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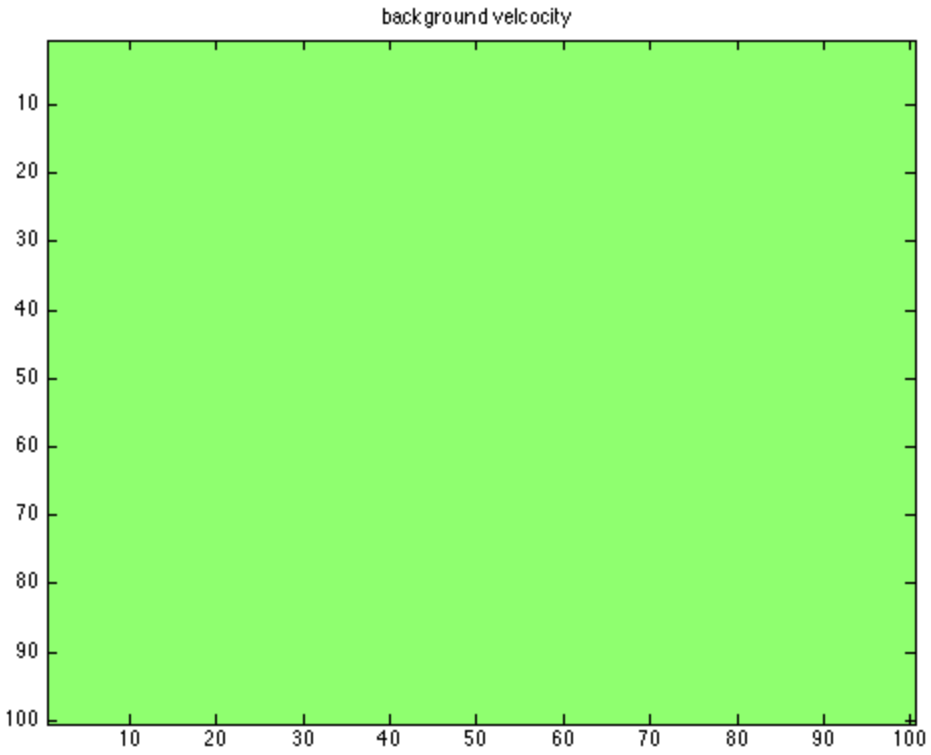
```
% addpath of some functions and operators
addpath /Volumes/Users/linamiao/Documents/Tools/Matlabtools/tuning/

clear
%close all
```

