Processing Seismic Data in the Presence of Residual Statics

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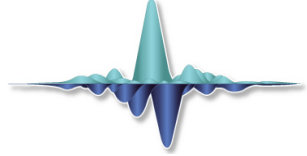
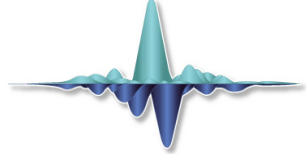
Outline



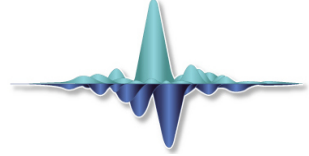
- Motivation
- Algorithm
- Synthetic Examples
- Real Examples

Motivation



- Processing tools that rely on sparsity or simplisity promotion can fail in the presence of static shifts.
- Many methods can solve for static shifts, but can we still process data with static shifts?
- Here we adapt radon multiple attenuation and reconstruction to work in the presence of small static shifts.

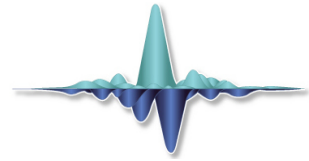
Projection Onto Convex Sets



$$D^k = \alpha_1 D^{obs} + (1 - \alpha_1 S) F_D^{-1} T F_D D^{k-1}$$

$\alpha_1 \rightarrow 1$ when data are free of noise.

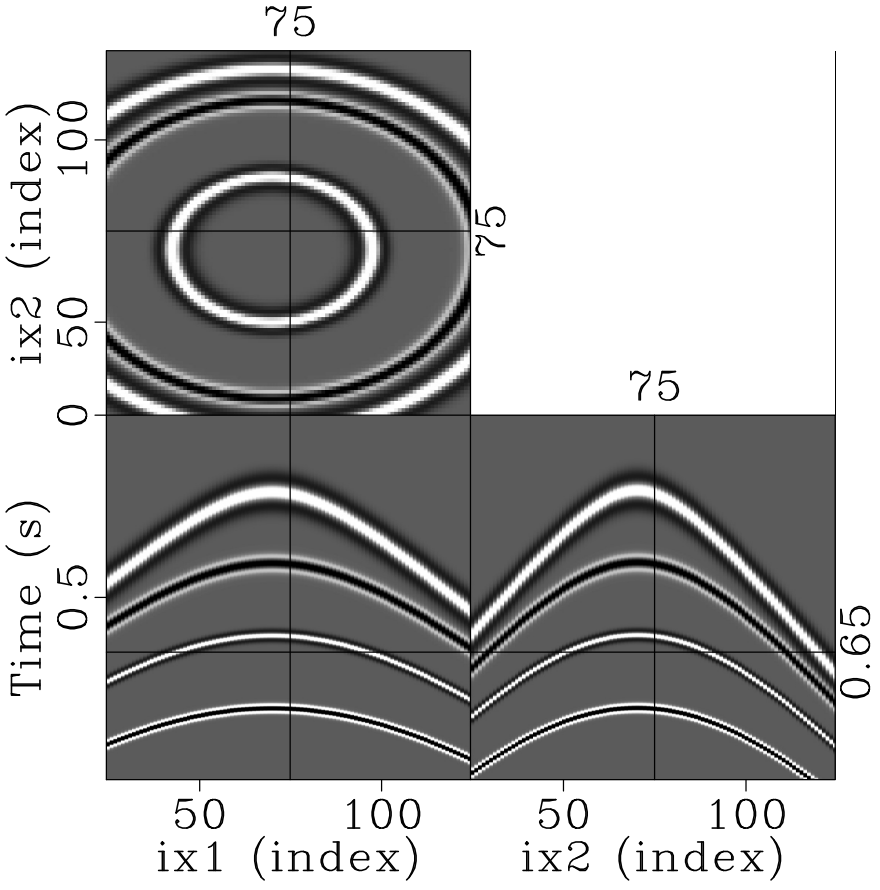
Projection Onto Convex Sets with statics computation



