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Large-scale power loss in ground-based CMB maps

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ABSTRACT

1. INTRODUCTION

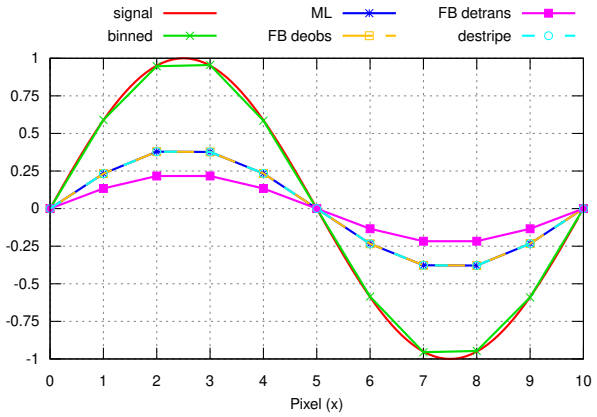

Figure 1. Demonstration of large loss of power in long-wavelength mode caused by the poor subpixel treatment in the standard nearest-neighbor pointing matrix. Figure 3 shows the noise model/inverse weights/inverse filter used in the various methods. **signal**: The input signal, a smooth long-wavelength mode, sampled at 10 samples per output pixel. **binned**: Simple binned map (the unweighted average per pixel). Very suboptimal in the presence of correlated noise, but unbiased. **ML**: Maximum-likelihood map. 2/3 of the signal is lost despite the naive expectation of biaslessness for this estimator. **FB deobs**: Filter+bin map debiased using an observation matrix. Identical to ML. **FB detrans**: Filter+bin map debiased by deconvolving a transfer function measured from simulations. Even more biased than the others due to ignoring mode coupling. **destripe**: Destriper in the limit of 1-sample baselines. Identical to ML.

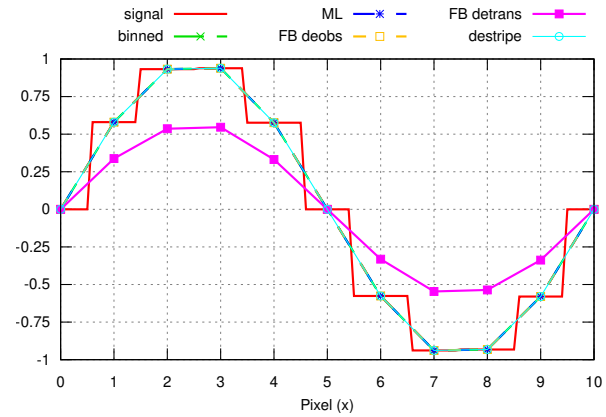

Figure 2. Like figure 1, but with the input signal having the same nearest-neighbor pixelization as the models. In this case all models except FB detrans are unbiased.

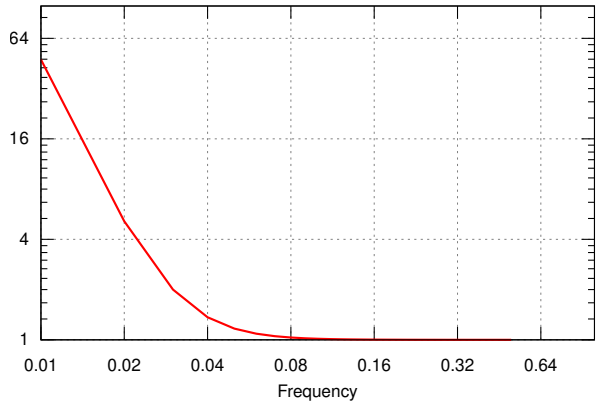

Figure 3. The noise model/inverse weights/inverse filter used in the subpixel bias demonstration in figures 1 and 2. It is a simple Fourier-diagonal 1/f + white noise spectrum typical for ground-based CMB observations.