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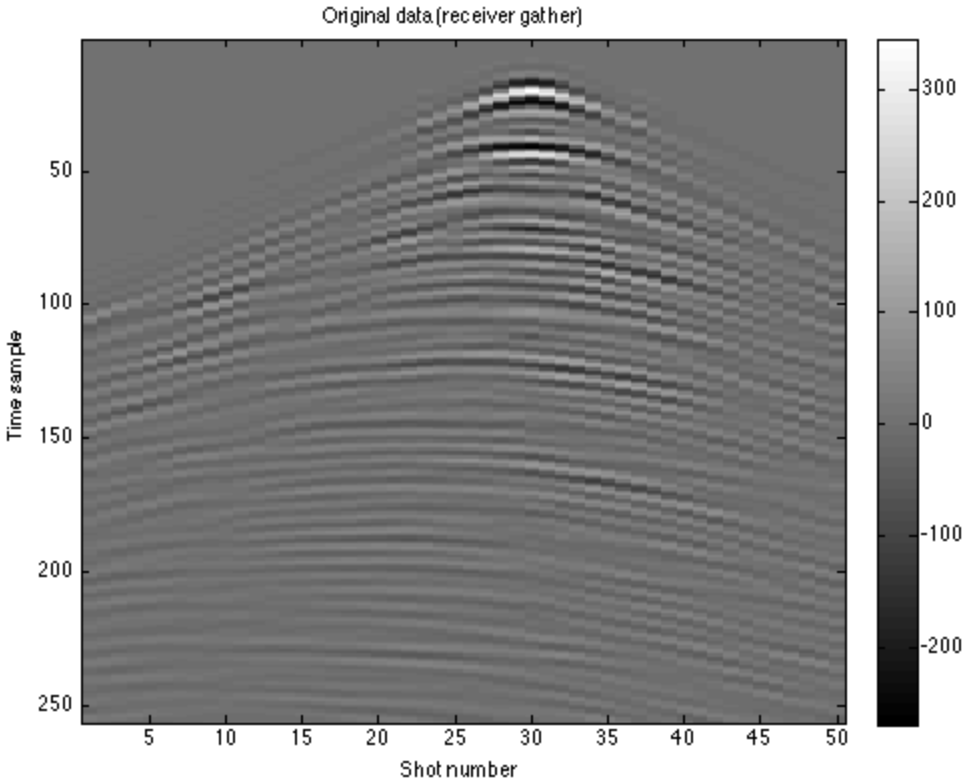
```
% random weights of simu shots

clear; close all;
cd ./functions
addpath(genpath(pwd))
cd ..
cd ./simu_functions/
addpath(genpath(pwd))
cd ..
```

original data

Number of time samples

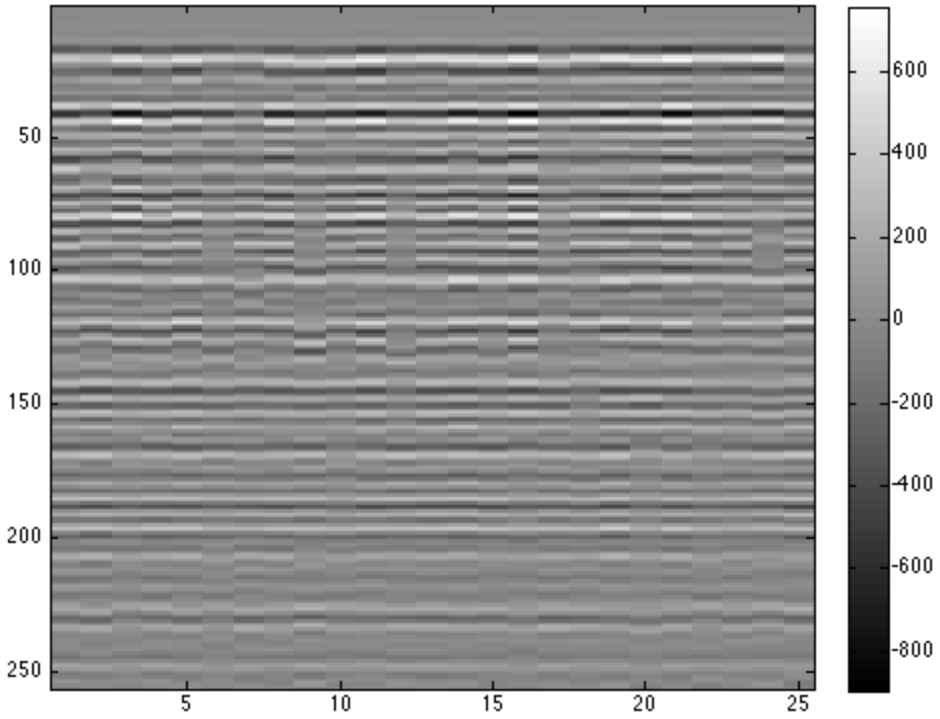
```
nt = 1024;
% Number of sources
ns = 178;
% Number of receivers
nr = 178;

% Read data
D = ReadSuFast('GulfOfSuez178.su');
D = reshape(D,nt,nr,ns);

% Select small subset
D = D(1:256,30,1:50);

% Define new data sizes
[nt,nr,ns] = size(D);

% Vectorize D
D = D(:);

% Display
figure
imagesc(reshape(D,nt,ns)); colormap(gray); colorbar;
title('Original data (receiver gather)');
xlabel('Shot number'); ylabel('Time sample')
```



random weights of simu shots

```
p = .5;
nse = p*ns;
SS = rand(nse,ns);
Dt = opDirac(nt);
Dr = opDirac(nr);
RM = opKron(SS,Dr,Dt);

x_test = rand(size(RM,2),1);
y_test = rand(size(RM,1),1);
left = y_test'*(RM*x_test);
right = (RM'*y_test)'*x_test;
error = norm(left-right);
fprintf('In dottest error:%5.5e\n',error);


simD1 = RM*D;
figure;
imagesc(reshape(simD1,nt,nse)); colormap(gray); colorbar;
```

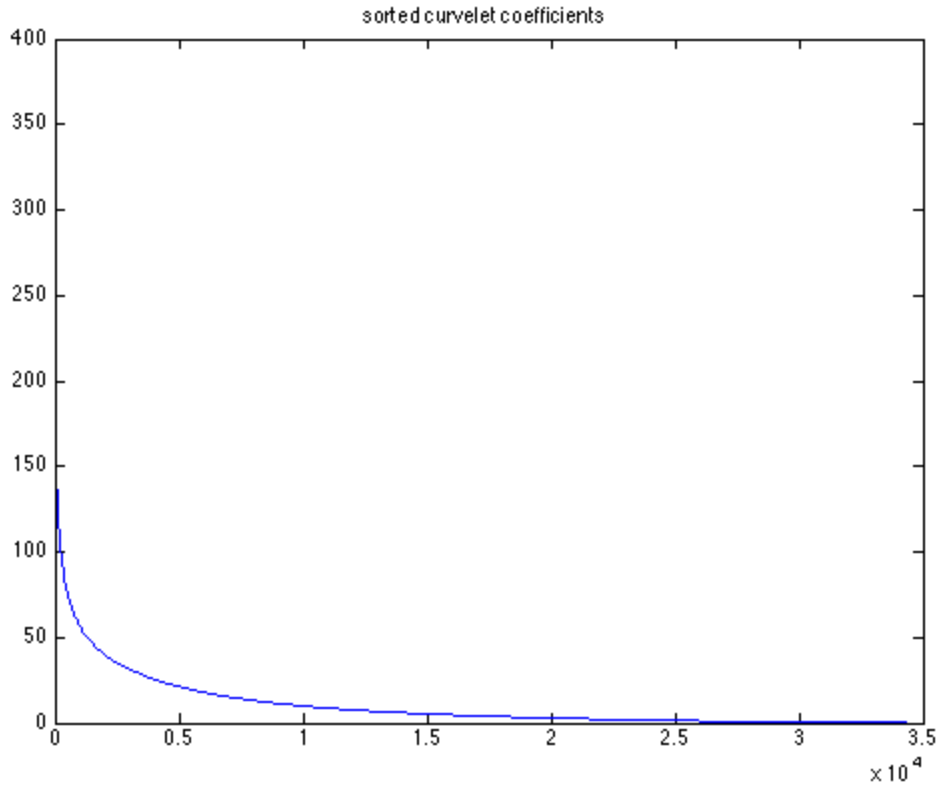
```
In dottest error:0.00000e+00
```



sparsifying transform

Use this to create a Curvelet SPOT operator:

```
C = opCurvelet(nt, ns);

% Transform the data into the Curvelet domain and plot the sorted coefficients
C_D = C*D;
sort_CD = sort(abs(C_D),'descend');
figure;plot(sort_CD);title('sorted curvelet coefficients')
```



reconstruct

```
options = spgSetParms('optTol', 1e-4, 'iterations', 200);%, 'fid', fid);
A = RM*C';
xestspg = spgl1_origin(A,simD1,0,1e-3,[],options);
options.iterations = 100;
xestpqn = pqnl1_2(A,simD1,0,1e-3,[],options);
fspg = C'*xestspg;
snrspg = SNR(D,fspg);
fpqn = C'*xestpqn;
snrpqn = SNR(D,fpqn);



figure;
subplot(1,2,1);imagesc(reshape(fspg,nt,ns)); colormap(gray);
title(strcat(['p = .5, SNR=' num2str(snrspg) 'dB']))
subplot(1,2,2);imagesc(reshape(fspg-D,nt,ns)); colormap(gray);
title('difference')


figure;
subplot(1,2,1);imagesc(reshape(fpqn,nt,ns)); colormap(gray);
title(strcat(['p = .5, SNR=' num2str(snrpqn) 'dB']))
subplot(1,2,2);imagesc(reshape(fpqn-D,nt,ns)); colormap(gray);
```

```
title('difference')
```

```
================================================================================
SPGL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
================================================================================
No. rows              :     6400      No. columns           :    34341
Initial tau           : 0.00e+00      Two-norm of b         : 1.53e+04
Optimality tol        : 1.00e-04      Target objective      : 1.00e-03
Basis pursuit tol     : 1.00e-06      Maximum iterations    :      200

 Iter      Objective   Relative Gap  Rel Error      gNorm   stepG    nnzX
    0  1.5318009e+04  0.0000000e+00  1.00e+00  1.005e+04     0.0       0
    1  1.5124796e+04  1.9599642e+00  1.00e+00  9.537e+03    -0.3       1
    2  1.3001082e+04  1.9112011e+00  1.00e+00  6.826e+03    -0.3     274
