Check the idea that n-CRS sews two solutions: CRS and DSR

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Introduction

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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;
current_folder = pwd;
```

Define model parameters (See table 4.1):

```
Rmin = 0.0001;              % min radius of curvature (0.1 m)
Rmax = 10000;                % max radius of curvature (10000 km)
R = logspace(log(Rmin)/log(10),log(Rmax)/log(10),50);
TePP = zeros(size(R));
TePS = zeros(size(R));
T_CRS = zeros(size(R));
T_nCRS = zeros(size(R));
T_DSR = zeros(size(R));
T_MF = zeros(size(R));
T_iCRS    = zeros(size(R));
T_DSR_PS  = zeros(size(R));
```

```
T_CRS_PS = zeros(size(R));
T_nCRS_PS = zeros(size(R));

for i=1:length(R)

    alpha = pi/6;               % radian
    Rnip = 1.0;                 % km
    Rn   = Rnip + R(i);         % km
    Vp   = 3.2;                 % km/s
    Vs   = 1.8;                 % km/s
    modelPP = [alpha, Rnip, Rn, Vp, Vp];
    modelPS = [alpha, Rnip, Rn, Vp, Vs];
```

Set offset and midpoint displacement

```
    m = 0.2;
    h = 0.4;
    [M,H]=meshgrid(m,h);
```

Part I: Calculate traveltimes of PP waves

```
    TePP(i) = Get_traveltime_2D_exact(M,H,modelPP);
    TePS(i) = Get_traveltime_2D_exact(M,H,modelPS);
```

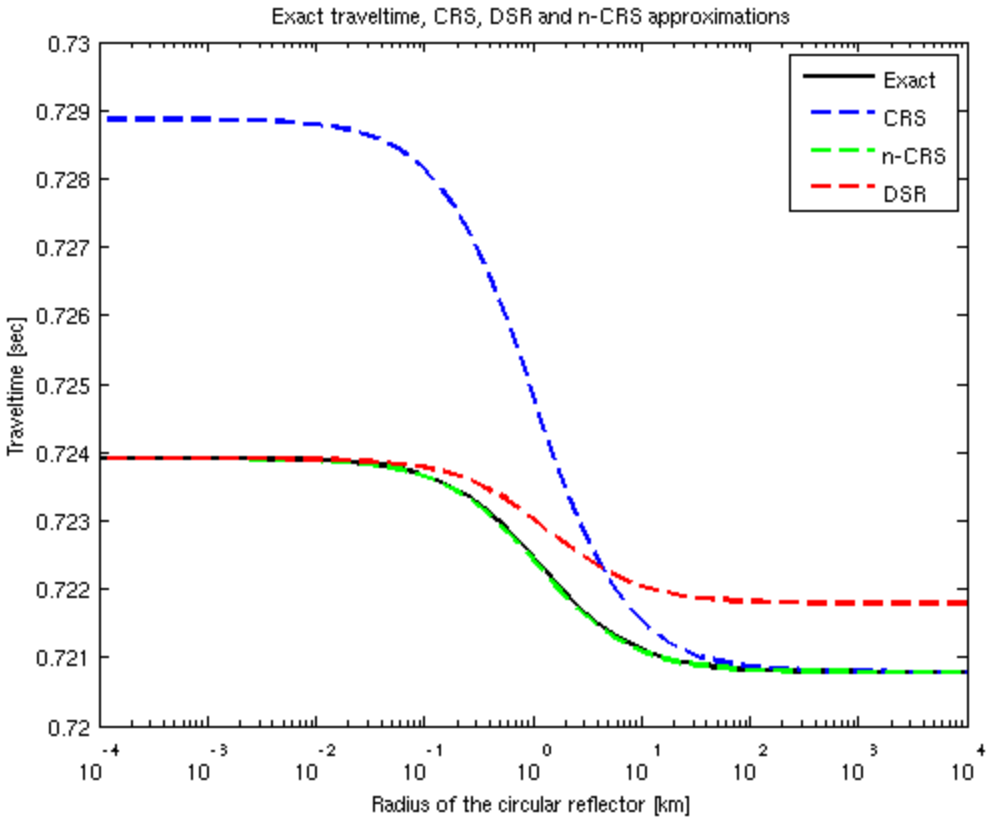
Part II: Find traveltime approximation for PP and PS waves