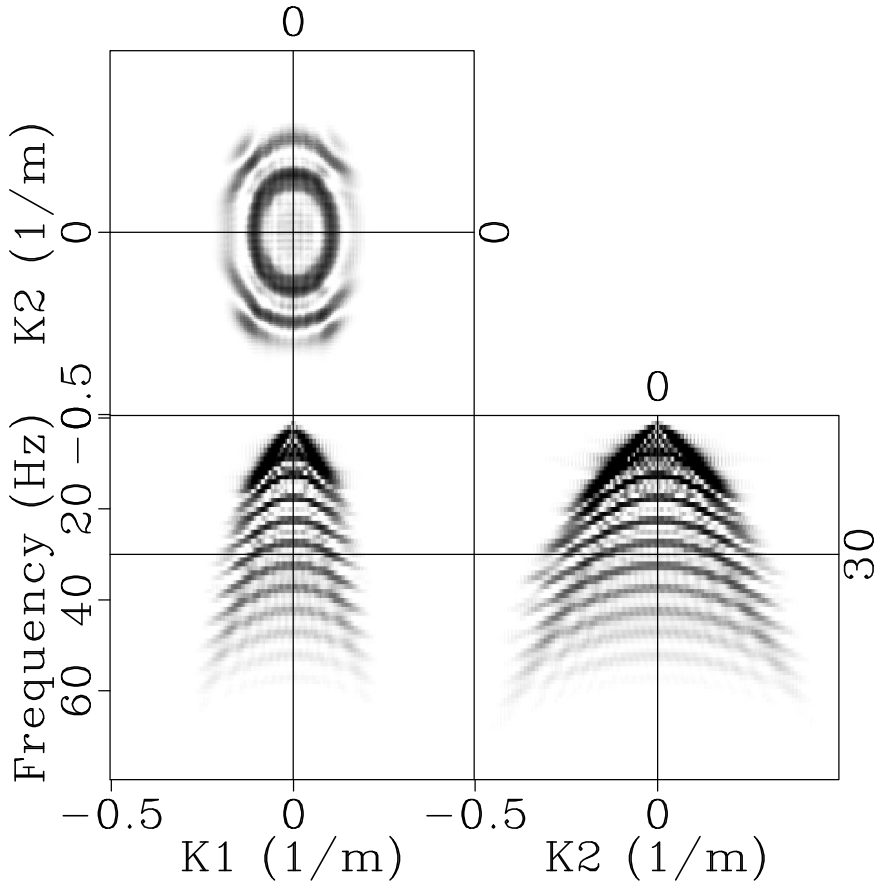
$$D^k = \alpha_1 D^{obs} e^{-i\omega(1-\alpha_2)\tau^k} + (1 - \alpha_1 S) F_D^{-1} T F_D D^{k-1}$$

$\alpha_1 \rightarrow 1$ when data are free of noise.
$\alpha_2 \rightarrow 1$ when data are free of statics.

Original data

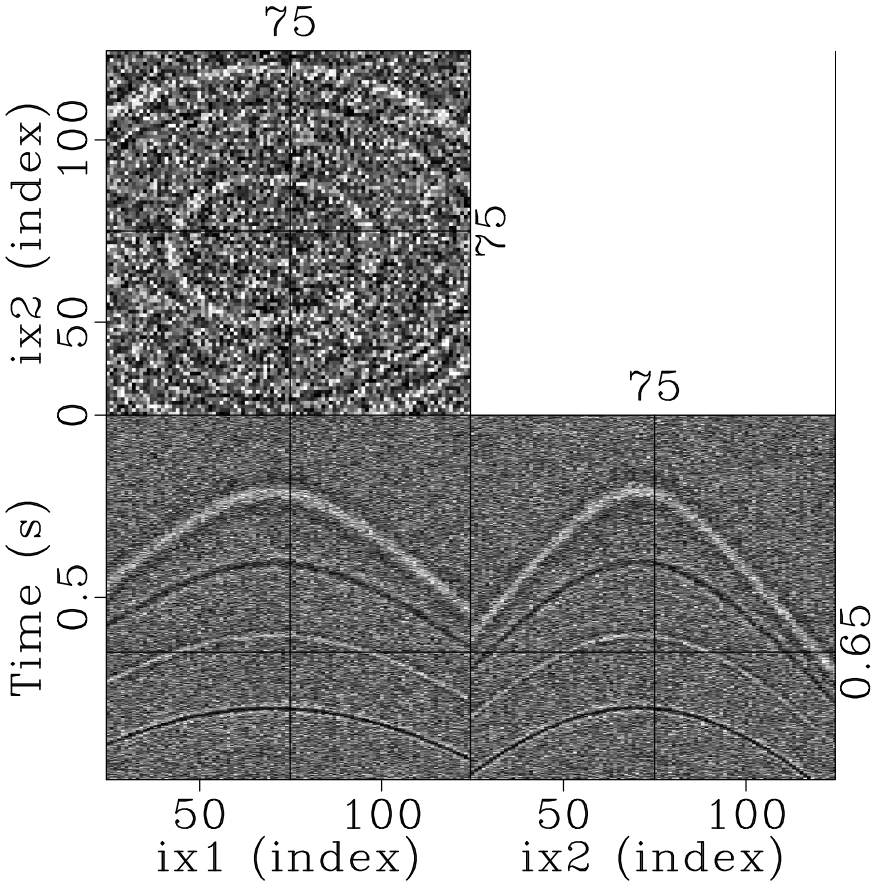


(a)

