SIO227A Homework 5: 6.2 (Eric Gallimore)

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Ch 6 #2

Data input

Values from IASP model, in [deg, s, s/deg]

```
iasp = [29,361.41,8.89; 30,370.27,8.85; 31,379.10,8.81;59,601.38,6.95;60,608.29,6.

% surface velocity
v_surf = 5.8; % km/s
u1 = 1/v_surf;

% we are interested in rays traveling from the surface to the surface, so
r1 = 6378; % km, at source
r2 = 6378; % km, at receiver

% convert to radians, s/radian, make variables easier to read
T = iasp(:,2); % time, seconds
Delta = pi/180 .* iasp(:,1); % distance, radians (of sphere)
p = 180/pi .* iasp(:,3); % slowness, s/rad
```

Processing

get dp/dDelta

```
diffpD = diff(p) ./ diff(Delta);
% Our values are actually off by half a delta step.  Apply a moving average
% to get them to align.  Drop the first element because it's an artifact of
% using filter() with half overlap at the beginning.
dPdD = filter([0.5 0.5], 1, [diffpD(1); diffpD; diffpD(end)]);
dPdD = dPdD(2:end);

% find takeoff angle using p = u0*sin(theta)
% note that the surface velocity is the same for both the source and
% receiver, so we get the same angle.
theta = atan(p./u1);

% Plot it to make sure it looks OK
% plot(Delta, theta);
```

```
% Use 6.23
E_coeff = (p ./ ((4*pi*u1^2*r1^2*r2^2) .* (cos(theta).^2) .* sin(Delta))) .* abs(d
% Take square root to get amplitudes
amp_coeff = sqrt(E_coeff);

% Look at the results for 30, 60, 90 deg.
idx = ismember(iasp(:,1), [30, 60, 90]);
amp = amp_coeff(idx);

% Compare the values at 60 and 90 deg to 30 deg (make 30 unity)
amp_scaled = (1/amp(1)) .* amp;
```

Results

and print the results

```
fprintf('Distance (deg)\tRelative Amplitude\n');
fprintf('30\t\t%.4f\n', amp_scaled(1));
fprintf('60\t\t%.4f\n', amp_scaled(2));
fprintf('90\t\t%.4f\n', amp_scaled(3));
```

```
Distance (deg) Relative Amplitude
30  1.0000
60  0.7132
90  0.2136
```

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