```
    % PP approximations
    T_CRS(i)     = Get_traveltime_2D_CRS(M, H, modelPP);
    T_nCRS(i)    = Get_traveltime_2D_nCRS(M, H, modelPP);
    T_DSR(i)     = Get_traveltime_2D_DSR_PS(M, H, modelPP);
    T_MF(i)      = Get_traveltime_2D_MF(M, H, modelPP);
    T_iCRS(i)    = Get_traveltime_2D_iCRS(M, H, modelPP);

    % PS approximations
    T_DSR_PS(i)  = Get_traveltime_2D_DSR_PS(M, H, modelPS);
    T_CRS_PS(i)  = Get_traveltime_2D_CRS_PS(M, H, modelPS);
    T_nCRS_PS(i) = Get_traveltime_2D_nCRS_PS(M, H, modelPS);

end
```

Part III Compare approximations

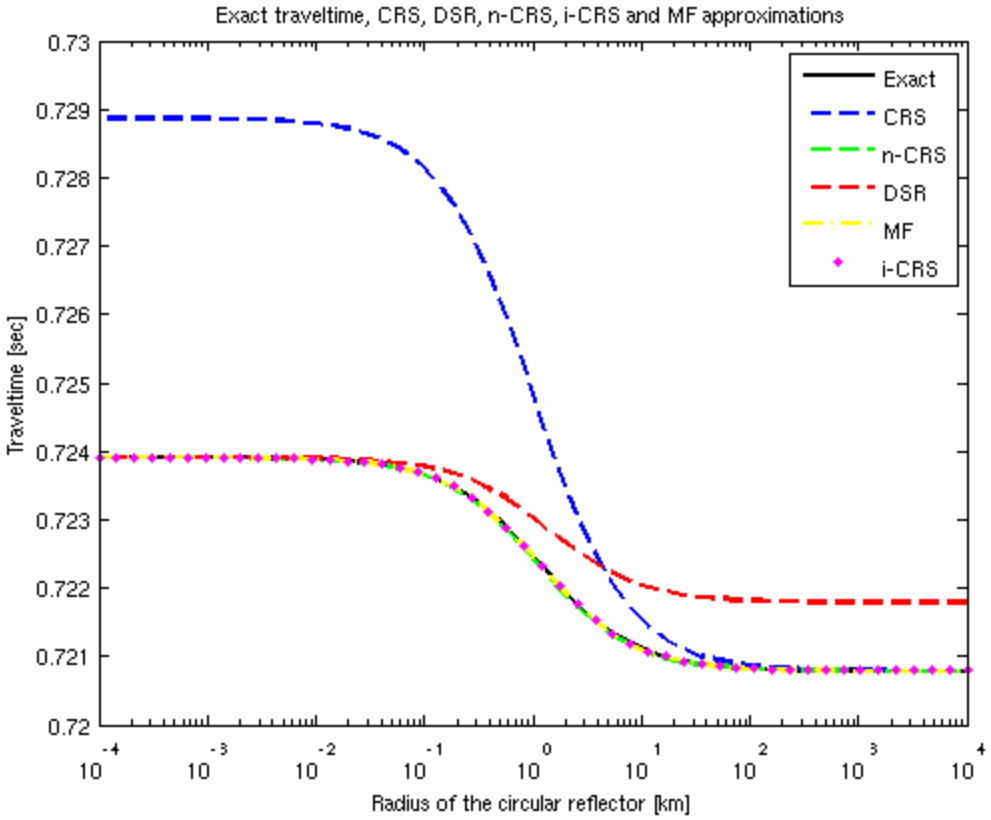
```
figure(1)
semilogx(R, TePP, '-black', 'LineWidth',2);
hold on
semilogx(R, T_CRS, '--blue', 'LineWidth',2);
semilogx(R, T_nCRS, '--g', 'LineWidth',2);
semilogx(R, T_DSR, '--r', 'LineWidth',2);
```

```
legend('Exact', 'CRS', 'n-CRS', 'DSR','Location','NorthEast');
% axis([0, 1.35, 0.35, 1.35]);
xlabel('Radius of the circular reflector [km]')
ylabel('Traveltime [sec]')
title('Exact traveltime, CRS, DSR and n-CRS approximations')