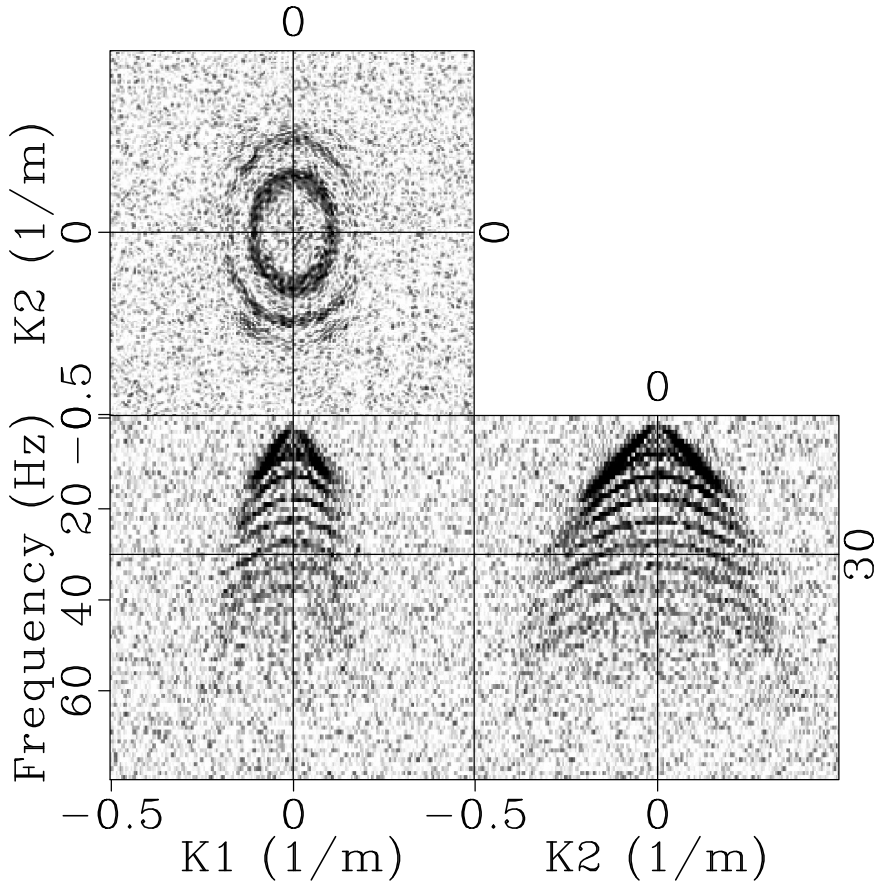


(b)

