Determining The Effective Resolution of Advection Schemes

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Abstract

The effective resolution of a numerical scheme describes the smallest spatial scale (largest wavenumber) that is completely resolved by that scheme. This is often significantly larger than the model's grid spacing, resulting in poor representation of features that are of the order of the grid scale. We present two methods to determine the effective resolution of numerical advection schemes. An analytical method using dispersion relation analysis is used to assess the effects of common modeling choices, such as order-of-accuracy and explicit diffusion, on the effective resolution of linear schemes. As the analysis is linear, we use a numerical test methodology to assess non-linear schemes. Using this testing we investigate the impact different types of flux-limiters have on the effective resolution of advection schemes.