% Add manualy
%point diffractor limit
%plane reflector limit
```



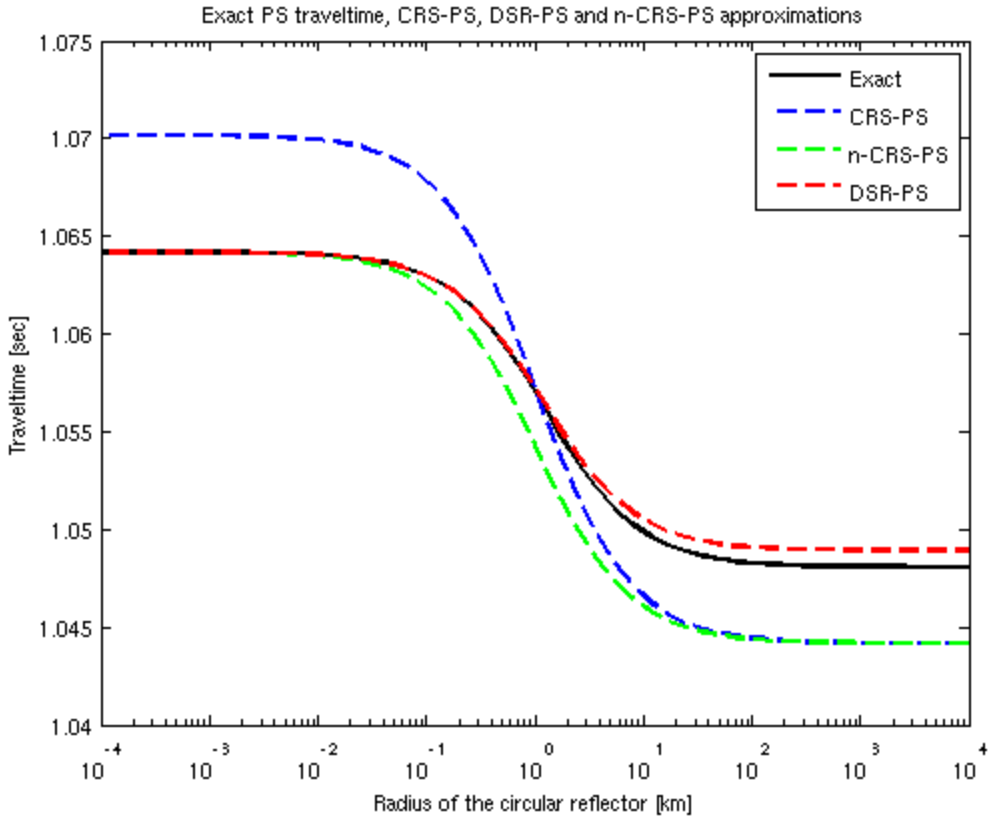
Part IV Compare approximations

```
figure(2)
semilogx(R, TePP, '-black', 'LineWidth',2);
hold on
semilogx(R, T_CRS, '--blue', 'LineWidth',2);
semilogx(R, T_nCRS, '--g', 'LineWidth',2);
semilogx(R, T_DSR, '--r', 'LineWidth',2);
semilogx(R, T_MF, '-.yellow', 'LineWidth',2);
semilogx(R, T_iCRS, '.m', 'LineWidth',2);
legend('Exact', 'CRS', 'n-CRS', 'DSR','MF','i-CRS','Location','NorthEast');
% axis([0, 1.35, 0.35, 1.35]);
xlabel('Radius of the circular reflector [km]')
ylabel('Traveltime [sec]')
title('Exact traveltime, CRS, DSR, n-CRS, i-CRS and MF approximations')
```



Part V Compare approximations

```
figure(3)
semilogx(R, TePS, '-black', 'LineWidth',2);
hold on
semilogx(R, T_CRS_PS, '--blue', 'LineWidth',2);
semilogx(R, T_nCRS_PS, '--g', 'LineWidth',2);
semilogx(R, T_DSR_PS, '--r', 'LineWidth',2);
legend('Exact', 'CRS-PS', 'n-CRS-PS', 'DSR-PS','Location','NorthEast');
% axis([0, 1.35, 0.35, 1.35]);
xlabel('Radius of the circular reflector [km]')
ylabel('Traveltime [sec]')
title('Exact PS traveltime, CRS-PS, DSR-PS and n-CRS-PS approximations')
```



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