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Equation Free Projective Integration for Plasma Systems[1] G. STANTCHEV, Univ. Maryland, M. SHAY, Univ. Delaware, W. DORLAND, J. DRAKE, Univ. Maryland — “”Equation free projective integration” has the potential to allow global simulations of phenomena including relevant kinetic physics. In our algorithm, the global plasma variables stepped forward in time are not integrated directly from differential equations – hence the name “equation free.” Instead, these variables are represented on a microgrid by a kinetic simulation, which is used to estimate the time derivatives of the variables for a large projection step. We present three examples. (1) An ion acoustic wave with strong Landau damping, with wavelets to represent f(x,v). (2) A large-scale MHD wave using a non-ideal fluid code as the micro-simulator. A key aspect of this problem is demontrating that the global time step is not limited by the nonideal wave speeds (such as the whistler). (3) Magnetic reconnection. We focus here on the use of nonlinear wavelet approximation schemes (thresholding and shrinkage). The resulting wavelet coefficients are projectively integrated. We study the effecs of various level-dependent threshold selection criteria based on statistical inference rules. We also discuss how to choose optimal decomposition bases with wavelet and more general lifting schemes.

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