Figure 301 trial 1

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Define working folder, add links to Library and SeisLab

```
clear; close all; clc;
mlibfolder = '/home/zmaw/u250128/Desktop/MLIB';
path(path, mlibfolder);
addmypath;
```

Plot results

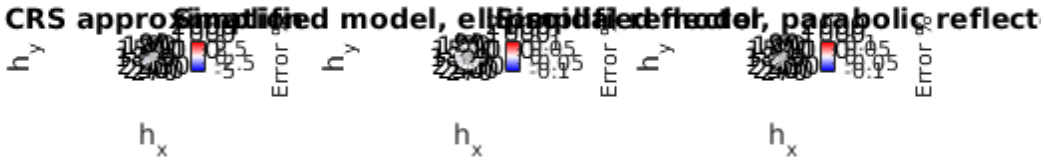
```
% Download exact traveltimes
model = 41;
acquisition = 4;
tti_ex_CMP = MLD([mlibfolder '/CRS/models/model_'
 num2str(model) '_traveltimes_for_acq_' num2str(acquisition) '.mat']);
acquisition = 5;
tti_ex_ZO = MLD([mlibfolder '/CRS/models/model_'
 num2str(model) '_traveltimes_for_acq_' num2str(acquisition) '.mat']);

% Download exact traveltimes in the simplified model with paraboloid
model = 141;
acquisition = 4;
tti_SM_par_CMP = MLD([mlibfolder '/CRS/models/model_'
 num2str(model) '_traveltimes_for_acq_' num2str(acquisition) '.mat']);
acquisition = 5;
tti_SM_par_ZO = MLD([mlibfolder '/CRS/models/model_'
 num2str(model) '_traveltimes_for_acq_' num2str(acquisition) '.mat']);

% Download exact traveltimes in the simplified model with ellipsoid
model = 241;
acquisition = 4;
tti_SM_el_CMP = MLD([mlibfolder '/CRS/models/model_'
 num2str(model) '_traveltimes_for_acq_' num2str(acquisition) '.mat']);
acquisition = 5;
tti_SM_el_ZO = MLD([mlibfolder '/CRS/models/model_'
 num2str(model) '_traveltimes_for_acq_' num2str(acquisition) '.mat']);

% Calculate CRS approximations
model = 41;
CRS_param = MLD([mlibfolder '/CRS/models/model_'
 num2str(model) '_CRS_param.mat']);
```

