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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
% This program maps the locations of volcanoes depending on the
% visibiity which differs by the instrument used to collect data.
% Subsequently, an analysis is conducted by examining the plotted
% figure.
%
% Assignment Information
%   Assignment:      PS 03, Problem 3
%   Author:         Tomoki Koike, koike@purdue.edu
%   Team ID:        002-08
%   Contributor:    no contributor
%   My contributor(s) helped me:
%       [ ] understand the assignment expectations without
%           telling me how they will approach it.
%       [ ] understand different ways to think about a solution
%           without helping me plan my solution.
%       [ ] think through the meaning of a specific error or
%           bug present in my code without looking at my code.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

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## INITIALIZATION

```
% Importing the data file of volcanoes
volcanoData = csvread('Data_volcano_list.csv', 1, 3);

% Setting variables for the columns in the data table

latit = volcanoData(:,1);    % The columns for the latitude of the
                             % volcanoes (DD: decimal degrees)
long = volcanoData(:,2);    % The columns for the longitude of the
                             % volcanoes (DD)
```

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```

elevtn = volcanoData(:,3);    % The columns for the elevation of the
                              % volcanoes (m: meters)

% The total row indices
allRow = numel(latit);        % The total number of rows
allRowIndex = (1:1:allRow)'; % The column vector of all row indices

```

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## CALCULATIONS

```

% Using relational and logical operators to create vectors of latitude
% and longitude values for all volcanoes that are

% a. Visible in the ACP-1 images
ACPlatit_v = latit(-39.5<=latit & latit<=39.5);
            % The values of latitude of the volcanoes that are within
            % the limits of ACP-1 (DD).
ACPlatit_row = find(-39.5<=latit & latit<=39.5);
            % The row indices of the latitudes that satisfy the limit
            % of ACP-1 (DD).
ACPlong_v = long(ACPlatit_row);
            % The values of longitude of the volcanoes that are within
            % the limit of ACP-1 (DD).

% b. Visible in the VII images
VIIlatit_v = latit(elevtn>2500 & latit<=0);
            % The values of latitude of the volcanoes that are within
            % the limits of VII (DD).
VIIlatit_row = find(elevtn>2500 & latit<=0);
            % The row indices of the latitudes that satisfy the limit
            % of VII (DD).
VIIlong_v = long(VIIlatit_row);
            % The values of longitude of the volcanoes that are within
            % the limit of VII (DD).

% c. Visible in the MASC images
MASClong_v = long((100<=long & long<145) | (-140<long & long<=-120));
            % The values of longitudes for the volcanoes that are
            % within the limits of MASC (DD).
MASClong_row = find((100<=long & long<145) | (-140<long &
long<=-120));
            % The row indices of the longitudes that satisfy the limit
            % of MASC (DD).
MASClatit_v = latit(MASClong_row);
            % The values of latitudes for the volcanoes that are
            % within the limit of MASC (DD).

% d. Visible in the PoLAR Viewer images

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```

PoLVlatit_v = latit(50<=latit);
    % The values of latitude of the volcanoes that are within
    % the limits of PoLAR Viewer (DD).
PoLVlatit_row = find(50<=latit);
    % The row indices of the latitudes that satisfy the limit
    % of PoLAR Viewer (DD).
PoLVlong_v = long(PoLVlatit_row);
    % The values of longitude of the volcanoes that are within
    % the limit of PoLAR Viewer (DD).

% e. visible in any instrument images
ACPlatitNull_row = setdiff(allRowIndex,ACPlatit_row);
    % Finds the row indices that are in ACPlatit_row but not
    % in allRowIndex.
VIILatitNull_row = setdiff(allRowIndex,VIILatit_row);
    % Finds the row indices that are in VIILatit_row but not
    % in allRowIndex.
MASCLongNull_row = setdiff(allRowIndex,MASCLong_row);
    % Finds the row indices that are in MASCLong_row but not
    % in allRowIndex.
PoLVlatitNull_row = setdiff(allRowIndex,PoLVlatit_row);
    % Finds the row indices that are in PoLVlatit_row but
    % not in allRowIndex.
noneVisible_row = intersect(intersect(intersect(ACPlatitNull_row...
    ,VIILatitNull_row),MASCLongNull_row),PoLVlatitNull_row);
    % Finds the row indices of the volcanoes that are not
    % visible with any of the instruments.
any_index = setdiff(allRowIndex,noneVisible_row);
    % Finds the row indices that is visible in any one of the
    % instrument images.
anyLatit = latit(any_index);
    % Finds the value of the latitudes that are visible in
    % any of the instrument images.
anyLong = long(any_index);
    % Finds the value of the longitudes that are visible in
    % any of the instrument images.

