

# Hippocampus

```
subject = 'Group';
plot_window=[1 25 1920 1080];
home_dir = '/bigvault/Projects/seeg_pointing';
group_dir = '/bigvault/Projects/seeg_pointing/results/memory_group/';

% obj_pic = 51:165; % original [-2,3], save [-0.5,1.5], pic [0,1.15]
% seq_pic = 251:500;% original [-5,7], save [-2.5,5], pic [0,2.5]
% seq_pre = 1:200; % original [-5,7], save [-2.5,5], pre interval [-2.5,-0.5]
% seq_after = 501:700;% original [-5,7], save [-2.5,5], pre interval [2.5,4.5]

index = [7,13,25,31,43,49];
bd_id = [index,index+18*6];
non_bd_id = [index+18*3,index+18*9];
```

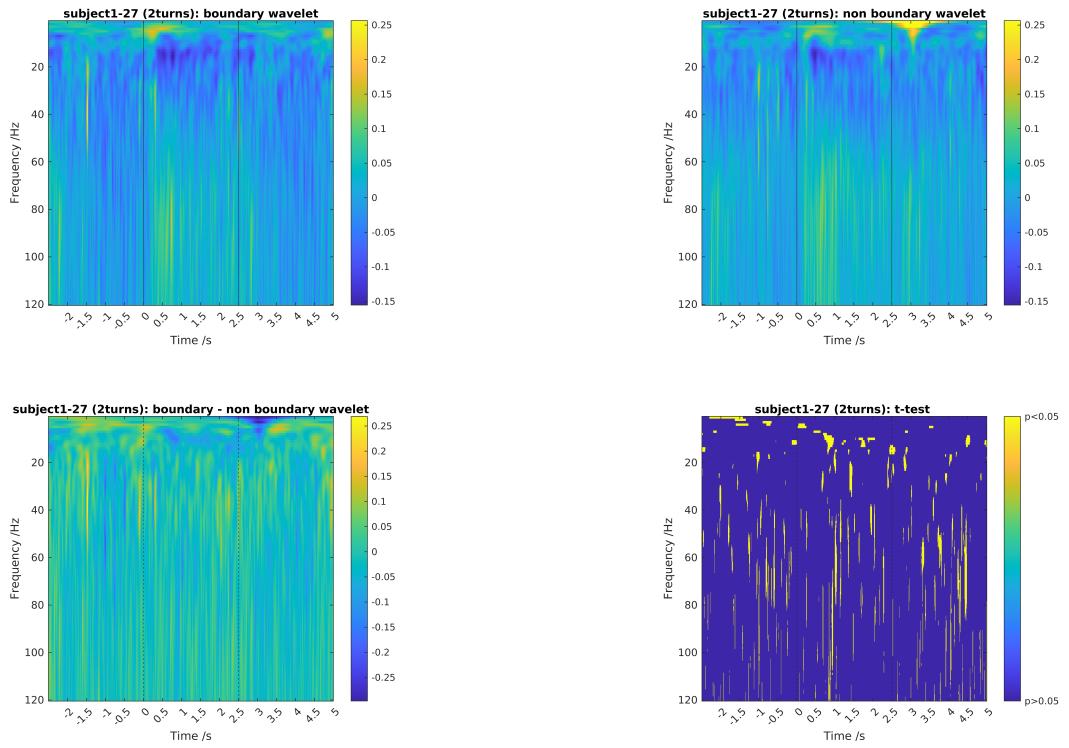
```
% load wavlet data for subject
load([group_dir,'Hippocampus_wavelet_subject.mat']);
```

## Boundary turns vs nonBoundary turns

total

```
subject='subject1-27 (2turns)';
data_bd = [];
data_non_bd = [];
subjects =wavelet_subject.subjects;
for subi=1:length(subjects)
    data_bd(:,:,subi) = mean(cell2matrix(wavelet_subject.data_bd(subjects(subi),7:18)));
    data_non_bd(:,:,subi) = mean(cell2matrix(wavelet_subject.data_non_bd(subjects(subi),7:18)));
end
wavelet_porr_h = [];
for i = 1:size(data_bd,1)
    for j = 1:size(data_bd,2)
        [wavelet_porr_h(i,j),~] = ttest(squeeze(data_bd(i,j,:)),squeeze(data_non_bd(i,j,:)));
    end
end
plt_wavelet_region_bd(data_bd, data_non_bd, subject, plot_window)
```

Warning: MATLAB has disabled some advanced graphics rendering features by switching to software OpenGL. For more information, click [here](#).

