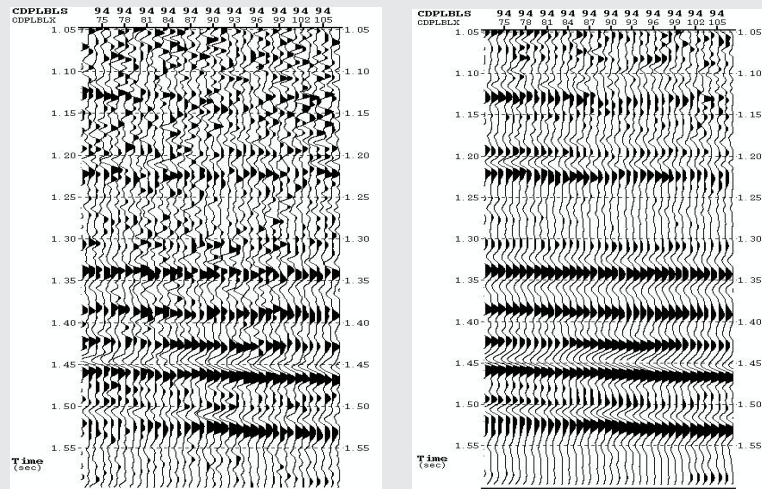


SUMMARY

Spatial prediction filtering and F-K velocity filtering work synergistically. Spatial prediction filtering attenuates random noise (e.g. spikes, noise bursts) and subsequent F-K filtering removes the linear dipping noise left behind by the spatial prediction filter.

Developed in 2000, FKKX increases S/N ratio, preserves moderate structure, and is AVO friendly. This noise attenuation process pre-conditions gathers for a cleaner and less noisy prestack time migration. Removing these types of noise also helps post stack spectral whitening.

We thank SIGMA Explorations Inc. for allowing use of their data.



STACK BEFORE FKKX

STACK AFTER FKKX

REFERENCES

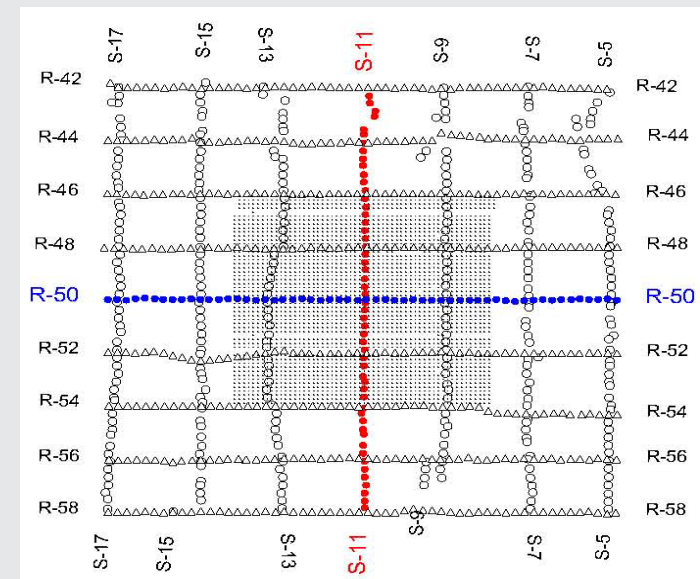
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FKKX

3-D PRESTACK NOISE ATTENUATION

INTRODUCTION

Vermeer demonstrated in 1998 that, with orthogonal 3-D acquisition, it was possible to construct prestack gathers with continuous subsurface coverage and referred to them as cross-spread gathers. Traditional prestack gathers (common-shot, common-receiver and CMP) have poor spatial sampling in at least one direction, precluding optimal 3-D prestack S/N enhancement. The cross-spread gather provides us with a uniformly sampled, 1-fold, 3-D prestack data volume appropriate for S/N enhancement such as 3-D F-K and 3-D F-X filtering.



CROSS SPREAD GATHER S11 + R50
SOURCE, RECEIVER AND CDP LOCATIONS

Fig. 1

THE CROSS-SPREAD GATHER

A cross-spread gather is formed by collecting all the data traces common to one source line and one receiver line. These traces comprise a 1-fold 3-D volume with subsurface coverage as shown in Figure 1. Each trace within the cross-spread gather has, as its nearest neighbours, traces from either the same shot or an adjacent shot, and traces from the same receiver or an adjacent receiver. This implies continuous subsurface coverage with even cdp sampling in both directions. The traces are arranged around the intersection of the source and receiver lines so that neighbouring traces have similar offsets and azimuths.

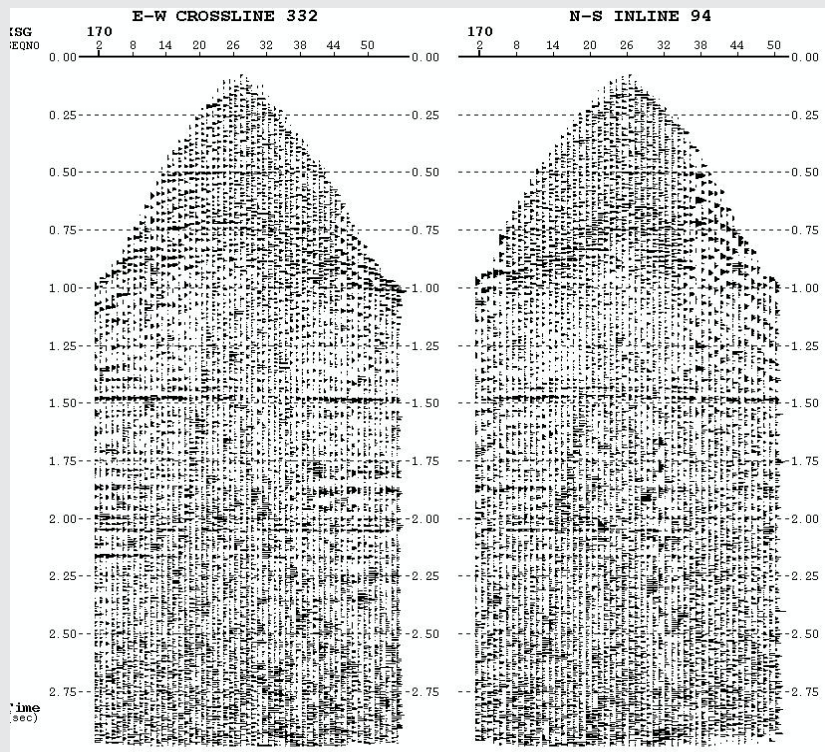
NOISE ISSUES

Seismic data contains incoherent random noise and coherent surface or near surface generated noise.

Figure 2 shows one cdp inline and one cdp crossline extracted from a typical cross-spread gather with random spiky noise and less apparent low velocity coherent noise.

Fig. 2

INPUT XSG S11 + R50



THE PROCESS

The FKKX process is the combination of a 3-D spatial prediction filter and a one pass 3-D F-K velocity filter applied to nmo and static corrected cross-spread gathers. The 3-D prediction filter removes the unpredictable components of the data (e.g. random noise), but tends to preserve linear dipping noise such as groundroll. This dipping noise is then removed by applying the 3-D F-K velocity filter to the cross-spread gather.

Figure 3 shows the application of the 3-D spatial prediction filter, (removal of random noise), and the application of a 3-D F-K filter, (removal of the linear dipping noise). Apparent structure and relative amplitudes are preserved.

Fig. 3

FKKX XSG S11 + R50