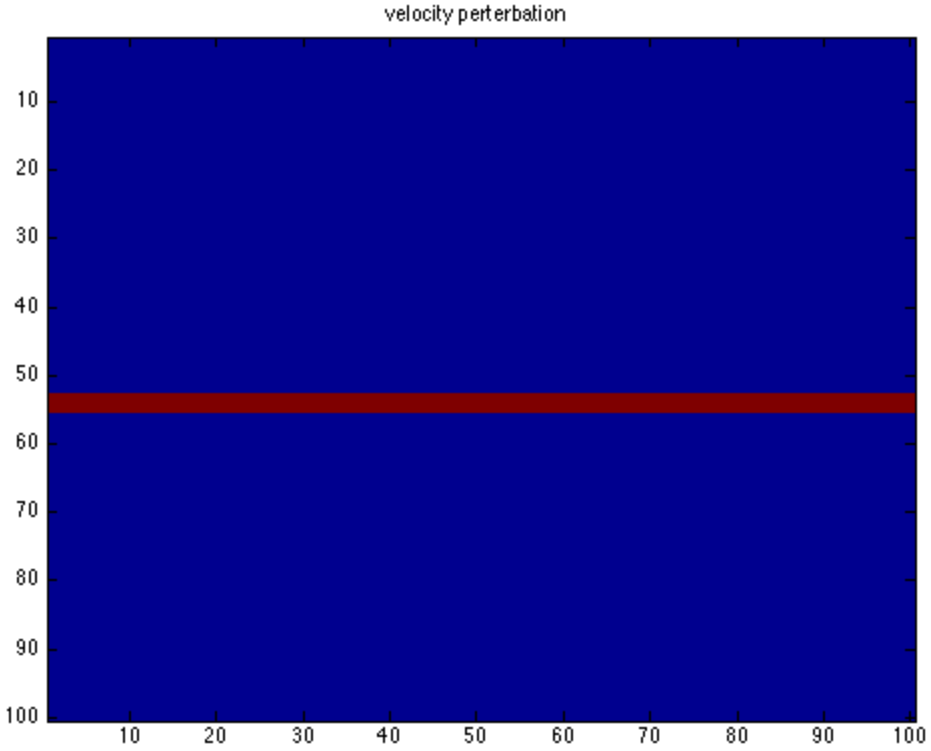
generate data

```
z = 0:10:990;
x = 0:10:990;
[zz,xx] = ndgrid(z,x);

% background velocity [m/s]
v0 = 1000 + 0.*zz;
figure;imagesc(v0);title('background velcocity')

% true velocity model
dv = 0*xx;
% dv(zz >= 0) = 1600;
% v(zz >= 300) = 2000;
dv(zz >= 520) = 600;
dv(zz >= 550) = 0;
figure; imagesc(dv);

% perturbation
%dv = v - v0;
figure;imagesc(dv);title('velocity perterbation')

% Modeling
model.o = [0 0];
model.d = [10 10];
model.n = [100 100];
model.nb = [30 30 0];

% frequencies [Hz]
model.freq = 5:20:125;
model.freq = 5:5:20;
nfreq = length(model.freq);

% Ricker wavelet peak frequency and phase shift
model.f0 = 20;
model.t0 = -.08;
```

```
% source and receiver positions
model.zsrc = 10;
model.xsrc = 0:10:990; nsrc = length(model.xsrc);
model.zrec = 10;
model.xrec = 0:10:990; nrec = length(model.xrec);

% define point sources, each column of this matrix represents a source
% function defined on the grid {model.zsrc,model.xsrc}. A point source is
% represented as a spike on one of the gridp-points. If we take Q to be an
% identity matrix, each column represents a point-source on a different
% gridpoint.
Q = speye(nsrc);

% define model in [km^2/s^2]
m = 1e6./(v0(:) + dv(:)).^2;

% create data
[DD,J] = F(m,Q,model,1);

% linearize data
D = J*m;

% reshape vectorized data into data-cube for plotting purposes
D = reshape(D,[nrec,nsrc,nfreq]);

% plot frequency slices
figure;imagesc(real(D(:,:,1)));title('frequency slice of observed data')

% re-organize data into frequency-receiver-source order
D = permute(D,[3,1,2]);

% % plot one common shot gather in time domain
% % compensate negative frequency part
% n = length(model.freq);
% if mod(n,2) == 1
%    tmp = [D ; conj(D(end:-1:2,:,:))];
% else
%    tmp = [D ; conj(D(end-1:-1:2,:,:))];
% end
%
% Dt = ifft(tmp,[],1)*sqrt(n);
% figure; imagesc(real(Dt(:,:,51)));colormap(gray);


% if pad zero to other frequencies part
% frequency axis
% f = 0:5:125;
% nf = length(f);
% temp = zeros(nf,length(x),length(x));
% for i = 1:n
%     idx = find(f==model.freq(i));
%     temp(idx,:,:) = D(i,:,:);
% end
```

```
%
%
% if mod(n,2) == 0
%    tmp = [temp ; conj(temp(end:-1:2,:,:))];
% else
%    tmp = [temp ; conj(temp(end-1:-1:2,:,:))];
% end
% Dt = ifft(tmp,[],1)*sqrt(n);
% figure; imagesc(real(Dt(:,:,51)));colormap(gray);
%


% save modelled data
save model_data DD D model x z dv v0 ;




%keyboard;
```




