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Stability and Accuracy of Semi-Extrapolated Finite Difference Schemes ANDREW BRANDON, SHEILA WHITMAN, MIKAYLA FELDBAUER, NARSHINI GUNPUTH, Lycoming College, BRENDAN DRACHLER, Rochester Institute of Technology, CARTER ALEXANDER, Lycoming College, LUCAS WILKINS, Vanderbilt University — When numerically solving partial differential equations, finite difference methods are a popular choice. Several factors come into play when choosing a finite difference method, such as stability, accuracy, and computational cost. In response to the small stability regions of explicit methods and the computational cost of implicit methods, we've developed a novel discretization technique called semi-extrapolation. Semi-extrapolation generates explicit schemes from implicit schemes by applying extrapolation in an unconventional fashion. Unlike extrapolation, which can severely curtail stability, semi-extrapolation can improve stability, as compared to analogous explicit methods. Furthermore, semi-extrapolation can have unexpected effects on accuracy. In this presentation, the concept of semi-extrapolation will be introduced and two semi-extrapolated discretizations of the Advection-Diffusion Equation will be discussed. Then, the accuracies and stabilities of these semi-extrapolated discretizations will be compared to the accuracies and stabilities of analogous mainstream finite difference discretizations.

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