Title: Nonlinear solvers and Diagonally Implicit Runge–Kutta methods

Abstract: Diagonally Implicit Runge–Kutta (DIRK) methods are a well-known class of implicit time-integration schemes for solving stiff ordinary differential equations. These methods require solving systems of nonlinear equations, typically using an iterative nonlinear solver. This talk will explore how subtle implementation choices within the nonlinear solver can have consequential effects on the order of accuracy of the final numerical method. The analysis we present explains certain order-reduction phenomena observed in production DIRK codes, and suggests promising new directions for deriving more efficient linearly implicit schemes.