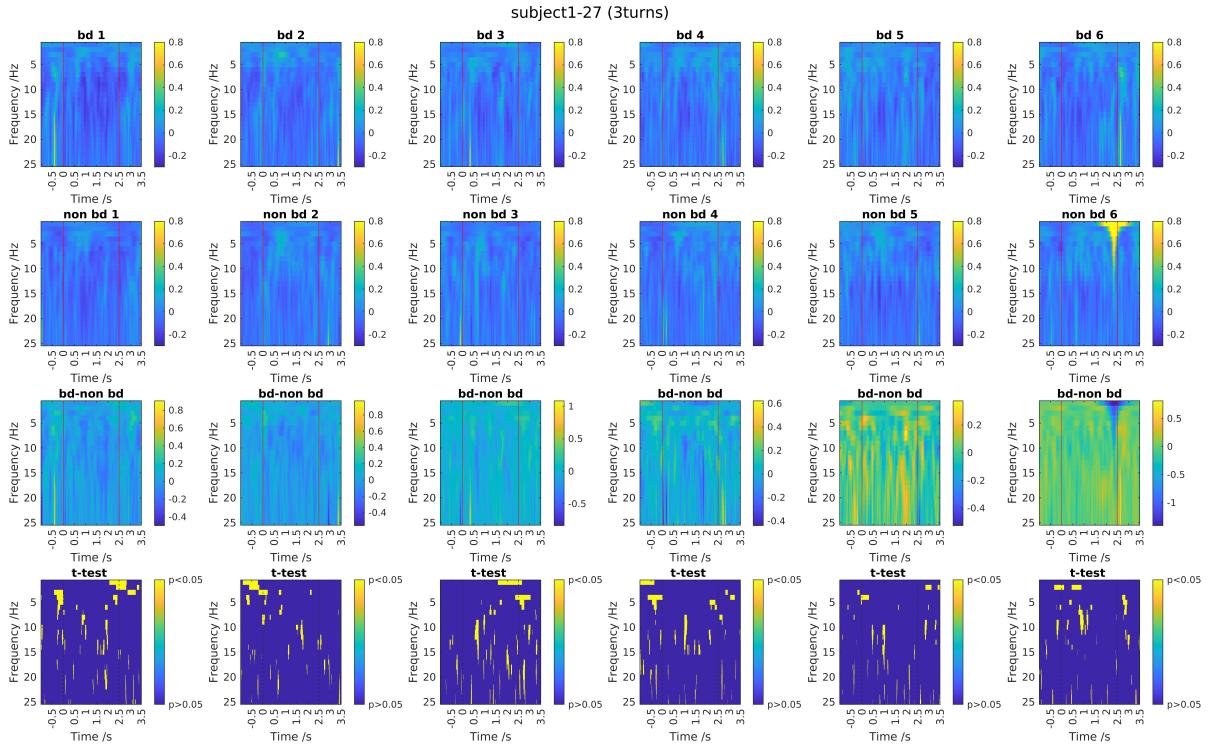


### 3 turns

```
subject='subject1-27 (3turns)'
```

```
subject =
'subject1-27 (3turns)'

data_bd = [];
data_non_bd = [];
subjects =wavelet_subject.subjects;
for subi=1:length(subjects)
    for seqi=1:6
        data_bd{subi,seqi} = mean(cell2matrix(wavelet_subject.data_bd(subjects(subi),seqi:6));
        data_non_bd{subi,seqi} = mean(cell2matrix(wavelet_subject.data_non_bd(subjects(subi),seqi:6));
    end
end
plt_wavelet_sd(data_bd, data_non_bd, subject, plot_window)
```