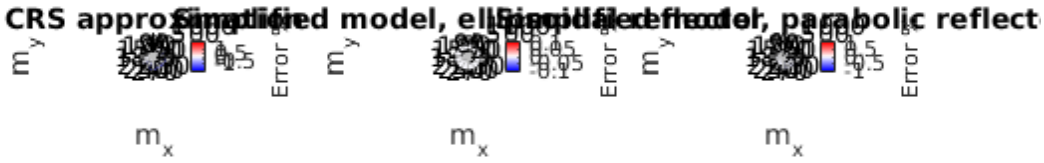
```
t0 = CRS_param.t0;
w3  = CRS_param.w;
M3  = CRS_param.M;
N3  = CRS_param.N;
w   = w3(1:2);
M   = M3(1:2,1:2);
N   = N3(1:2,1:2);

acquisition = 4;
Get_model_acquisition_geometry;
HH_CMP = (Xg(1:2, :) - Xs(1:2,:))/2;
MM_CMP = (Xg(1:2, :) + Xs(1:2,:))/2;
MM_CMP(1,:) = MM_CMP(1,:) - X0(1);
MM_CMP(2,:) = MM_CMP(2,:) - X0(2);
of_CMP = offset;
az_CMP = azimuth;
tti_crs_CMP  = Get_traveltime_3D_CRS (MM_CMP, HH_CMP, t0, w, M, N);

acquisition = 5;
Get_model_acquisition_geometry;
HH_ZO = (Xg(1:2, :) - Xs(1:2,:))/2;
MM_ZO = (Xg(1:2, :) + Xs(1:2,:))/2;
MM_ZO(1,:) = MM_ZO(1,:) - X0(1);
MM_ZO(2,:) = MM_ZO(2,:) - X0(2);
of_ZO = offset;
az_ZO = azimuth;
tti_crs_ZO  = Get_traveltime_3D_CRS (MM_ZO, HH_ZO, t0, w, M, N);

dt_crs_CMP    = reshape((tti_crs_CMP   -tti_ex_CMP)./
tti_ex_CMP*100,length(az_CMP),length(of_CMP));
dt_SM_el_CMP  = reshape((tti_SM_el_CMP -tti_ex_CMP)./
tti_ex_CMP*100,length(az_CMP),length(of_CMP));
dt_SM_par_CMP = reshape((tti_SM_par_CMP-tti_ex_CMP)./
tti_ex_CMP*100,length(az_CMP),length(of_CMP));

dt_crs_ZO    = reshape((tti_crs_ZO   -tti_ex_ZO)./
tti_ex_ZO*100,length(az_ZO),length(of_ZO));
dt_SM_el_ZO  = reshape((tti_SM_el_ZO -tti_ex_ZO)./
tti_ex_ZO*100,length(az_ZO),length(of_ZO));
dt_SM_par_ZO = reshape((tti_SM_par_ZO-tti_ex_ZO)./
tti_ex_ZO*100,length(az_ZO),length(of_ZO));

[OF, AZ] = meshgrid(of_CMP,az_CMP);
XX = OF.*cos(AZ);
YY = OF.*sin(AZ);

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
subplot(2,3,1)
h = polar(azimuth,2000*ones(size(azimuth)), '-black');
hold on
contourf(XX,YY,dt_crs_CMP,11);
%
for a = 0:pi/6:pi
    hold on
```

```
    x1 = (-2000:10:2000)*cos(a);
    x2 = (-2000:10:2000)*sin(a);
    plot(x1,x2,'Color',[0.75 0.75 0.75])
end
polar(azimuth,1000*ones(size(azimuth)),'--black');
text(250,1100,'1000')
text(-2000,2000,'a)')
%
c = colorbar('Ticks', [-5,-2.5 0, 2.5, 5]);
c.Label.String = 'Error %';caxis([-5 5])
xlabel('h_x')
ylabel('h_y')
title('CRS approximation')

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
subplot(2,3,2)
h = polar(azimuth,2000*ones(size(azimuth)), '-black');
hold on
contourf(XX,YY,dt_SM_el_CMP,11);
for a = 0:pi/6:pi
    hold on
    x1 = (-2000:10:2000)*cos(a);
    x2 = (-2000:10:2000)*sin(a);
    plot(x1,x2,'Color',[0.75 0.75 0.75])
end
polar(azimuth,1000*ones(size(azimuth)),'--black');
text(250,1100,'1000')
text(-2000,2000,'b)')
c = colorbar('Ticks', [-0.1,-0.05 0, 0.05, 0.1]);
c.Label.String = 'Error %';
caxis([-.1 .1])
colormap(makeColorMap([0 0 1],[1 1 1],[1 0 0],100));
xlabel('h_x')
ylabel('h_y')
title('Simplified model, ellipsoidal reflector')

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
subplot(2,3,3)
h = polar(azimuth,2000*ones(size(azimuth)), '-black');
hold on
contourf(XX,YY,dt_SM_par_CMP,11);
%
for a = 0:pi/6:pi
    hold on
    x1 = (-2000:10:2000)*cos(a);
    x2 = (-2000:10:2000)*sin(a);
    plot(x1,x2,'Color',[0.75 0.75 0.75])
end
polar(azimuth,1000*ones(size(azimuth)),'--black');
text(250,1100,'1000')
text(-2000,2000,'c)')
c = colorbar('Ticks', [-0.1,-0.05 0, 0.05, 0.1]);
c.Label.String = 'Error %';
caxis([-.1 .1])
```

```
xlabel('h_x')
ylabel('h_y')
title('Simplified model, parabolic reflector')

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
[OF, AZ] = meshgrid(of_ZO,az_ZO);
XX = OF.*cos(AZ);
YY = OF.*sin(AZ);

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
subplot(2,3,4)
h = polar(azimuth,1000*ones(size(azimuth)), '-black');
hold on
contourf(XX,YY,dt_crs_ZO,11);
%
for a = 0:pi/6:pi
    hold on
    x1 = (-1000:10:1000)*cos(a);
    x2 = (-1000:10:1000)*sin(a);
    plot(x1,x2,'Color',[0.75 0.75 0.75])
end
polar(azimuth,500*ones(size(azimuth)),'--black');
text(125,550,'500')
text(-1000,1000,'d)')
c = colorbar('Ticks', [-1,-0.5 0, 0.5, 1]);
c.Label.String = 'Error %';
caxis([-2 2])
xlabel('m_x')
ylabel('m_y')
title('CRS approximation')


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
subplot(2,3,5)
h = polar(azimuth,1000*ones(size(azimuth)), '-black');
hold on
contourf(XX,YY,dt_SM_el_ZO,11);
%
for a = 0:pi/6:pi
    hold on
    x1 = (-1000:10:1000)*cos(a);
    x2 = (-1000:10:1000)*sin(a);
    plot(x1,x2,'Color',[0.75 0.75 0.75])
end
polar(azimuth,500*ones(size(azimuth)),'--black');
text(125,550,'500')
text(-1000,1000,'e)')
c = colorbar('Ticks', [-0.1,-0.05 0, 0.05, 0.1]);
c.Label.String = 'Error %';
caxis([-0.1 0.1])
xlabel('m_x')
ylabel('m_y')
title('Simplified model, ellipsoidal reflector')
```

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
subplot(2,3,6)
h = polar(azimuth,1000*ones(size(azimuth)), '-black');
hold on
contourf(XX,YY,dt_SM_par_ZO,11);
%
for a = 0:pi/6:pi
    hold on
    x1 = (-1000:10:1000)*cos(a);
    x2 = (-1000:10:1000)*sin(a);
    plot(x1,x2,'Color',[0.75 0.75 0.75])
end
polar(azimuth,500*ones(size(azimuth)),'--black');
text(125,550,'500')
text(-1000,1000,'f)')
colorbar;
c = colorbar('Ticks', [-1,-0.5 0, 0.5, 1]);
c.Label.String = 'Error %';
caxis([-1 1])
xlabel('m_x')
ylabel('m_y')
title('Simplified model, parabolic reflector')
```





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