    3  8.2815922e+03  2.4021694e+00  1.00e+00  5.164e+03     0.0    2698
    4  7.9536373e+03  5.4758235e-01  1.00e+00  2.471e+03     0.0    2863
    5  7.9049881e+03  4.5990496e-01  1.00e+00  2.351e+03     0.0    2633
    6  7.8148125e+03  4.7213247e-01  1.00e+00  2.347e+03     0.0    2231
    7  7.8645764e+03  2.1563973e+00  1.00e+00  4.623e+03     0.0    1883
    8  7.7856730e+03  1.2850737e+00  1.00e+00  3.361e+03    -0.3    1957
    9  7.6814640e+03  6.3869399e-01  1.00e+00  2.609e+03     0.0    2017
   10  7.6681527e+03  3.1176829e-01  1.00e+00  2.190e+03     0.0    1926
   11  7.6558631e+03  2.8456789e-01  1.00e+00  2.160e+03     0.0    1793
   12  7.5718914e+03  4.7469615e-01  1.00e+00  2.404e+03     0.0    1246
   13  7.5489622e+03  7.0032576e-01  1.00e+00  2.644e+03    -0.3    1332
   14  7.5339234e+03  8.3742410e-01  1.00e+00  2.849e+03     0.0    1459
   15  7.5221521e+03  4.2997189e-01  1.00e+00  2.348e+03     0.0    1347
   16  7.5179256e+03  1.8622748e-01  1.00e+00  2.056e+03     0.0    1270
   17  7.5113535e+03  2.7468607e-01  1.00e+00  2.163e+03     0.0    1203
   18  7.4844954e+03  1.3438986e+00  1.00e+00  3.425e+03     0.0     934
   19  7.4840285e+03  4.7349799e-01  1.00e+00  2.356e+03    -0.3     964
   20  7.4615956e+03  3.4798087e-01  1.00e+00  2.245e+03     0.0    1014
   21  7.4573506e+03  1.6996086e-01  1.00e+00  2.032e+03     0.0     955
   22  7.4540737e+03  1.5980241e-01  1.00e+00  2.024e+03     0.0     930
   23  7.4407830e+03  5.9759078e-01  1.00e+00  2.543e+03     0.0     862
   24  7.4412484e+03  5.8751144e-01  1.00e+00  2.521e+03    -0.3     866
   25  7.4359379e+03  6.5532803e-01  1.00e+00  2.610e+03     0.0     873
   26  7.4321472e+03  1.5278112e-01  1.00e+00  2.016e+03     0.0     864
   27  7.4305777e+03  2.0173249e-01  1.00e+00  2.074e+03     0.0     852
   28  7.4203494e+03  1.5043191e-01  1.00e+00  2.009e+03     0.0     783
   29  7.4070830e+03  1.0524307e+00  1.00e+00  3.063e+03    -0.3     784
   30  7.4296861e+03  8.2559355e-01  1.00e+00  2.766e+03    -0.3     896
   31  7.3975671e+03  7.4855875e-01  1.00e+00  2.708e+03     0.0    1168
   32  7.3917825e+03  1.4347358e-01  1.00e+00  2.001e+03     0.0     990
   33  7.3902830e+03  1.6158521e-01  1.00e+00  2.023e+03     0.0     873
   34  7.3819279e+03  1.4733514e-01  1.00e+00  2.007e+03     0.0     708
   35  7.3798139e+03  6.0276776e-01  1.00e+00  2.522e+03    -0.3     564
   36  7.3665563e+03  1.7102265e-01  1.00e+00  2.015e+03    -0.3     729
   37  7.3625221e+03  2.2843447e-01  1.00e+00  2.100e+03     0.0     858
   38  7.3607053e+03  1.5760216e-01  1.00e+00  2.015e+03     0.0     742
   39  7.3581964e+03  1.3092790e-01  1.00e+00  1.986e+03     0.0     627
   40  7.3540796e+03  1.7093793e-01  1.00e+00  2.016e+03     0.0     509
   41  7.3486209e+03  1.9791583e-01  1.00e+00  2.058e+03    -0.3     568
```

42	7.3469848e+03	1.6261669e-01	1.00e+00	2.018e+03	0.0	524
43	7.3459827e+03	1.2093625e-01	1.00e+00	1.972e+03	0.0	521
44	7.3447469e+03	1.5078060e-01	1.00e+00	2.005e+03	0.0	493
45	7.3421776e+03	6.1887862e-01	1.00e+00	2.546e+03	0.0	466