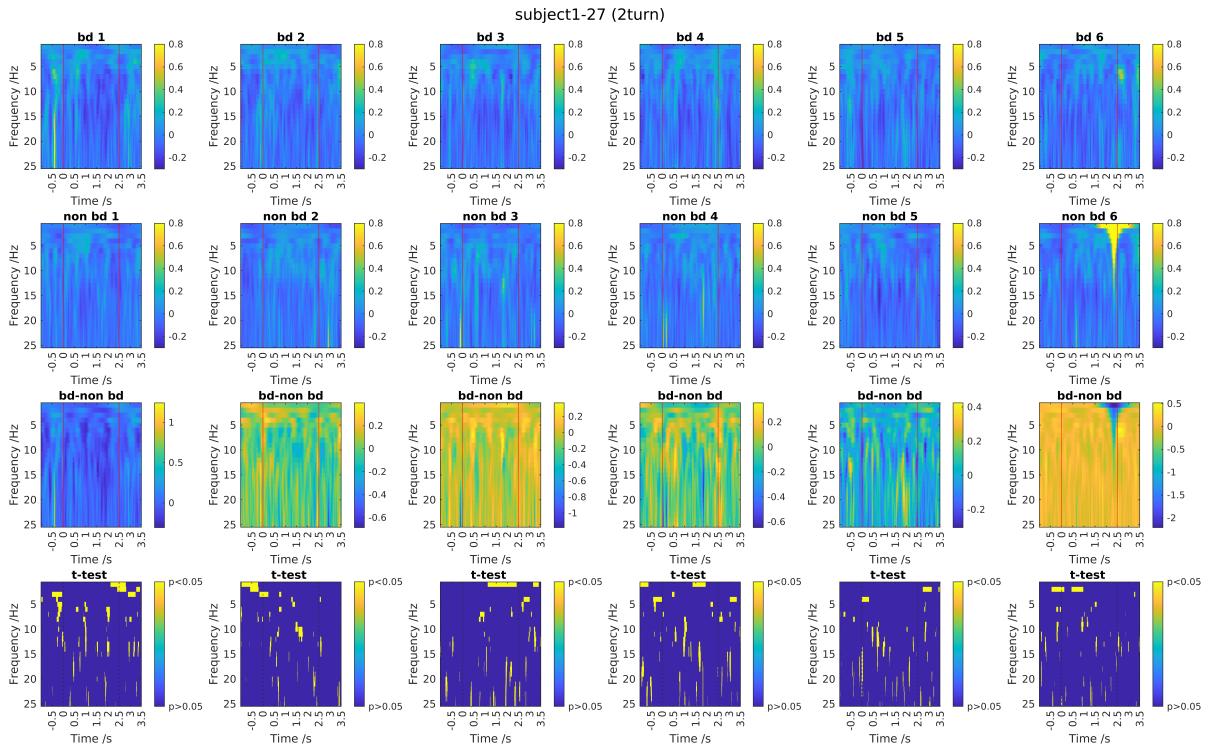


## 2 turns

```
% zoom in 1-25Hz
subject='subject1-27 (2turn)'
```

```
subject =
'subject1-27 (2turn)'
```

```
data_bd = [];
data_non_bd = [];
subjects =wavelet_subject.subjects;
for subi=1:length(subjects)
    for seqi=1:6
        data_bd{subi,seqi} = mean(cell2matrix(wavelet_subject.data_bd(subjects(subi),seqi+6));
        data_non_bd{subi,seqi} = mean(cell2matrix(wavelet_subject.data_non_bd(subjects(subi),
    end
end
plt_wavelet_sd(data_bd, data_non_bd, subject, plot_window)
```



