Background
When strong coherent noise is anticipated during seismic data acquisition, it is always best to choose a source or receiver spacing that allows spatial sampling of all anticipated coherent noises without significant aliasing. If this is not possible, due to financial or time constraints, there are a few simple processing tricks that can improve coherent noise attenuation, though never quite approaching the attenuation possible with unaliased data.

We tested some of these tricks on a source gather from the CREWES physical modeling facility, which was properly sampled spatially during actual acquisition. To provide the test data, the well-sampled gather was spatially binned by discarding every second trace. We then applied various simple processing tricks to attempt to emulate the coherent noise attenuation possible on the original well-sampled gather.

Results
Figure 1 displays the original well-sampled physical model source gather, on which several reflections may be seen, dominated by a very strong surface wave and its repeats. Figure 2 shows this same gather after several passes of R-T filtering to remove coherent noise. This filtered result is our ideal. The binned gather was subjected to the same R-T filter passes; and Figure 3 shows that the noise attenuation is much less successful, due to the aliasing of the surface wave.

The noise attenuation on the binned gather is improved if we apply partial linear moveout (LMO) to reduce the surface wave aliasing before estimating and subtracting the surface wave, as shown in Figure 4.

If we apply a simple 2-point R-T domain interpolation to the binned gather, followed by R-T domain AGC, we improve the noise attenuation, but lose any AVO information (Figure 5).

If we apply AGC in the R-T domain first, then interpolate the gather, we achieve even better noise attenuation, but still lose AVO information, as shown in Figure 6.

It is always better to sample properly during acquisition.

Traces in all plots are individually normalized, so relative amplitudes are not accurately portrayed.