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Daniel Patrick Howard* (dphoward@wisc.edu), 118 Buck Cole, 625 Elm Drive, Madison, WI 53706-1183, and **Keith J Wojciechowski** (wojciechowskik@uwstout.edu), 202D Jarvis Hall - Science Wing, 410 10th Avenue East, Menomonie, WI 54751-2506. *Applying the Eigendecomposition Pseudospectral Method to Wave Propagation Problems.*

In this talk we demonstrate the range and applicability of the eigen-decomposition pseudospectral (EPS) method to a variety of linear and nonlinear PDEs. The derivative matrix construction for the EPS method is based on representing the derivative operator as an integral kernel composed of singular functions so the matrices naturally incorporate the boundary conditions of the problem and do not rely on the interpolating polynomials. If the boundary conditions of the application are not encompassed by the natural boundary conditions of the operator, we show how to modify the method to accommodate these circumstances. Moreover, we demonstrate how this modification can be used to incorporate the EPS method in a domain decomposition setting. We show that the construction achieves similar or better accuracy than traditional pseudospectral derivative matrices, while resulting in a norm that is orders of magnitude smaller than the standard construction. (Received September 17, 2013)