Noise

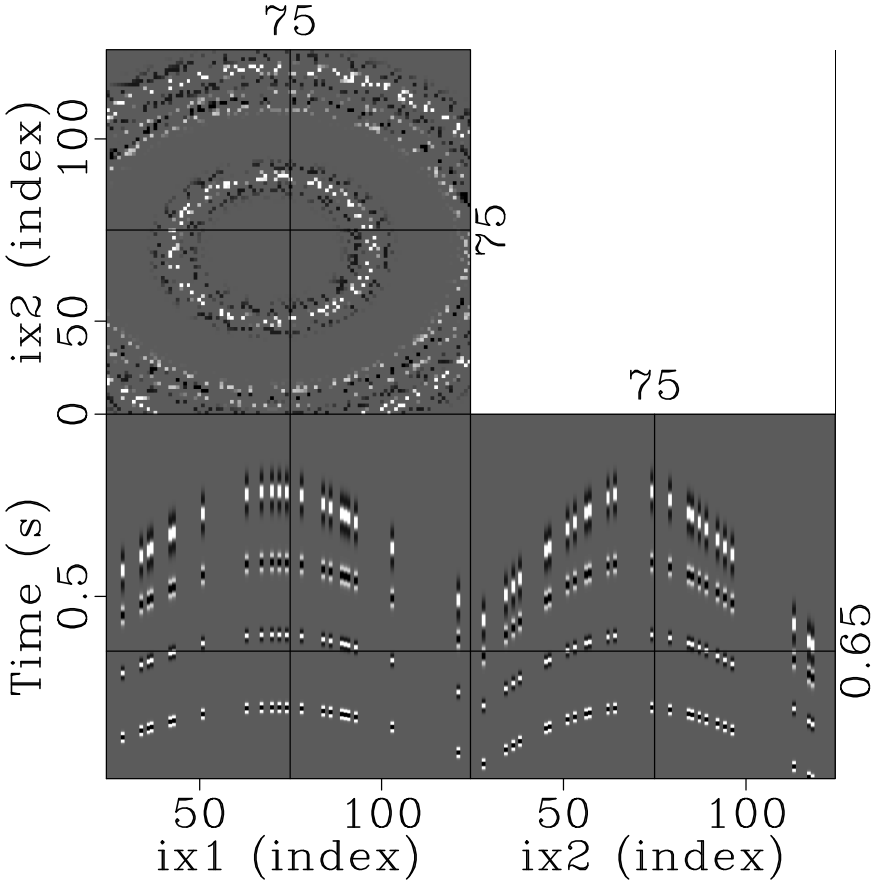

75
ix2 (index)
100
50
0
75
75
Time (s)
0.5
0.65
50
100
ix1 (index)
50
100
ix2 (index)

(c)

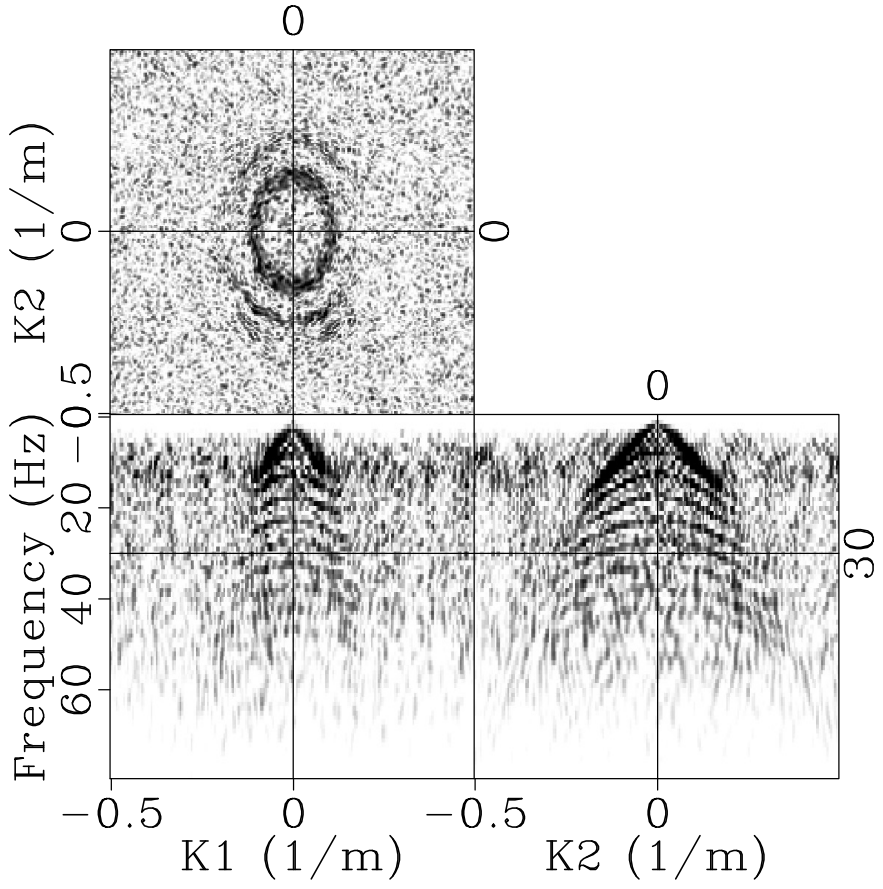

0
K2 (1/m)
0
0
0
Frequency (Hz)
20
40
60
−0.5
30
−0.5
0
0
K1 (1/m)
K2 (1/m)

(d)