46	7.3399131e+03	1.2786014e-01	1.00e+00	1.972e+03	-0.3	478
47	7.3391295e+03	1.1898002e-01	1.00e+00	1.966e+03	0.0	477
48	7.3383042e+03	1.1574097e-01	1.00e+00	1.964e+03	0.0	473
49	7.3344385e+03	1.1316705e-01	1.00e+00	1.959e+03	0.0	448
50	7.3324848e+03	5.3991014e-01	1.00e+00	2.447e+03	-0.3	448
51	7.3316206e+03	1.6183009e-01	1.00e+00	2.004e+03	-0.3	463
52	7.3298560e+03	1.7066898e-01	1.00e+00	2.024e+03	0.0	490
53	7.3294000e+03	1.0246432e-01	1.00e+00	1.945e+03	0.0	463
54	7.3282932e+03	1.0559665e-01	1.00e+00	1.949e+03	0.0	445
55	7.3244970e+03	6.4905976e-01	1.00e+00	2.575e+03	0.0	399
56	7.3241885e+03	1.6078677e-01	1.00e+00	2.000e+03	-0.3	411
57	4.8933937e+03	4.7507991e+00	1.00e+00	7.893e+02	0.0	7703
58	4.6010570e+03	1.9546452e+00	1.00e+00	4.676e+02	0.0	33269
59	4.5413017e+03	1.7605049e+00	1.00e+00	4.561e+02	0.0	22656
60	4.4011925e+03	1.1638091e+00	1.00e+00	5.240e+02	0.0	11074
61	4.5787828e+03	4.7131441e+00	1.00e+00	7.595e+02	0.0	5115
62	4.3231511e+03	1.4219979e+00	1.00e+00	4.114e+02	-0.3	18334
63	4.2869450e+03	1.5959551e+00	1.00e+00	4.052e+02	0.0	14056
64	4.2396191e+03	1.2891978e+00	1.00e+00	3.935e+02	0.0	9762
65	4.1620986e+03	1.1905384e+00	1.00e+00	3.693e+02	0.0	5185
66	4.1457234e+03	1.0628037e+00	1.00e+00	3.692e+02	-0.3	5380
67	4.1323478e+03	1.0895269e+00	1.00e+00	3.657e+02	0.0	4949
68	4.1224674e+03	1.0551385e+00	1.00e+00	3.648e+02	0.0	4705
69	4.1138881e+03	1.0492835e+00	1.00e+00	3.628e+02	0.0	4453
70	4.1033744e+03	1.3674873e+00	1.00e+00	4.211e+02	0.0	4108
71	4.1193123e+03	5.8112877e+00	1.00e+00	1.162e+03	0.0	3861
72	4.0897273e+03	2.2781778e+00	1.00e+00	5.735e+02	0.0	4003
73	4.0786513e+03	9.8697247e-01	1.00e+00	3.555e+02	0.0	3798
74	4.0753036e+03	9.7923782e-01	1.00e+00	3.548e+02	0.0	3683
75	4.0304465e+03	1.3957812e+00	1.00e+00	4.259e+02	0.0	2942
76	4.0370295e+03	5.3108512e+00	1.00e+00	1.059e+03	-0.3	2959
77	4.0358804e+03	8.2026829e+00	1.00e+00	1.526e+03	0.0	3045
78	4.0160247e+03	8.8501578e-01	1.00e+00	3.400e+02	0.0	3008
79	4.0139719e+03	8.8663610e-01	1.00e+00	3.396e+02	0.0	2916
80	4.0078810e+03	8.8169488e-01	1.00e+00	3.382e+02	0.0	2766
81	3.9907421e+03	9.4026954e+00	1.00e+00	1.737e+03	0.0	1447
82	3.9384028e+03	3.6838184e+00	1.00e+00	8.008e+02	-0.3	1879
83	3.9123624e+03	2.6854607e+00	1.00e+00	6.468e+02	0.0	2549
84	3.9044601e+03	7.7592146e-01	1.00e+00	3.488e+02	0.0	2388
85	3.9005270e+03	6.6588321e-01	1.00e+00	3.281e+02	0.0	2296
86	3.8953134e+03	5.1384202e-01	1.00e+00	2.969e+02	0.0	2086
87	3.8994566e+03	5.5760183e+00	1.00e+00	1.055e+03	0.0	1877
88	3.8893196e+03	5.6468156e-01	1.00e+00	2.975e+02	-0.3	1863
89	3.8885501e+03	5.7165485e-01	1.00e+00	2.974e+02	0.0	1850
90	3.8871901e+03	5.7935443e-01	1.00e+00	2.974e+02	0.0	1786
91	3.8721382e+03	1.3235496e+00	1.00e+00	3.856e+02	0.0	1409
92	3.8854067e+03	4.2619991e+00	1.00e+00	8.402e+02	-0.3	1590
93	3.8671614e+03	9.1690228e-01	1.00e+00	3.330e+02	-0.3	1835
94	3.8653224e+03	6.2738537e-01	1.00e+00	2.916e+02	0.0	1804
95	3.8645051e+03	6.2118650e-01	1.00e+00	2.914e+02	0.0	1676

96	3.8615609e+03	8.6148046e-01	1.00e+00	3.311e+02	0.0	1448
97	3.8607505e+03	6.8709542e-01	1.00e+00	3.052e+02	-0.3	1485
