Lab13: Solar image processing to determine the angular velocity of EUV coronal wave

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```matlab
clc; clear; close all;
addpath('functions/', 'Week 7/Lab13/data');
D = importdata('ro.mat');
B = importdata('phi.mat');
Im1 = importdata('Image1.mat');
Im2 = importdata('Image2.mat');
Im3 = importdata('Image3.mat');
Im4 = importdata('Image4.mat');
B1 = importdata('borders1.mat');
B2 = importdata('borders2.mat');
B3 = importdata('borders3.mat');
B4 = importdata('borders4.mat');
Image = {Im1,Im2,Im3,Im4};
Borders = {B1,B2,B3,B4};
Center = zeros(1,4);
Angles = zeros(1,4);

for j=1:4
    Img = Image{j};
    Border = Borders{j};
    WaveFrontIndex = find( D > Border(1) & D < Border(2) );
    WaveIntensity = Img(WaveFrontIndex);
    WaveAngle = B(WaveFrontIndex);
    [tmp, indexSortedByAngle] = sort(WaveAngle);
    WaveIntensity = WaveIntensity(indexSortedByAngle);
    WaveAngle = WaveAngle(indexSortedByAngle);

    %Filtration
    n = length(WaveAngle);
    FilteredIntensity = zeros(1,n);
    for i=1:n
        FilterIndex=find(WaveAngle > WaveAngle(i)-pi/16 & WaveAngle < WaveAngle(i)+pi/16);
        FilteredIntensity(i) = sum(WaveIntensity(FilterIndex));
    end