% f. Not visible in any instrument images
noneVisible_latit = latit(noneVisible_row);
    % The latitudes of the volcanoes that are not visible
    % in any of the instruments.
noneVisible_long = long(noneVisible_row);
    % The longitudes of the volcanoes that are not visible
    % in any of the instruments.

```

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## FORMATTED FIGURES

```

% Plotting all the volcanoes in the data.

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```

figure
plot(long,latit,'xr')
hold on
title('Locations of All Volcanoes')
xlabel('longitude (DD)')
ylabel('latitude (DD)')
xlim([-180,180])
ylim([-90,90])
grid on
grid minor
hold off

% Plotting the locations of the volcanoes that are visible for each
% instrument.
% ACP-1
figure
subplot(2,2,1)
hold on
plot(ACPlong_v,ACPlatit_v,'xm')
title('Volcanoes Visible in ACP-1')
xlabel('longitude (DD)')
ylabel('latitude (DD)')
xlim([-180,180])
ylim([-90,90])
grid on
grid minor

% VII
subplot(2,2,3)
plot(VIIlong_v,VIIlatit_v,'xg')
title('Volcanoes Visible in VII')
xlabel('longitude (DD)')
ylabel('latitude (DD)')
xlim([-180,180])
ylim([-90,90])
grid on
grid minor

% MASC
subplot(2,2,2)
plot(MASClong_v,MASClatit_v,'xb')
title('Volcanoes Visible in MASC')
xlabel('longitude (DD)')
ylabel('latitude (DD)')
xlim([-180,180])
ylim([-90,90])
grid on
grid minor

% PoLAR Viewer
subplot(2,2,4)
plot(PoLVlong_v,PoLVlatit_v,'xk')
title('Volcanoes Visible in PoLAR Viewer')
xlabel('longitude (DD)')

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```

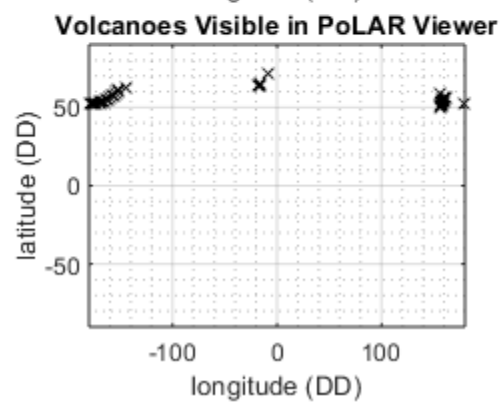
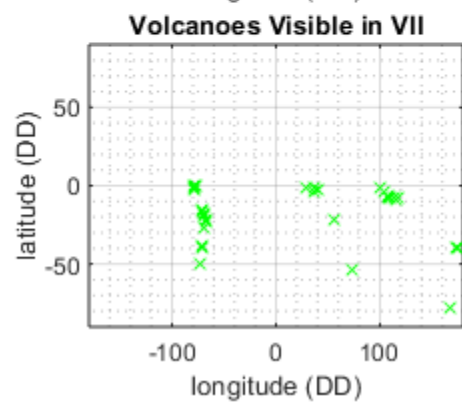
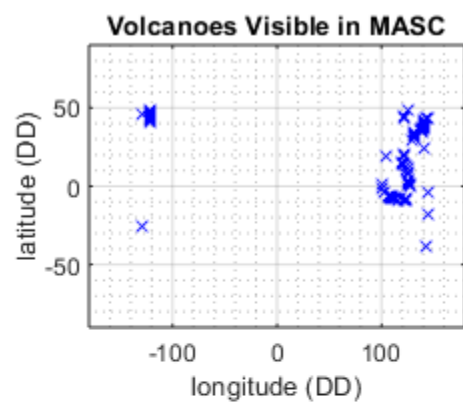
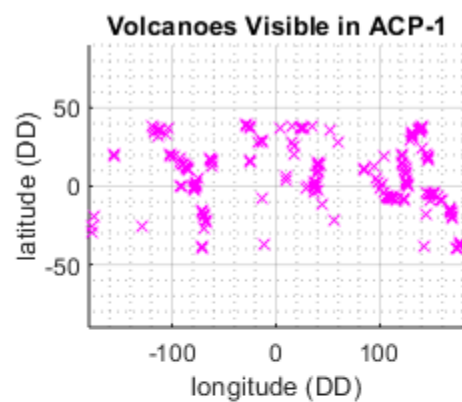
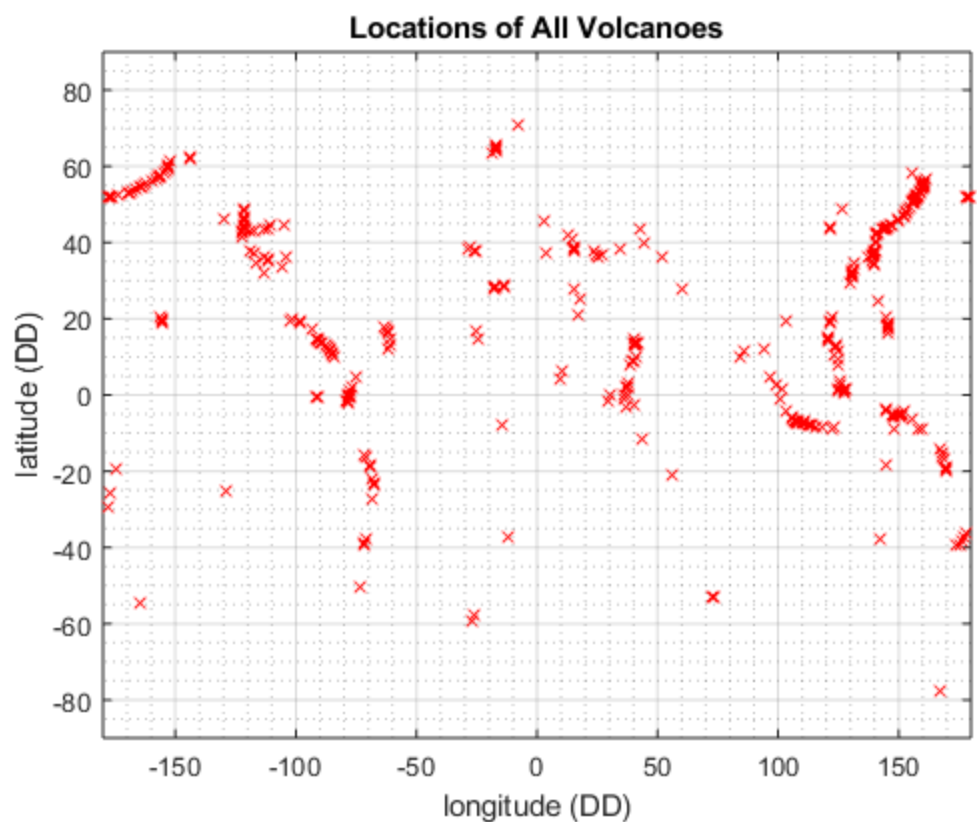
ylabel('latitude (DD)')
xlim([-180,180])
ylim([-90,90])
grid on
grid minor
hold off