98	3.8601582e+03	9.8366600e-01	1.00e+00	3.498e+02	0.0	1448
99	3.8595869e+03	5.7572371e-01	1.00e+00	2.891e+02	0.0	1431
100	3.8591410e+03	5.7352176e-01	1.00e+00	2.889e+02	0.0	1421
101	3.8585328e+03	5.7162781e-01	1.00e+00	2.887e+02	0.0	1403
102	3.8579380e+03	1.7976117e+00	1.00e+00	4.710e+02	0.0	1364
103	3.8576566e+03	1.9582592e+00	1.00e+00	4.942e+02	-0.3	1359
104	3.8562051e+03	5.6276872e-01	1.00e+00	2.877e+02	0.0	1366
105	3.8559191e+03	5.6237065e-01	1.00e+00	2.877e+02	0.0	1356
106	3.8550608e+03	5.5915997e-01	1.00e+00	2.873e+02	0.0	1342
107	3.8553705e+03	7.5740188e+00	1.00e+00	1.328e+03	-0.3	1154
108	3.8536437e+03	4.0252489e+00	1.00e+00	8.150e+02	-0.3	1227
109	3.8365291e+03	4.7644180e-01	1.00e+00	2.791e+02	0.0	2146
110	3.8356145e+03	4.8021557e-01	1.00e+00	2.792e+02	0.0	1677
111	3.8334132e+03	1.1546778e+00	1.00e+00	3.753e+02	0.0	1224
112	3.8349095e+03	5.4720524e-01	1.00e+00	2.877e+02	-0.3	1213
113	3.8323680e+03	1.1032026e+00	1.00e+00	3.681e+02	0.0	1322
114	3.8319565e+03	4.9222932e-01	1.00e+00	2.789e+02	0.0	1228
115	3.8317371e+03	4.9189852e-01	1.00e+00	2.788e+02	0.0	1192
116	3.8290830e+03	4.8575485e-01	1.00e+00	2.781e+02	0.0	1146
117	3.8301064e+03	2.8440490e+00	1.00e+00	6.225e+02	-0.3	1159
118	3.8277352e+03	7.2282039e-01	1.00e+00	3.121e+02	-0.3	1170
119	3.8273718e+03	4.8649449e-01	1.00e+00	2.777e+02	0.0	1164
120	3.8271792e+03	4.8633223e-01	1.00e+00	2.776e+02	0.0	1158
121	3.8231426e+03	4.7421422e-01	1.00e+00	2.764e+02	0.0	1101
122	3.8228885e+03	5.5629358e-01	1.00e+00	2.878e+02	-0.3	1167
123	3.8225114e+03	1.5225760e+00	1.00e+00	4.286e+02	0.0	1218
124	3.8215377e+03	7.3861339e-01	1.00e+00	3.144e+02	0.0	1180
125	3.8211420e+03	4.7428566e-01	1.00e+00	2.759e+02	0.0	1156
126	3.8209649e+03	4.7399031e-01	1.00e+00	2.759e+02	0.0	1142
127	3.6879284e+03	4.3566193e+00	1.00e+00	2.801e+02	-0.3	34200
128	3.5705742e+03	3.0530836e+00	1.00e+00	2.638e+02	0.0	34234
129	3.4528473e+03	4.2640356e+00	1.00e+00	2.618e+02	0.0	34289
130	3.3277783e+03	2.4771651e+00	1.00e+00	2.497e+02	0.0	34291
131	3.3978280e+03	1.1032073e+01	1.00e+00	5.056e+02	0.0	34312
132	3.0778966e+03	2.6302000e+00	1.00e+00	2.216e+02	0.0	34320
133	2.9902847e+03	4.0435975e+00	1.00e+00	2.239e+02	0.0	34310
134	2.9204430e+03	3.9347680e+00	1.00e+00	2.177e+02	0.0	34315
135	2.5475318e+03	1.2998754e+01	1.00e+00	4.810e+02	0.0	13466
136	2.9269815e+03	4.2018332e+01	1.00e+00	1.733e+03	-0.3	15081
137	2.5304722e+03	1.2806578e+01	1.00e+00	4.605e+02	0.0	27043
138	2.4886497e+03	3.7892134e+00	1.00e+00	1.691e+02	0.0	19812
139	2.4793147e+03	3.7611219e+00	1.00e+00	1.681e+02	0.0	16813
140	2.3736776e+03	1.1665933e+01	1.00e+00	3.745e+02	0.0	9614
141	2.3927159e+03	1.8867937e+01	1.00e+00	5.696e+02	-0.3	11049
142	2.3496446e+03	6.9293995e+00	1.00e+00	2.428e+02	0.0	13317
143	2.3410847e+03	3.6081208e+00	1.00e+00	1.507e+02	0.0	11174
144	2.3368487e+03	3.5799344e+00	1.00e+00	1.501e+02	0.0	10417
145	2.2867268e+03	7.7886224e+00	1.00e+00	2.523e+02	0.0	8189
146	2.2886950e+03	1.8376770e+01	1.00e+00	5.208e+02	-0.3	8934
147	2.2776368e+03	1.5829897e+01	1.00e+00	4.540e+02	0.0	8906
148	2.2701989e+03	3.3655493e+00	1.00e+00	1.394e+02	0.0	8635