    %Cut the north pole sector
    cutInd = find(WaveAngle <= 2 | WaveAngle >= 4);
    Bcut = WaveAngle(cutInd);
    Dcut = FilteredIntensity(cutInd);
    Dcut(Dcut < 0 ) = 0;
    k = length(Dcut);
    Center(j) = round ( (sum((1:k).*Dcut))/ sum(Dcut) );
    Angles(j) = Bcut(Center(j)).*(180/pi);

    figure;
        imshow(Img,[-100 300]);
        colormap jet;
        title(['Image ', num2str(j)]);
    figure;
        plot(Dcut);
        title(['filtered Intensity from Image', num2str(j); '  northPole sector is cutted  ' ]
end
```
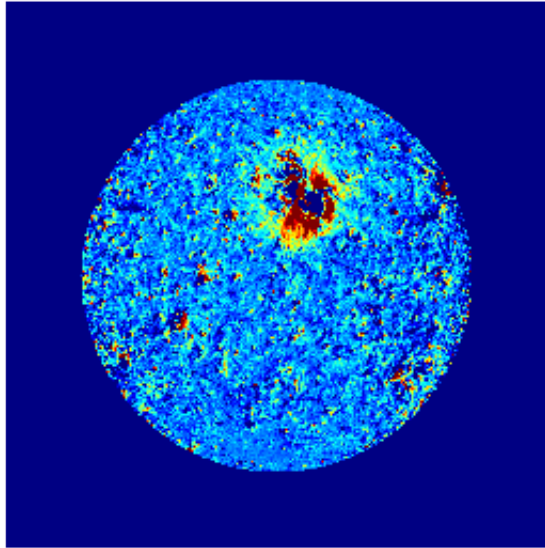
Image 1
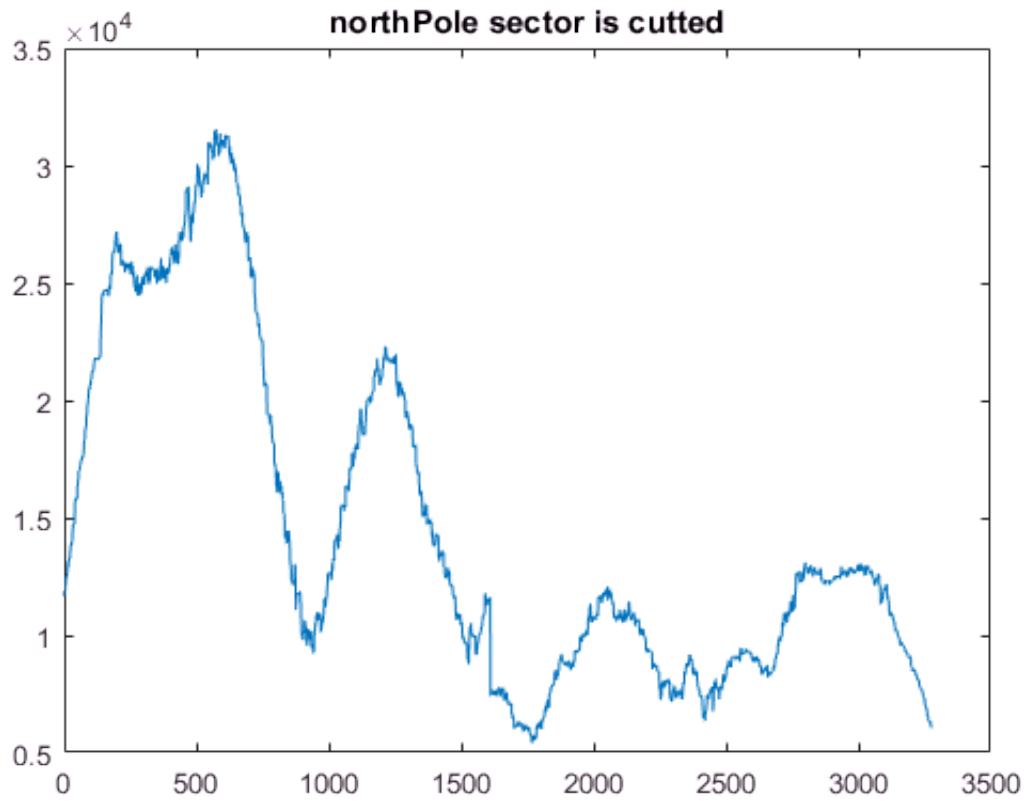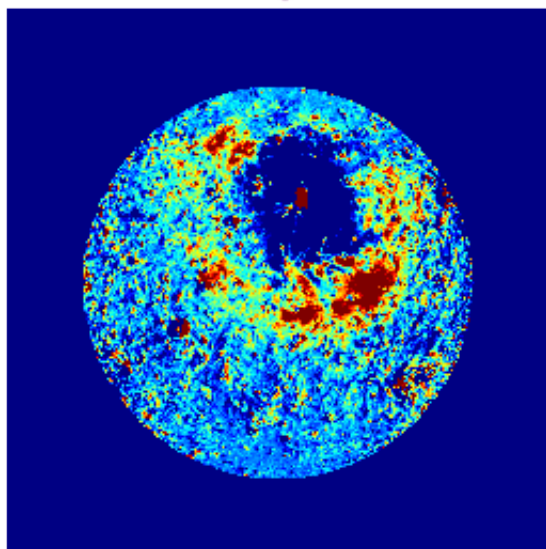
