate time lines and volumetric partitions. From these, one can derive visually intuitive quantities that illuminate flow patterns and well connections, as well as dynamic heterogeneity measures that correlate well with oil recovery from waterflooding processes.

In this talk we review the main concepts for flow diagnostic computations and present applications within flow-based proxy modelling for optimization and interactive visualization. We further discuss ongoing work and point out future research directions within flow diagnostics. Finally, we will demonstrate relevant upcoming capabilities in the freely available Matlab Reservoir Simulation Toolbox (MRST).