

```

% gdall_08
% Supports Problem 11.6

clear all;

% In order for this script to actually write the datafile
% you must set dwrite to 1
dwrite=0;

% known constants
c0 = 0.7;
b = 0.4;

figure(1);
clf;

% time setup
N=101;
Dt = 0.1;
i0 = floor(N/10);
t = Dt*[-i0+1:N-i0]';

% heterogeities
t01 = 1;
a1 = 0.1;
s1 = 0.25;
t02 = 4;
a2 = 0.05;
s2 = 0.5;
dm = a1*exp(-((t-t01).^2)/(2*s1*s1))+a2*exp(-((t-t02).^2)/(2*s2*s2));
subplot(3,1,1);
set(gca, 'LineWidth',2);
hold on;
mr = 0.11;
axis( [t(1), t(end), -mr, mr] );
plot( t, dm, 'k-', 'LineWidth', 3 );
xlabel('time t');
ylabel('dm');

% reference solution
u0 = (t>0) .* exp( -c0*t );
subplot(3,1,2);
set(gca, 'LineWidth',2);
hold on;
ur = 1.1;
axis( [t(1), t(end), -ur, ur] );
plot( t, u0, 'k-', 'LineWidth', 3 );
xlabel('time t');
ylabel('u');

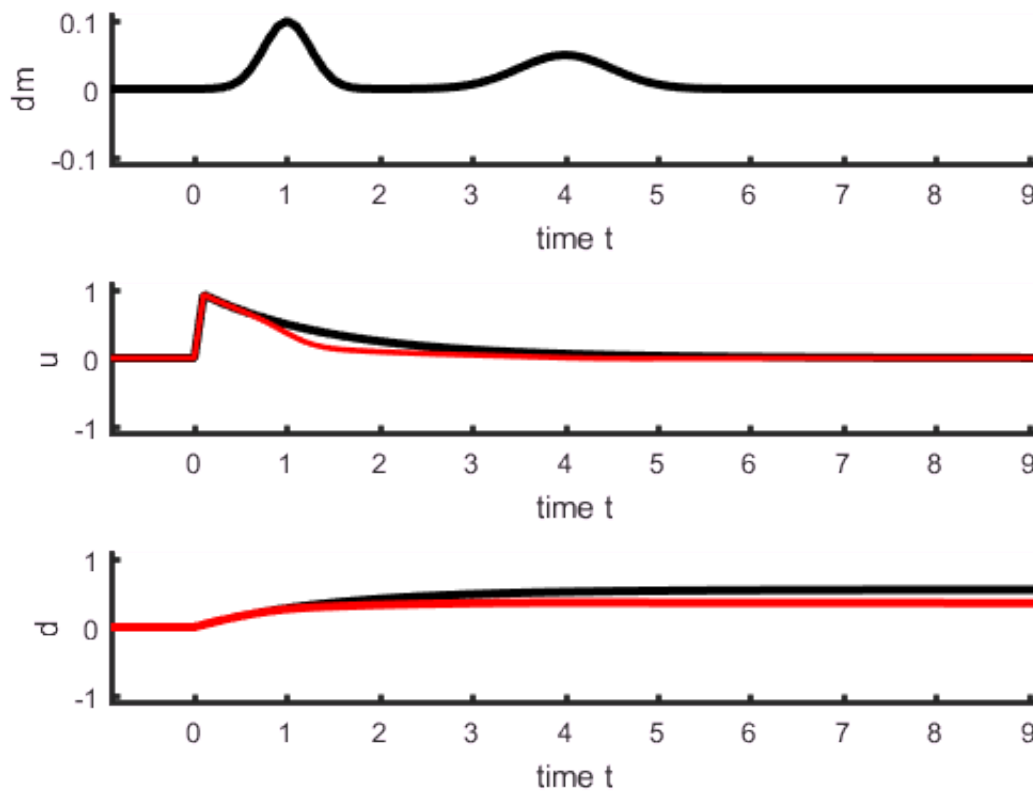
% sum up point scatterers to get perturbation in solution
du = zeros(N,1);
for i=1:N
    t0i = t(i);
    dui = -dm(i) * u0(i) * (t>t0i) .* exp( -c0*(t-t0i) );
    du = du + dui;
end
u = u0 + du;
plot( t, u, 'r-', 'LineWidth', 2 );

```

```

% data predicted by reference solution
d0 = b*Dt*cumsum( (t>0) .* u0 );
% data predicted by heterogenous solution
d = b*Dt*cumsum( (t>0) .* u );
subplot(3,1,3);
set(gca, 'LineWidth',2);
hold on;
dr = 1.1;
axis( [t(1), t(end), -dr, dr] );
plot( t, d0, 'k-', 'LineWidth', 3 );
plot( t, d, 'r-', 'LineWidth', 3 );
xlabel('time t');
ylabel('d');

```



```

% Figure. (A) Model perturbation dm(t). (B) Reference solution u0(t)
% (black) and perturbed solution (red) (D) Data d0(t) (black) associated with
% the reference solution and observed data (red)

```

```

% write it two places
if( dowrite )
    dlmwrite('gdall06_data.txt', [t,dm,d], 'delimiter', '\t' );
    dlmwrite('..data/gdall06_data.txt', [t,dm,d], 'delimiter', '\t' );
end

```