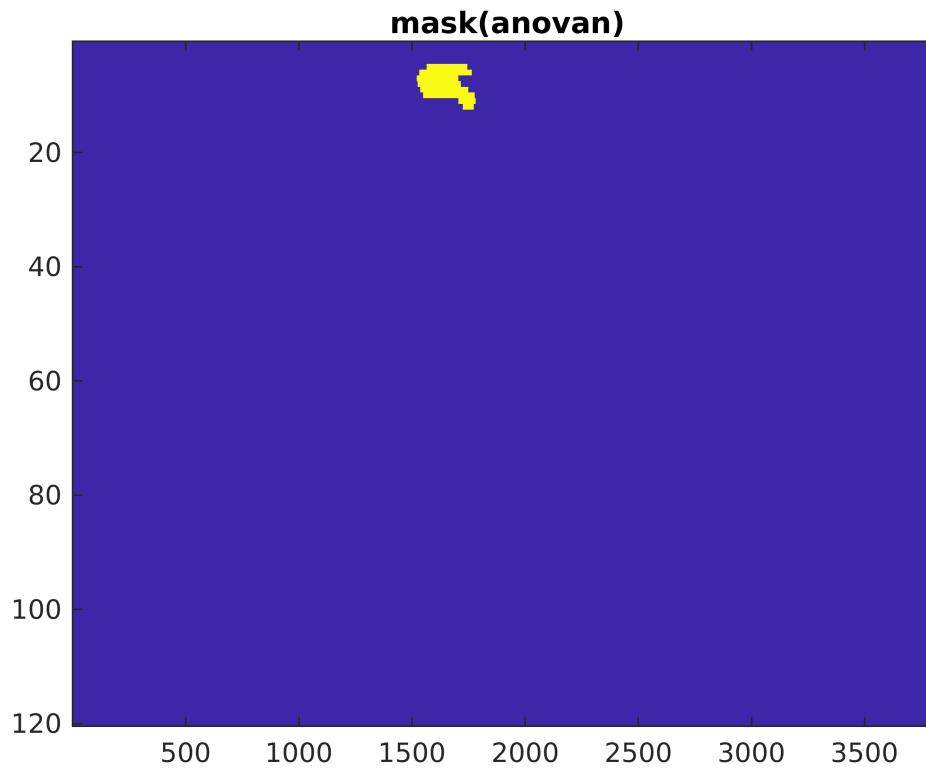
## Theta (anova)

```
% anovan
wavelet_bd = (cell2matrix(wavelet_subject.data_bd(:, 7))+cell2matrix(wavelet_subject.dat
wavelet_pre_bd = (cell2matrix(wavelet_subject.data_bd(:, 6))+cell2matrix(wavelet_subject.dat
wavelet_non_bd = (cell2matrix(wavelet_subject.data_non_bd(:, 7))+cell2matrix(wavelet_subj
wavelet_pre_non_bd = (cell2matrix(wavelet_subject.data_non_bd(:, 6))+cell2matrix(wavelet_su

wavelet = cat(3, wavelet_bd,wavelet_pre_bd,wavelet_non_bd,wavelet_pre_non_bd);
condition = reshape(repmat([1,1,2,2], 10, 1),[],1);
position = reshape(repmat([1,2,1,2], 10, 1),[],1);
p2=[];
for i = 1:size(wavelet,1)
    for j=1:size(wavelet,2)
        p2(i,j,:)= anovan(squeeze(wavelet(i,j,:)),{condition position}, 'model', 'interac
    end
end
```

```
% mask combain ttest and anova
p=p2;
a = p; a(a<0.05)=-1; a(a>=0.05)=0; a=abs(a);
anova_condition = a(:,:,1);
CC = bwconncomp(anova_condition);
cc_size=[];
for i=1:length(CC.PixelIdxList)
    cc_size(i)=length(CC.PixelIdxList{1, i});
end
```

```
[cc_sort,cc_idx] = sort(cc_size,'descend');
mask = zeros(size(anova_condition));
mask(CC.PixelIdxList{1, cc_idx(1)}) = 1;
figure; imagesc(mask)
title('mask(anovan)')
```