Decimation

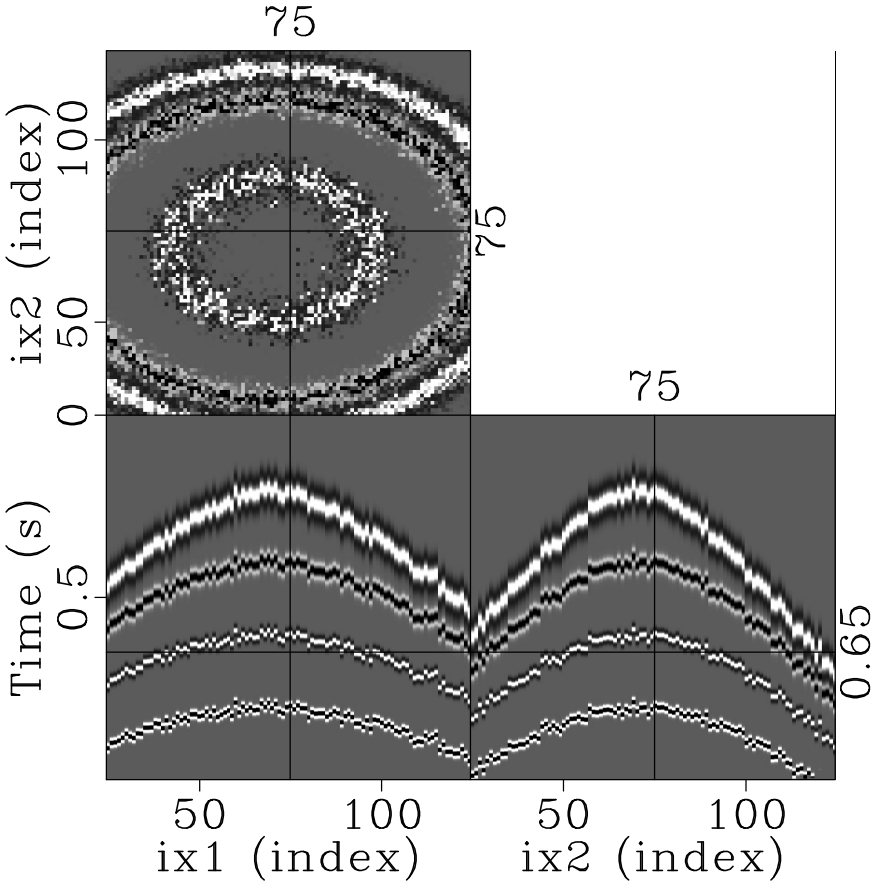


(e)

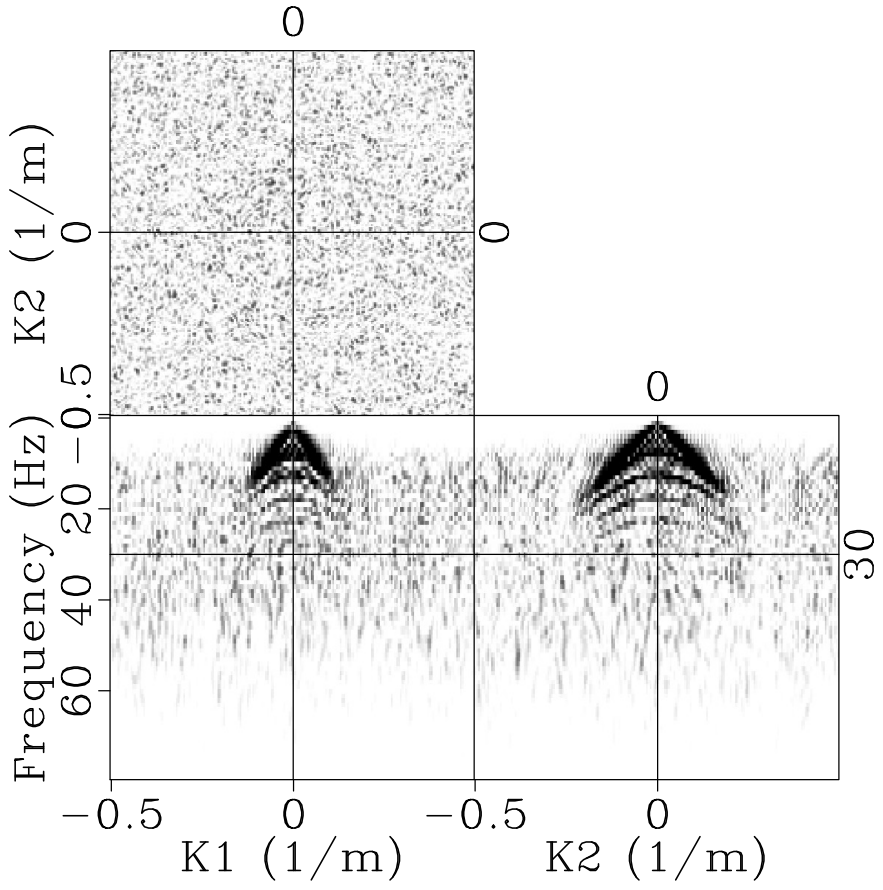


(f)

Statics


75
ix2 (index)
100
50
0
75
75
Time (s)
0.5
0.65
50
100
ix1 (index)
50
100
ix2 (index)

(g)


0
K2 (1/m)
0
0
0
Frequency (Hz)
20
−0.5
40
60
30
−0.5
0
−0.5
0
K1 (1/m)
K2 (1/m)

(h)