149	2.2678713e+03	3.3571098e+00	1.00e+00	1.390e+02	0.0	8381

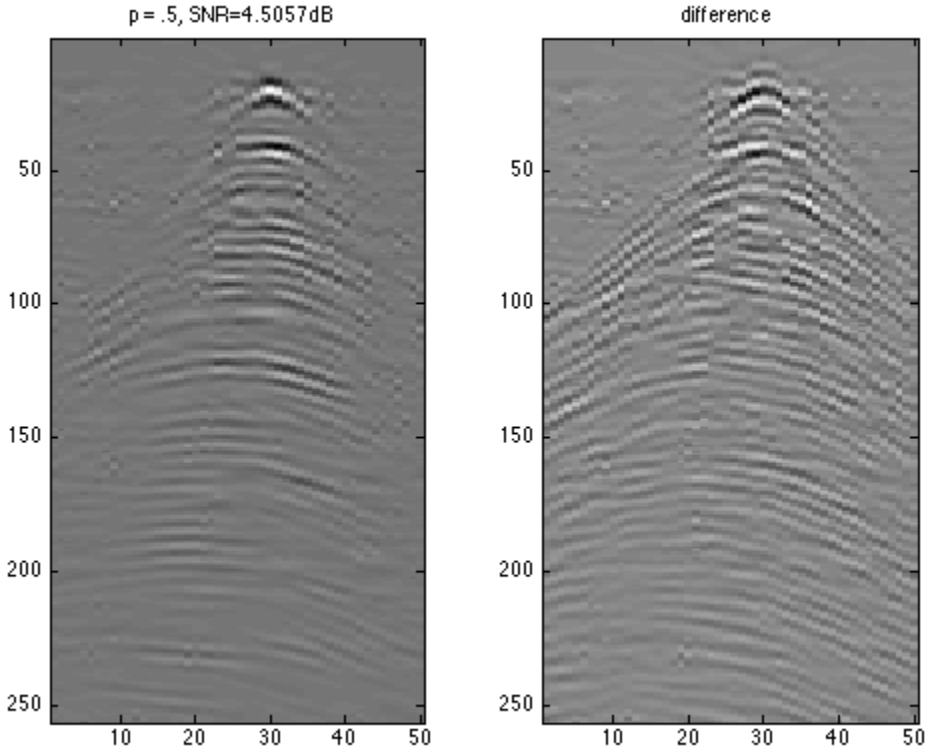
150	2.2461801e+03	7.2901217e+00	1.00e+00	2.323e+02	0.0	7491
151	2.2666595e+03	3.4877231e+01	1.00e+00	9.249e+02	-0.3	7684
152	2.2496221e+03	2.6543408e+01	1.00e+00	7.052e+02	0.0	7930
153	2.2331473e+03	3.2054193e+00	1.00e+00	1.324e+02	0.0	7740
154	2.2316431e+03	3.2006057e+00	1.00e+00	1.322e+02	0.0	7536
155	2.2025982e+03	5.5634270e+00	1.00e+00	1.866e+02	0.0	6589
156	2.2199987e+03	3.5012429e+01	1.00e+00	8.874e+02	-0.3	6705
157	2.1963568e+03	1.0385957e+01	1.00e+00	2.989e+02	-0.3	7334
158	2.1922523e+03	2.9964324e+00	1.00e+00	1.246e+02	0.0	7023
159	2.1906564e+03	2.9890891e+00	1.00e+00	1.244e+02	0.0	6821
160	2.1694497e+03	1.0677986e+01	1.00e+00	2.986e+02	0.0	5940
161	2.1739715e+03	1.5320123e+01	1.00e+00	4.010e+02	-0.3	6437
162	2.1617825e+03	6.1462243e+00	1.00e+00	1.938e+02	0.0	6869
163	2.1596469e+03	2.8701609e+00	1.00e+00	1.191e+02	0.0	6331
164	2.1582976e+03	2.8584209e+00	1.00e+00	1.188e+02	0.0	6129
165	2.1427431e+03	2.0495246e+01	1.00e+00	5.097e+02	0.0	5318
166	2.1480523e+03	2.6165691e+01	1.00e+00	6.441e+02	-0.3	5794
167	2.1297532e+03	2.6809270e+00	1.00e+00	1.131e+02	0.0	6652
168	2.1286057e+03	2.6623167e+00	1.00e+00	1.130e+02	0.0	5887
169	2.1262191e+03	2.6709405e+00	1.00e+00	1.127e+02	0.0	5519
170	2.1113758e+03	2.3085189e+01	1.00e+00	5.529e+02	0.0	4893
171	2.1123935e+03	2.4487324e+01	1.00e+00	5.815e+02	-0.3	5223
172	2.1024424e+03	4.1432970e+00	1.00e+00	1.420e+02	0.0	5626
173	2.1016456e+03	2.5708031e+00	1.00e+00	1.083e+02	0.0	5223
174	2.0997630e+03	2.5428003e+00	1.00e+00	1.079e+02	0.0	5008
175	2.0922138e+03	2.4404864e+01	1.00e+00	5.716e+02	0.0	4646
176	2.0978486e+03	3.4259160e+01	1.00e+00	7.869e+02	-0.3	4876
177	2.0850057e+03	2.4388366e+00	1.00e+00	1.050e+02	0.0	5369
178	2.0843285e+03	2.4306134e+00	1.00e+00	1.049e+02	0.0	4963
179	2.0830813e+03	2.4313420e+00	1.00e+00	1.047e+02	0.0	4751
180	2.0812588e+03	4.7353366e+01	1.00e+00	1.049e+03	0.0	4169
181	2.0639019e+03	1.8627234e+01	1.00e+00	4.381e+02	-0.3	4586
182	2.0574285e+03	2.2308060e+00	1.00e+00	9.898e+01	0.0	5192
183	2.0567389e+03	2.2357969e+00	1.00e+00	9.888e+01	0.0	4817
184	2.0534351e+03	4.9402189e+00	1.00e+00	1.531e+02	0.0	4421
185	2.0525245e+03	2.3417384e+00	1.00e+00	1.003e+02	-0.3	4579
186	2.0517526e+03	2.6735918e+00	1.00e+00	1.074e+02	0.0	4456
187	2.0511363e+03	2.3584219e+00	1.00e+00	1.010e+02	0.0	4369
188	2.0503488e+03	2.6080917e+00	1.00e+00	1.061e+02	0.0	4270
189	2.0503255e+03	8.2610827e+00	1.00e+00	2.214e+02	0.0	4218
190	1.9875601e+03	1.9517587e+01	1.00e+00	3.403e+02	0.0	34175
191	1.9656027e+03	6.4841002e+01	1.00e+00	1.099e+03	0.0	34253
192	2.0451355e+03	1.0263001e+02	1.00e+00	1.722e+03	0.0	34287
193	1.7851795e+03	1.1537298e+01	1.00e+00	1.918e+02	0.0	34293
194	1.7722231e+03	3.9189783e+00	1.00e+00	8.499e+01	0.0	32212
195	1.7551475e+03	3.8620973e+00	1.00e+00	8.392e+01	0.0	27919
196	1.7436503e+03	6.0963754e+01	1.00e+00	8.283e+02	0.0	7313
197	1.6811632e+03	5.3039599e+01	1.00e+00	6.470e+02	-0.3	8982
198	1.6439063e+03	1.5915215e+01	1.00e+00	2.148e+02	0.0	13285
199	1.6393389e+03	2.8974226e+00	1.00e+00	6.940e+01	0.0	11505
