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Interactive comment on "The impact of periodization methods on the kinetic energy spectra for limited-area numerical weather prediction models" *by* V. Blažica et al.

Anonymous Referee #2

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This paper examines a number of methods used to produce kinetic energy (KE) spectra from limited-area model simulations. The spectral computations requires transforming the horizontally non-periodic fields into periodic fields because of the necessary use of Fourier transforms in the computations. The authors' examinations focus on the extension zone techniques used in the ALADIN and HIRLAM models that also require periodic horizontal fields. The authors' main result is that the ALADIN and HIRLAM extension zone techniques should not be used for computing KE spectra - very large errors are introduced using these approaches; other techniques, such as the Boyd methods, the cosine transform and the trending approach, yield much more accurate spectra. The authors' figures 3 and 4 provide a clear illustration of the problem with

the KE computations using the ALADIN and HIRLAM extension zone techniques. This illustration is produced using a specific test problem of the authors' design. The rest of the paper provides a more-detailed view of the results from this test problem.

The errors in the limited-area KE spectra computed using the ALADIN and HIRLAM extension zone techniques are large, so much so that these techniques should not be used. Given that limited-area KE spectra have been published computed using these techniques, this paper should be published so that no further studies are conducted using them for computing spectra.

Two aspects of the manuscript deserve further comment:

1. As a reader, one would expect that the general behavior of the spectra using the different periodicity constraints could be easily revealed in a 1D linear analysis of the Fourier components. Specifically, an understanding of the low wavenumber response and the asymptotic high-wavenumber response of the detrending method, Boyd's method and the DCT method, illustrated in figure 7, would likely fall out of such an analysis, in addition to the smooth error fields for the HIRLAM and ALADIN approaches illustrated in figure 9.

2. The authors have chosen the setup of the wind fields for their test, and they note that the tests favor the detrending method because the departure from periodicity is small (at the end of section 3). The authors could have constructed a test problem that was not deficient in this manner, especially given that they attempted no linear analysis of the techniques using the test setup.

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