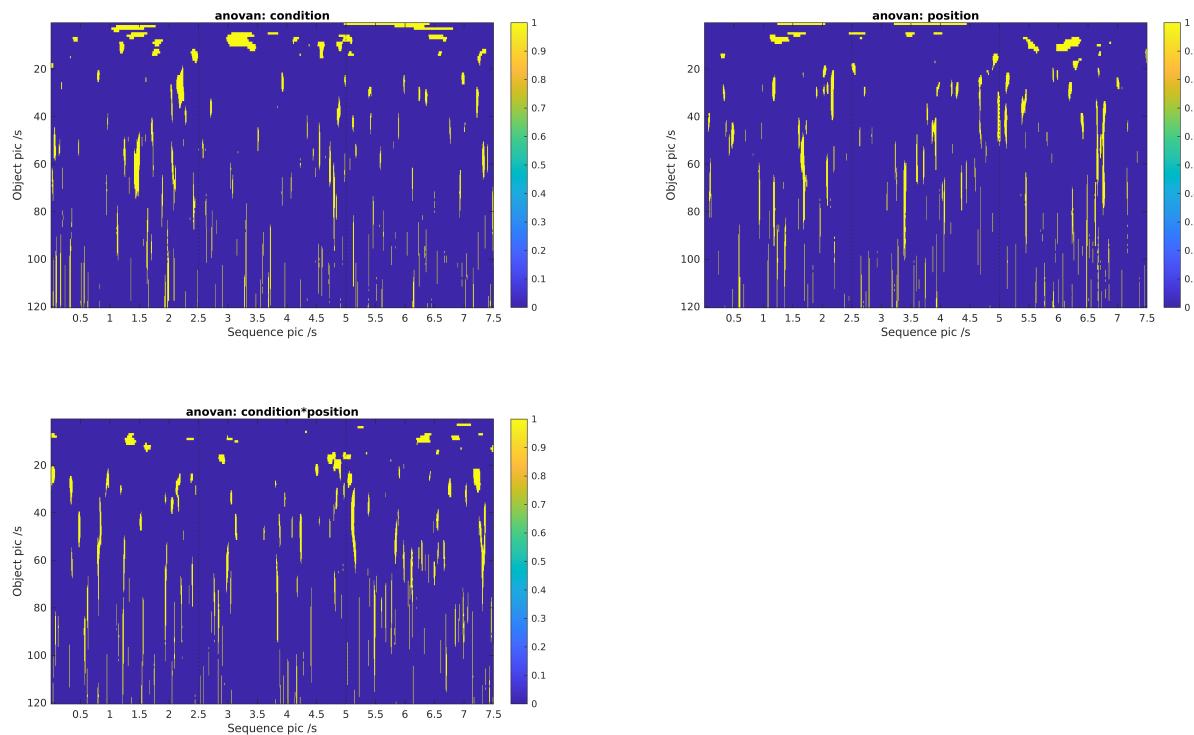
```
mask_anova2 = mask;
```

```
p=p2;
a = p; a(a<0.05)=-1; a(a>=0.05)=0; a=abs(a);
anova_name = { 'condition', 'position', 'condition*position' };
figure
for i= 1:3
    subplot(2,2,i)
    if i<4
        imagesc(a(:,:,i))
        title(['anovan: ',anova_name{i}])
    else
        imagesc(pic_corr_h)
        title('Mask')
    end
    yticks(0:20:120);
    yticklabels([0:20:120]);
    ylabel('Object pic /s')
    xticks(0:256:7.5*512);
    xticklabels([0:256:7.5*512]/512);
    xlabel('Sequence pic /s')
    xline(2.5*512, '--')
```

```

xline(5*512, '--')
colorbar()
end
set(gcf, 'Position', [1 25 1920 1080]);