filtered Intensity from Image1
northPole sector is cutted

Image 2

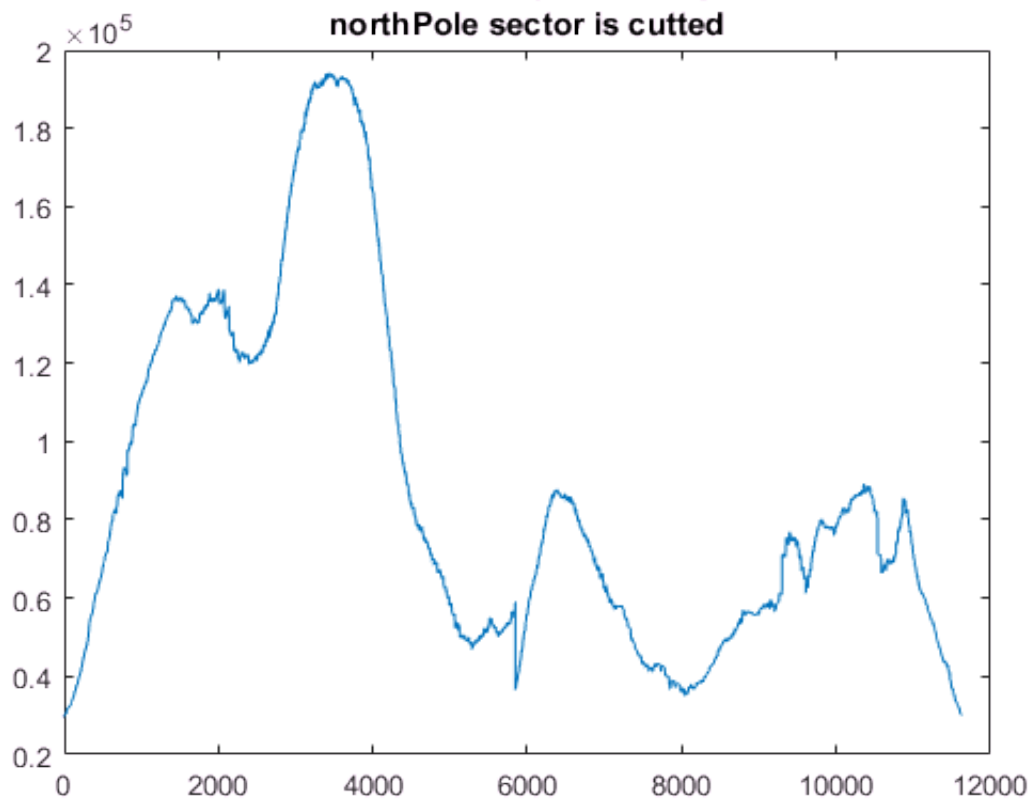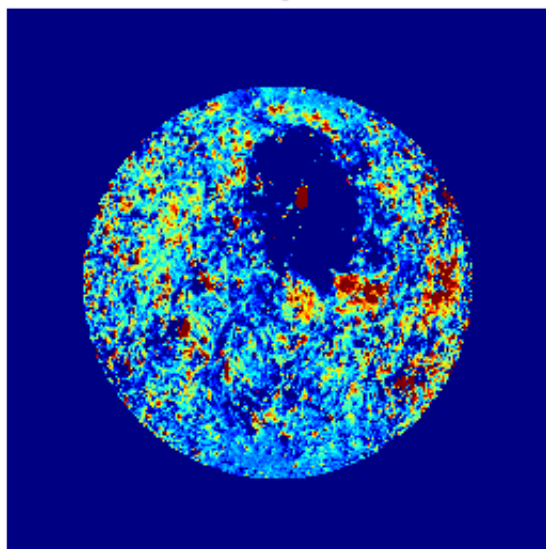## filtered Intensity from Image2
northPole sector is cutted

Image 3

filtered Intensity from Image3
northPole sector is cutted

Image 4

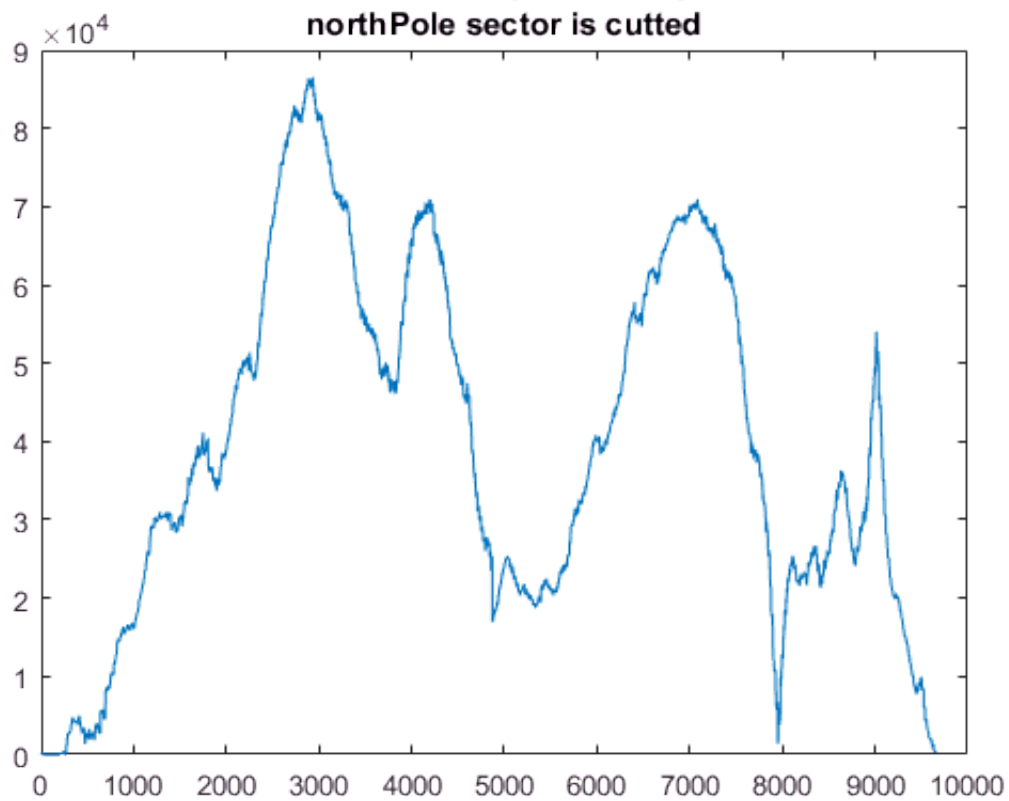## filtered Intensity from Image4
northPole sector is cutted
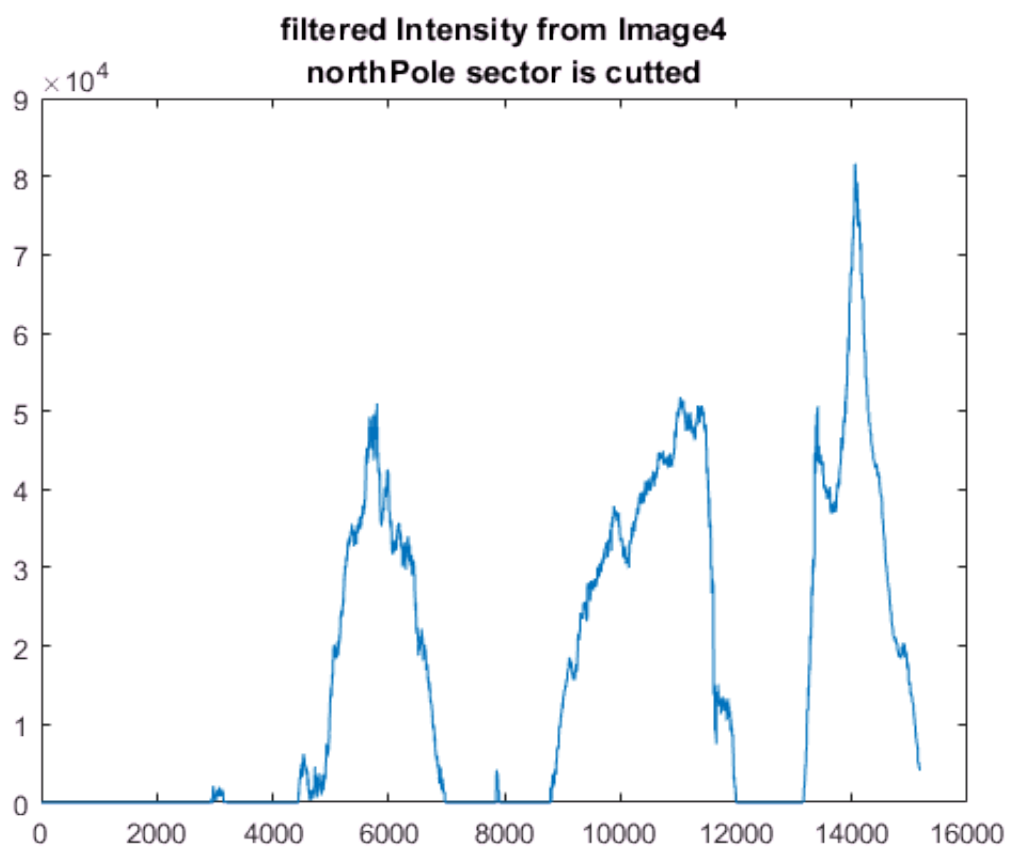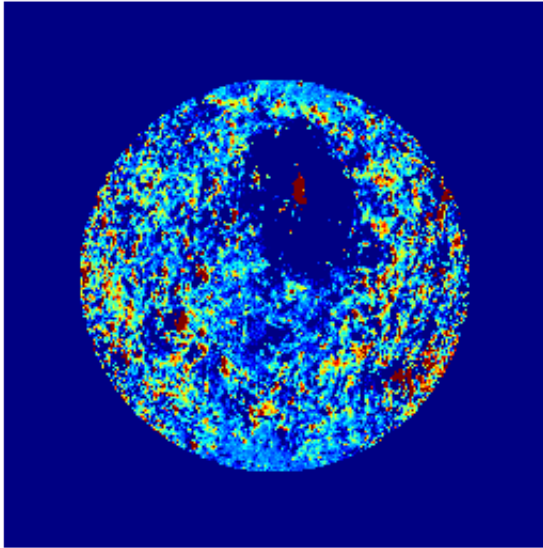


```
figure;
    plot(Angles);
    title('Angle of center of intensity');
```

Angle of center of intensity