Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Accuracy and Computational Cost of Semi-Extrapolated Finite Difference Schemes SHEILA WHITMAN, MIKAYLA FELDBAUER, NARSHINI GUNPUTH, ANDREW BRANDON, Lycoming College — 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. Semi-extrapolation can improve stability, however, we've also found that semi-extrapolation can have unexpected and interesting effects on accuracy. In our presentation, we'll introduce our semi-extrapolation technique and discretize the Advection Equation and the Advection-Diffusion Equation according to semi-extrapolated and mainstream finite difference methods. Then, we'll examine the computational costs and accuracies of semi-extrapolated methods. Included in this examination will be a comparison against the costs and accuracies of mainstream methods and a discussion regarding how stability influences the accuracy of semi-extrapolated schemes.

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Date submitted: 30 Jul 2019 Electronic form version 1.4