```



```

% plot anova result condition(anova 2*2, mask ttest)
mask_anova=mask_anova2;
data = [];
data(1,1,:) = squeeze(mean(mean(wavelet_bd.*mask_anova,1),2));
data(1,2,:) = squeeze(mean(mean(wavelet_pre_bd.*mask_anova,1),2));
data(2,1,:) = squeeze(mean(mean(wavelet_non_bd.*mask_anova,1),2));
data(2,2,:) = squeeze(mean(mean(wavelet_pre_non_bd.*mask_anova,1),2));

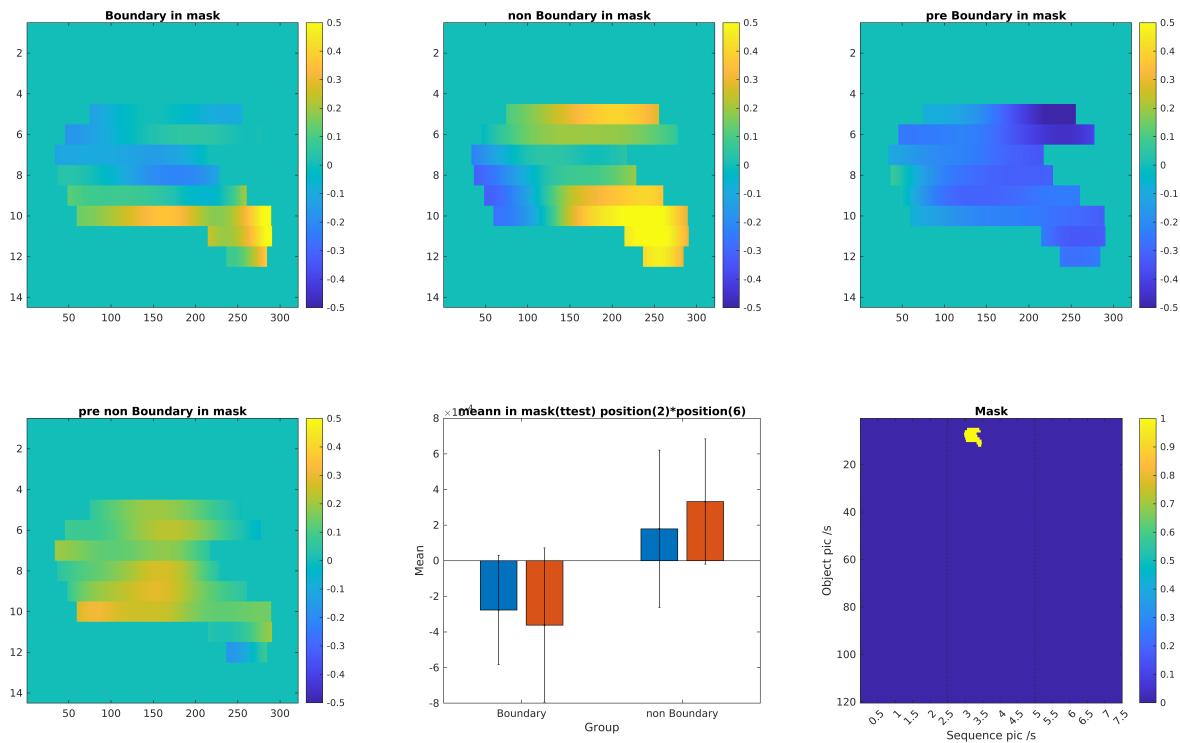
figure
clim = [-0.5,0.5];
subplot(2,3,1)
temp = wavelet_bd.*mask_anova;
imagesc(mean(temp(1:14,1490:1810),3))
title('Boundary in mask')
caxis(clim)
colorbar()
subplot(2,3,2)
temp = wavelet_non_bd.*mask_anova;
imagesc(mean(temp(1:14,1490:1810),3))
title('non Boundary in mask')
caxis(clim)
colorbar()
subplot(2,3,3)