200	1.6371287e+03	2.9282530e+00	1.00e+00	6.915e+01	0.0	10515

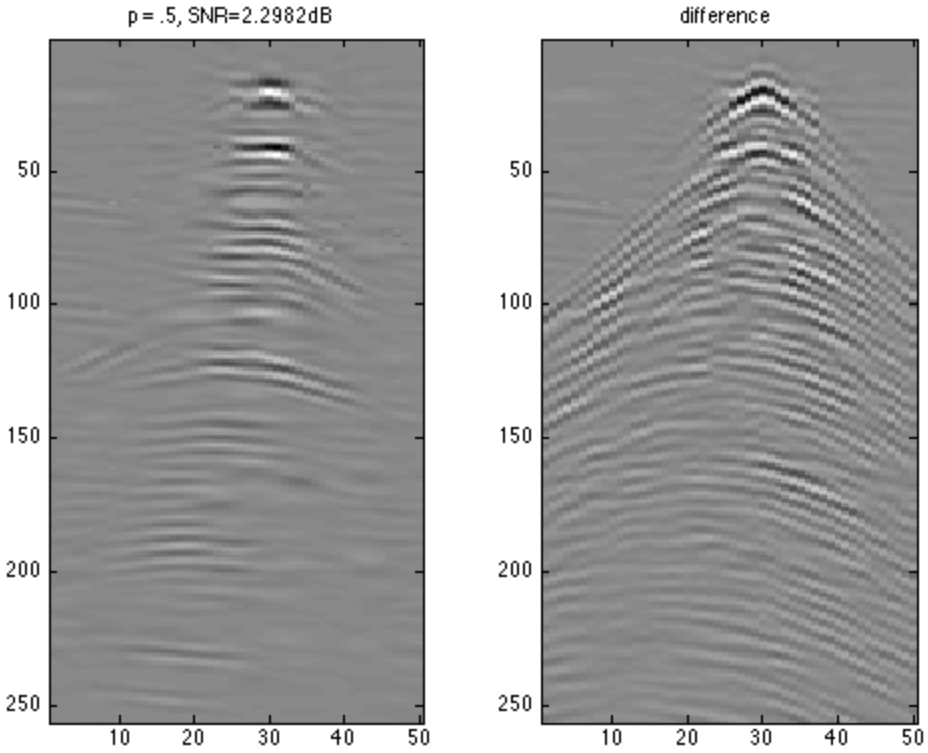
ERROR EXIT -- Too many iterations

```
 Products with A     :     279        Total time   (secs) :   106.4
 Products with A'    :     202        Project time (secs) :     1.1
 Newton iterations   :       4        Mat-vec time (secs) :   104.1
 Line search its     :     144        Subspace iterations :       0


 ===============================================================================
 PQNL1_SLIM v. 46  (Tue, 14 Jun 2011) based on v.1017
 ===============================================================================
 No. rows              :     6400      No. columns           :    34341
 Initial tau           : 0.00e+00      Two-norm of b         : 1.53e+04
 Optimality tol        : 1.00e-04      Target objective      : 1.00e-03
 Basis pursuit tol     : 1.00e-06      Maximum iterations    :      100

     0  1.5318009e+04  0.0000000e+00   1.00e+00  1.005e+04     0.0       0
 Iteration   FunEvals Projections     Step Length          rNorm2        O
         1          5           4     1.25000e-01     1.45668e+04     2.614
         2          6          43     1.00000e+00     8.21448e+03     4.239
         3          7          80     1.00000e+00     8.04141e+03     4.159
         4          8         119     1.00000e+00     7.88463e+03     3.829
         5          9         154     1.00000e+00     7.82801e+03     3.793
         6         10         195     1.00000e+00     7.78071e+03     3.865
         7         11         244     1.00000e+00     7.74319e+03     3.707
         8         12         301     1.00000e+00     7.70906e+03     3.610
         9         13         354     1.00000e+00     7.67697e+03     3.599
        10         14         409     1.00000e+00     7.64742e+03     3.463
        11         15         477     1.00000e+00     7.61054e+03     3.263
        12         16         538     1.00000e+00     7.57777e+03     3.119
        13         17         587     1.00000e+00     7.54829e+03     2.866
        14         18         646     1.00000e+00     7.52145e+03     2.552
        15         19         712     1.00000e+00     7.49755e+03     2.386
        16         20         778     1.00000e+00     7.47649e+03     2.266
        17         21         839     1.00000e+00     7.45914e+03     2.084
        18         22         897     1.00000e+00     7.44330e+03     1.937
        19         23         967     1.00000e+00     7.42780e+03     1.900
        20         24        1032     1.00000e+00     7.41465e+03     1.773
        21         25        1086     1.00000e+00     7.40232e+03     1.600
        22         26        1142     1.00000e+00     7.39233e+03     1.546
        23         27        1194     1.00000e+00     7.38335e+03     1.523
        24         28        1258     1.00000e+00     7.37530e+03     1.432
        25         29        1336     1.00000e+00     7.36734e+03     1.331
        26         30        1414     1.00000e+00     7.35890e+03     1.272