velocity perterbation
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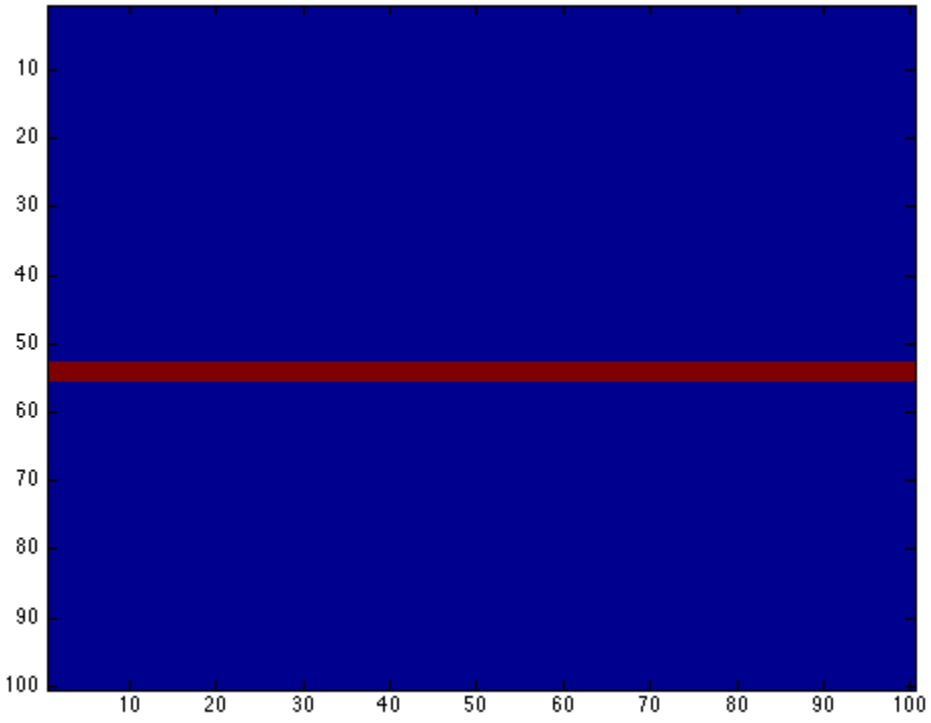
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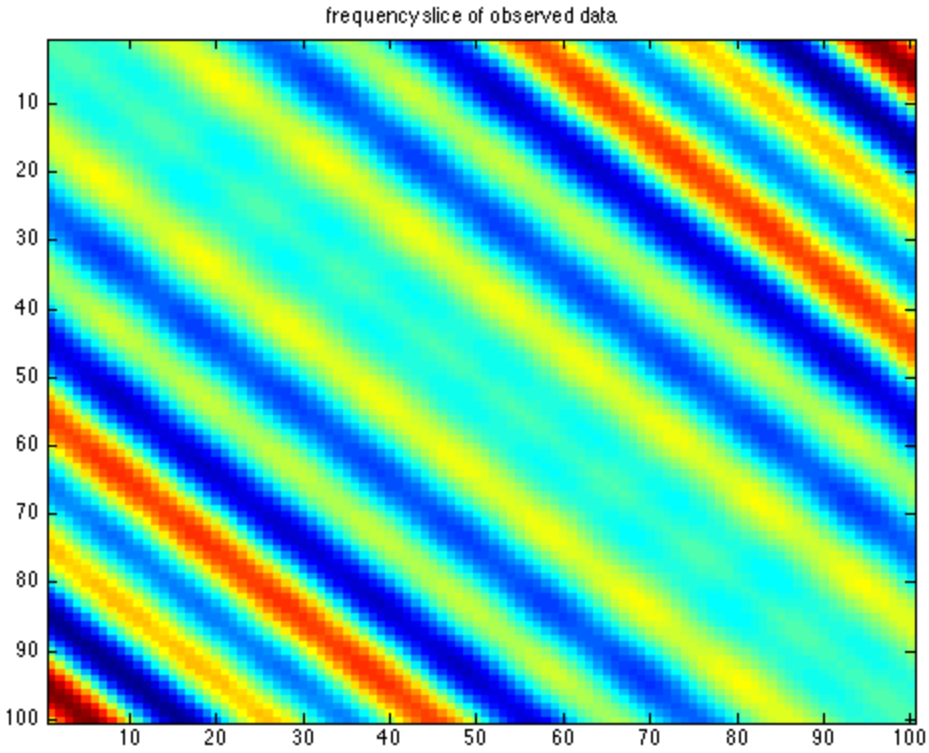
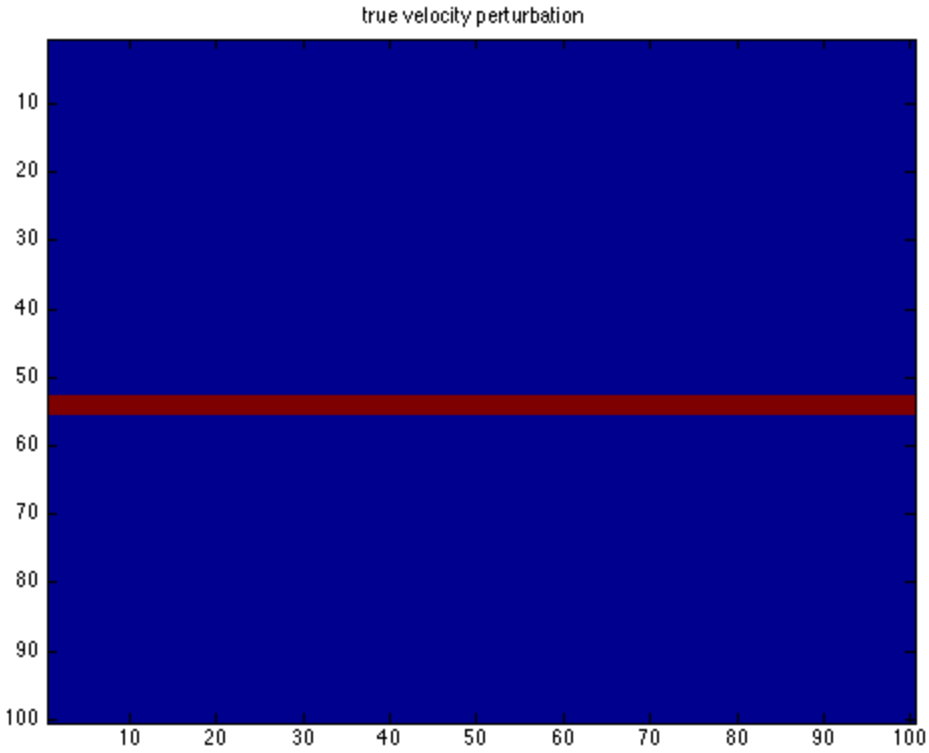