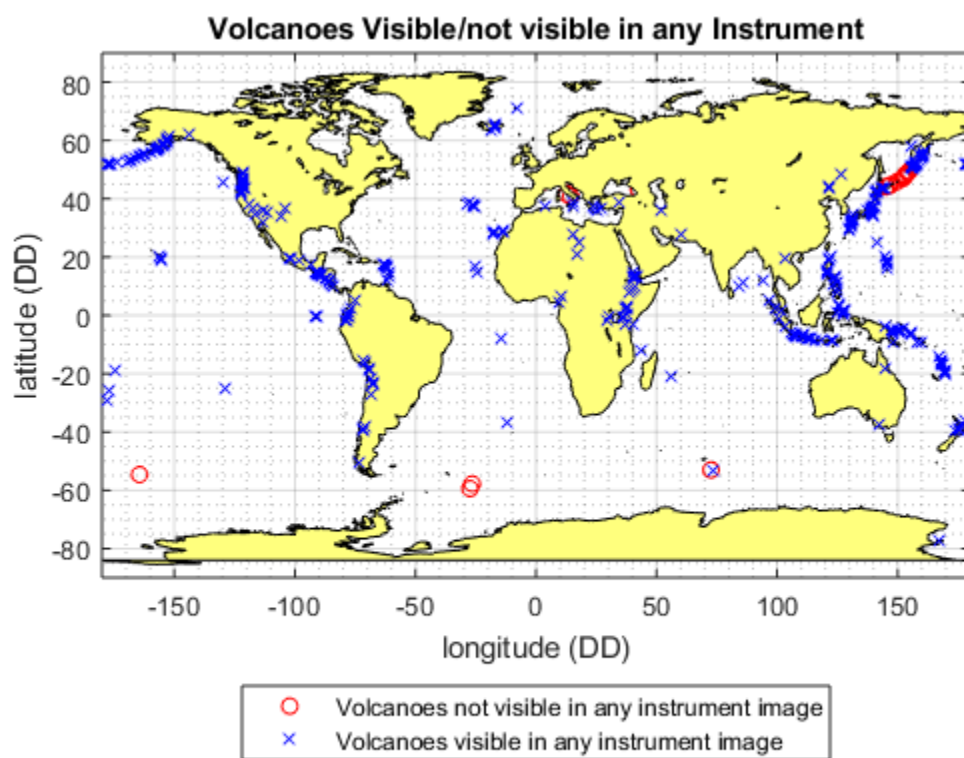
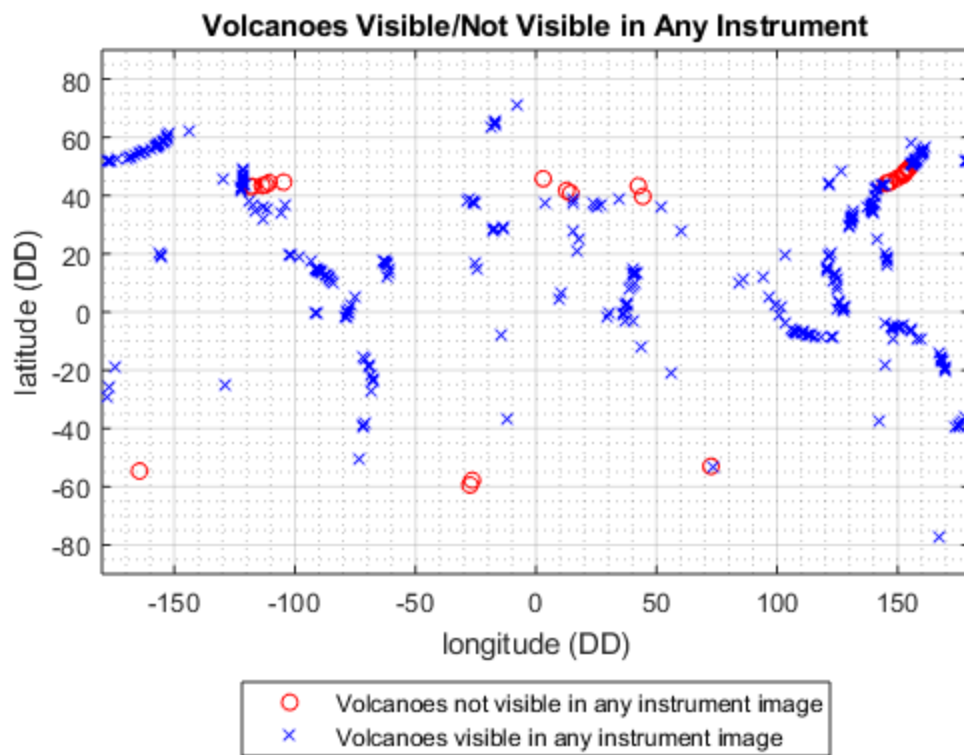
% A figure showing the locations of the volcanoes that are visible
% in any instrument as well as the volcanoes that are not visible in
% any of the instruments.
figure
plot(noneVisible_long,noneVisible_latit,'or')
title('Volcanoes Visible/Not Visible in Any Instrument')
xlabel('longitude (DD)')
ylabel('latitude (DD)')
xlim([-180,180])
ylim([-90,90])
grid on
grid minor
hold on
plot(anyLong,anyLatit,'xb');
legend('Volcanoes not visible in any instrument image',...
       'Volcanoes visible in any instrument
       image', 'location','southoutside')
hold off