        27         31        1491     1.00000e+00     7.35332e+03     1.239
 Function Evaluations exceeds maxIter
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        28          6           4     6.25000e-02     7.35033e+03     1.387
        29          7          41     1.00000e+00     7.34950e+03     1.262
        30          8         105     1.00000e+00     7.34552e+03     1.187
        31          9         196     1.00000e+00     7.34222e+03     1.450
        32         10         310     1.00000e+00     7.33865e+03     1.521
        33         11         411     1.00000e+00     7.33347e+03     1.402
        34         12         520     1.00000e+00     7.32853e+03     1.249
        35         13         630     1.00000e+00     7.32487e+03     1.191
        36         14         702     1.00000e+00     7.32089e+03     1.083
```

```
        37          15         809     1.00000e+00     7.31711e+03     9.591
        38          16         892     1.00000e+00     7.31399e+03     8.835
        39          17         974     1.00000e+00     7.31177e+03     8.292
        40          18        1078     1.00000e+00     7.30893e+03     7.874
        41          19        1150     1.00000e+00     7.30708e+03     7.529
        42          20        1222     1.00000e+00     7.30570e+03     7.183
        43          21        1314     1.00000e+00     7.30413e+03     7.069
        44          22        1391     1.00000e+00     7.30224e+03     7.345
        45          23        1472     1.00000e+00     7.30066e+03     7.577
        46          24        1574     1.00000e+00     7.29956e+03     7.293
        47          25        1658     1.00000e+00     7.29811e+03     7.003
        48          26        1799     1.00000e+00     7.29676e+03     6.997
        49          27        1893     1.00000e+00     7.29550e+03     7.542
        50          28        1961     1.00000e+00     7.29482e+03     7.006
break of testUpdateTau    50  7.2948166e+03  3.4936974e+02   1.00e+00  1.9
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        51          3           4     5.00000e-01     6.13905e+03     8.806
        52          4          69     1.00000e+00     4.52657e+03     8.015
        53          5         112     1.00000e+00     4.47321e+03     7.412
        54          6         170     1.00000e+00     4.34441e+03     5.634
        55          7         233     1.00000e+00     4.27568e+03     5.015
        56          8         312     1.00000e+00     4.20264e+03     4.323
        57          9         389     1.00000e+00     4.14228e+03     3.999
        58         10         454     1.00000e+00     4.10082e+03     3.907
        59         11         510     1.00000e+00     4.06638e+03     3.784
        60         12         578     1.00000e+00     4.03534e+03     3.533
        61         13         636     1.00000e+00     4.00552e+03     3.227
        62         14         700     1.00000e+00     3.98008e+03     3.019
        63         15         761     1.00000e+00     3.95574e+03     2.809
        64         16         825     1.00000e+00     3.93502e+03     2.658
