

Efficient Finite Volume Methods: From a Posteriori Error Estimates to Fuel Cell Simulations

Mario Ohlberger
University of Maryland

Abstract: In this contribution we focus on the derivation of efficient finite volume schemes for flow problems in porous media, including two phase flow and reactive transport. The efficiency of the method is obtained by adaptivity in space and time, based on rigorous a posteriori error estimates for convection dominated weakly coupled systems. In addition, higher order reconstruction is used in order to compensate for the poor convergence rate of the first order method for advective transport problems. Numerical experiments include applications to radio nuclide transport with non-linear adsorption, contaminant transport with biodegradation, and the simulation of the reactive flow processes in proton exchange membrane fuel cells.