% Optional
% Combining the world map with the location of the volcanoes that are
% visible in all instrument image and not visible in all instrument
% images.
figure
plot(noneVisible_long,noneVisible_latit,'or')
hold on
landareas = shaperead('landareas.shp');
mapshow(landareas);
title('Volcanoes Visible/not visible in any Instrument')
xlabel('longitude (DD)')
ylabel('latitude (DD)')
xlim([-180,180])
ylim([-90,90])
grid on
grid minor
plot(anyLong,anyLatit,'xb');
legend('Volcanoes not visible in any instrument image',...
       'Volcanoes visible in any instrument
       image', 'location','southoutside')
hold off

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## ANALYSIS

### -- Q1

The instruments provided for the analysis is not sufficient considering the fact that there are volcanoes that are not visible in any of the instruments and also that there is no volcano that is commonly visible in all of the instruments. Overall, there are volcanoes that are not visible due to the limited domain of the latitude. By observing the figure of the volcanoes that are not visible in any of the instruments it is evident that volcanoes that have latitudes from -60 to -50 and 40 to 50 are ruled out from the remote sensing process.

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## ACADEMIC INTEGRITY STATEMENT

I have not used source code obtained from any other unauthorized source, either modified or unmodified. Neither have I provided access to my code to another. The script I am submitting is my own original work.

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