```

```

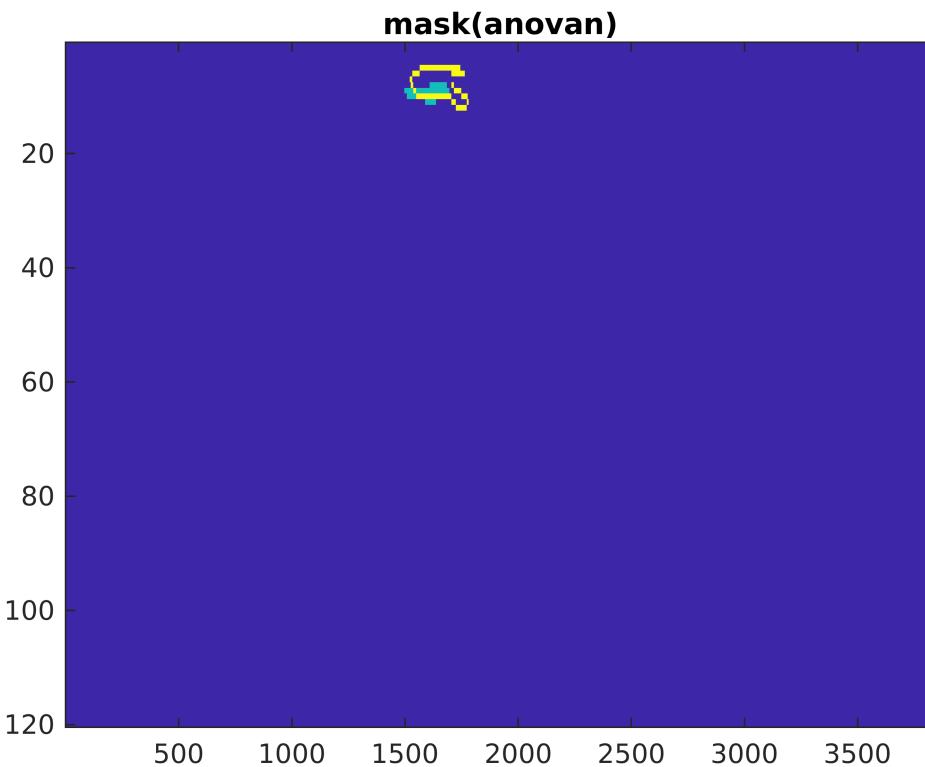
temp = wavelet_pre_bd.*mask_anova;
imagesc(mean(temp(1:14,1490:1810),3))
title('pre Boundary in mask')
caxis(clim)
colorbar()
subplot(2,3,4)
temp = wavelet_pre_non_bd.*mask_anova;
imagesc(mean(temp(1:14,1490:1810),3))
title('pre non Boundary in mask')
caxis(clim)
colorbar()
subplot(2,3,5)
plt_bar_group(data,{'Boundary','non Boundary'}) % no ttest for each bins
title('meann in mask(ttest) position(2)*position(6)')
subplot(2,3,6)
imagesc(mask_anova)
title('Mask')
yticks(0:20:120);
yticklabels([0:20:120]);
ylabel('Object pic /s')
xticks(0:256:7.5*512);
xticklabels([0:256:7.5*512]/512);
xlabel('Sequence pic /s')
xline(2.5*512,'--')
xline(5*512,'--')
colorbar()
sgtitle('obj2seq mask')

