

# Now you see it, now you don't (coherent noise, that is)

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## Background

The **radial trace (R-T) domain** has been shown to be an **intuitive** and **effective** one in which to attenuate coherent noise on seismic trace ensembles. As early as 2000, CREWES released ProMAX modules to sponsors for applying R-T domain algorithms to seismic trace ensembles. Several sponsor companies have made effective use of these modules, or have modified them for their own proprietary systems.

While CREWES has continued to improve and refine the ProMAX modules over the years, we have never offered a **general tutorial**, including parameter recommendations, for the routine analysis and attenuation of coherent noise. This report chapter is such a tutorial. It presents ProMAX **processing flows**, **parameter guidance**, and **real data examples**.

The examples at right show a **'conventional'** application of a **series of R-T filters** to clean up a high-resolution source gather (Figures 1 and 1a); a **nonlinear** R-T application (**R-T domain AGC**) for attenuating very strong linear noise modes (Figures 2 and 2a); and another **nonlinear** application (**R-T domain spectral clipping**) for attenuating a difficult noise encountered in the arctic (Figures 3 and 3a). In each case, the 'before' and 'after' source gathers are displayed, and the ProMAX processing flow which accomplished the noise attenuation is shown.

*In the first example, only the raw gather and final processed gather are shown, but the report chapter describes the step-by-step process of removing the coherent noises in stages, analyzing the result at each stage, and designing the appropriate filter for the next stage.*

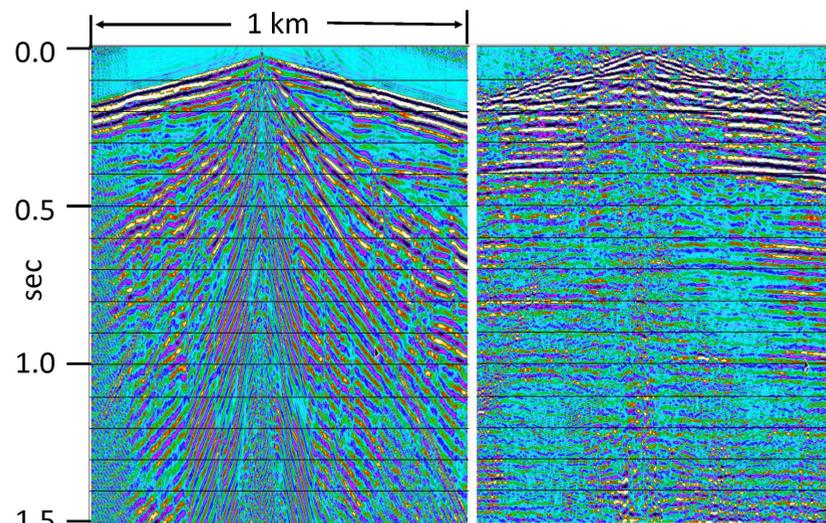


Fig. 1. Raw high-resolution source gather (left) and the final filtered gather (right) after several stages of R-T filtering. **The filters are estimate-and-subtract operations, so artefacts are minimal.**

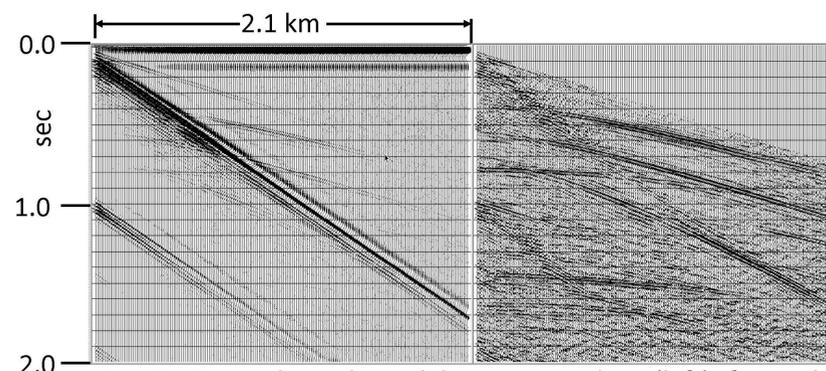


Fig. 2. Raw physical model source gather (left) from the CREWES physical modeling facility. The very strong surface wave overwhelms the underlying reflections, motivating the use of AGC in the R-T domain (right) to attenuate the wave. **This nonlinear operation destroys any AVO information.**

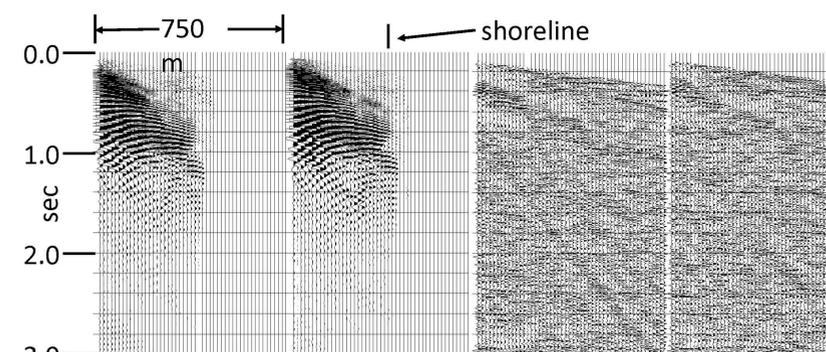
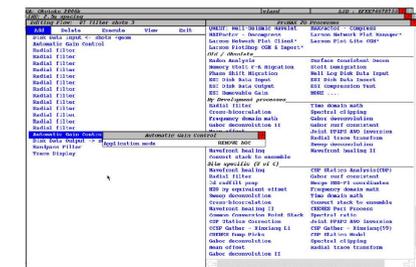
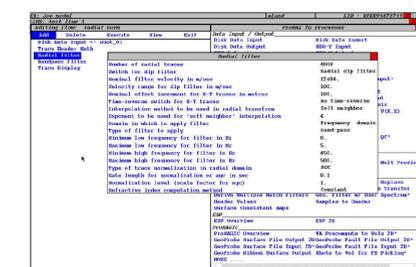


Fig. 3. Two raw source gathers from an arctic survey performed partially on floating ice (left), showing the completely dominant ice-flexural wave. **After applying R-T domain spectral clipping, the gathers show fragmentary reflections (right), even under the floating ice.**



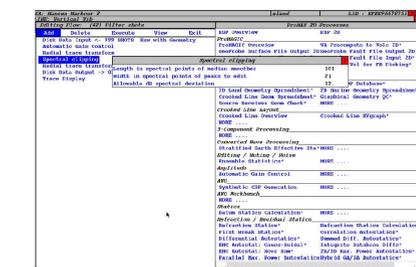
Diagnostic and design process flow for radial trace filtering (6)

Fig. 1a. The ProMAX processing flow that transforms the raw gather at far left to the filtered gather at near left. **In analysis mode, the filters are enabled one at a time to judge their effect on the gather before adding another filter stage.**



Process flow for radial trace AGC

Fig. 2a. The simple ProMAX flow which accomplishes the **R-T domain AGC** demonstrated at left.



Process flow for spectral clipping in the radial trace domain (2)

Fig. 3a. The simple ProMAX process flow which applies the **R-T domain spectral clipping** demonstrated at left.