migration in frequency domain

```
clear;%close all;
load model_data;
figure;imagesc(dv);title('true velocity perturbation')
data = D;
image = DSR_mig_freq(data,model.freq,x,x,z,v0(1:length(z)));
figure; imagesc(abs(image));

save img image
```


true velocity perturbation
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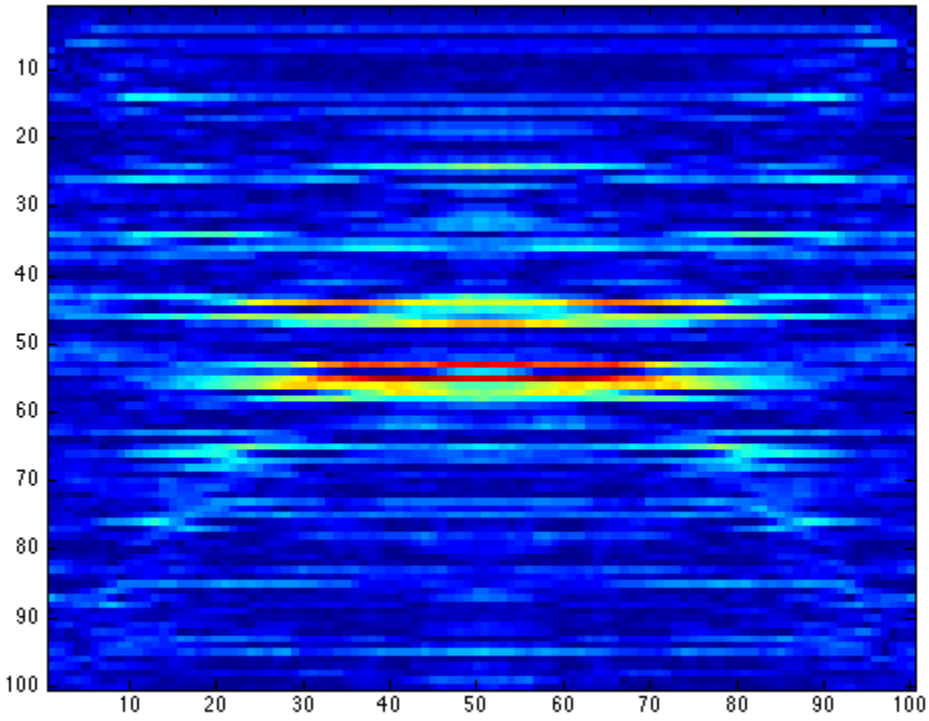
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first transform data into time domain, then use DSR_mig in time domain

keyboard; clear;%close all; load model_data; figure;imagesc(dv);title('true velocity perturbation')

% pad zero to other frequencies part % frequency axis n = length(model.freq); faxis = 0:.5:120; nf = length(faxis); temp = zeros(nf,length(x),length(x)); for i = 1:n idx = find(faxis==model.freq(i)); temp(idx,:,:) = D(i,:,:); end

if mod(n,2) == 1 % cause faxis has 0 component inside tmp = [temp ; conj(temp(end:-1:2,:,:))]; else tmp = [temp ; conj(temp(end-1:-1:2,:,:))]; end Dt = ifft(tmp,[],1);%*sqrt(n);

data = Dt; fmax = faxis(end); df = faxis(2) - faxis(1); t = [0:.5/fmax:1/df]; figure; imagesc(real(Dt(:,:,51)));colormap(gray);

image = DSR_mig(data,t,x,x,z,v0);

figure;imagesc(real(image));

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