        65         17         893     1.00000e+00     3.91811e+03     2.498
        66         18         971     1.00000e+00     3.90156e+03     2.330
        67         19        1037     1.00000e+00     3.88523e+03     2.203
        68         20        1108     1.00000e+00     3.87227e+03     2.076
        69         21        1176     1.00000e+00     3.85900e+03     1.945
        70         22        1259     1.00000e+00     3.84780e+03     1.829
        71         23        1345     1.00000e+00     3.83622e+03     1.764
        72         24        1425     1.00000e+00     3.82579e+03     1.704
        73         25        1538     1.00000e+00     3.81584e+03     1.613
        74         26        1637     1.00000e+00     3.80858e+03     1.557
        75         27        1740     1.00000e+00     3.80174e+03     1.496
        76         28        1840     1.00000e+00     3.79536e+03     1.389
        77         29        1948     1.00000e+00     3.78895e+03     1.346
        78         30        2061     1.00000e+00     3.78310e+03     1.324
        79         31        2186     1.00000e+00     3.77793e+03     1.329
Function Evaluations exceeds maxIter
 Iteration   FunEvals Projections     Step Length          rNorm2        O
        80          6           4     6.25000e-02     3.77568e+03     1.784
        81          7          43     1.00000e+00     3.77495e+03     1.477
        82          8          91     1.00000e+00     3.77327e+03     1.269
        83          9         205     1.00000e+00     3.77197e+03     1.779
        84         10         390     1.00000e+00     3.77044e+03     2.117
        85         11         658     1.00000e+00     3.76805e+03     2.216
        86         12         829     1.00000e+00     3.76517e+03     1.920
```

```
   87        13        1042     1.00000e+00     3.76204e+03     1.703

   88        14        1230     1.00000e+00     3.75984e+03     1.708
   89        15        1411     1.00000e+00     3.75713e+03     1.631
   90        16        1558     1.00000e+00     3.75432e+03     1.444
   91        17        1691     1.00000e+00     3.75197e+03     1.374
   92        18        1859     1.00000e+00     3.75007e+03     1.261
   93        19        2065     1.00000e+00     3.74734e+03     1.216
   94        20        2201     1.00000e+00     3.74576e+03     1.141
   95        21        2310     1.00000e+00     3.74391e+03     1.076
   96        22        2472     1.00000e+00     3.74210e+03     1.026
   97        23        2640     1.00000e+00     3.73947e+03     1.067
   98        24        2796     1.00000e+00     3.73744e+03     1.082
   99        25        2936     1.00000e+00     3.73478e+03     1.052
  100        26        3080     1.00000e+00     3.73302e+03     9.290

ERROR EXIT -- Too many iterations

Products with A     :     117        Total time   (secs) :   132.1
Products with A'    :     118        Project time (secs) :   106.6
Newton iterations   :       2        Mat-vec time (secs) :    50.9
```





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