```



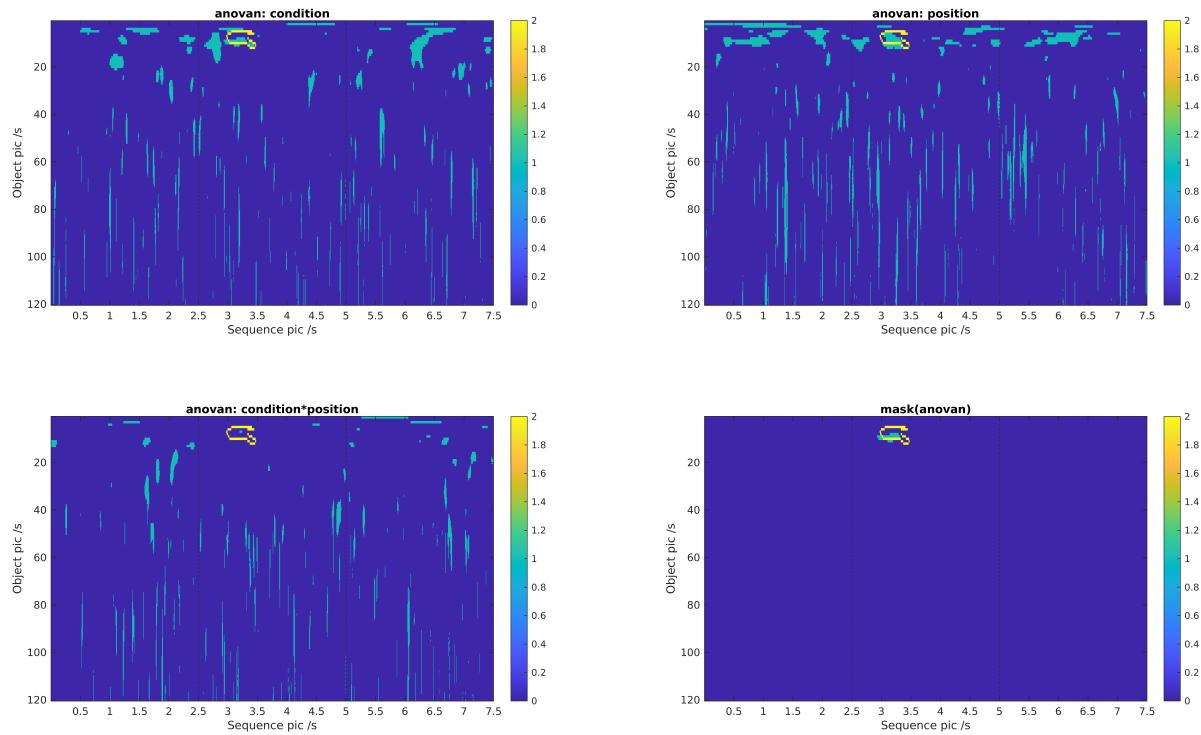
```
% anova    position(2,[boundary, non_boundary])*position(6,[1:6])
wavelet= [];
for pici =1:6
wavelet = cat(3, wavelet,cell2matrix(wavelet_subject.data_bd(:,[pici,pici+6,pici+12])));
end
for pici =1:6
wavelet = cat(3, wavelet,cell2matrix(wavelet_subject.data_non_bd(:,[pici,pici+6,pici+12])));
end
condition = reshape(repmat([1,2], 10*6, 1),[],1);
position = reshape(repmat([1:6,1:6], 10, 1),[],1);
p6=[];
for i = 1:size(wavelet,1)
    for j=1:size(wavelet,2)
        p6(i,j,:)= anovan(squeeze(wavelet(i,j,:)),{condition position}, 'model', 'interaction');
    end
end
```

```
% compare anova mask in 2*2 and 2*6
p=p6;
a = p; a(a<0.05)=-1; a(a>=0.05)=0; a=abs(a);
anova_condition = a(:,:,1);
BW_anova = bwperim(mask_anova2);
CC = bwconncomp(anova_condition);
cc_size=[];
for i=1:length(CC.PixelIdxList)
    cc_size(i)=length(CC.PixelIdxList{1, i});
end
[cc_sort,cc_idx] = sort(cc_size,'descend');
mask = zeros(size(anova_condition));
mask(CC.PixelIdxList{1, cc_idx(6)}) = 1;
figure; imagesc(max(mask,BW_anova*2))
title('mask(anovan)')
```



```
mask_anova6 = mask;
```

```
p=p6;
a = p; a(a<0.05)=-1; a(a>=0.05)=0; a=abs(a);
anova_name = { 'condition', 'position', 'condition*position' };
figure
for i= 1:4
    subplot(2,2,i)
    if i<4
        imagesc(max(a(:,:,i),BW_anova*2))
        title(['anova: ',anova_name{i}])
    else
        imagesc(max(mask_anova6,BW_anova*2))
        title('mask(anovan)')
    end
    yticks(0:20:120);
    yticklabels([0:20:120]);
    ylabel('Object pic /s')
    xticks(0:256:7.5*512);
    xticklabels([0:256:7.5*512]/512);
    xlabel('Sequence pic /s')
    xline(2.5*512,'--')
    xline(5*512,'--')
    colorbar()
end
set(gcf, 'Position', [1 25 1920 1080]);
```



```
% plot anova result condition(anova 2*6, mask ttest)
data = [];
for pici=1:6
    data(1,pici,:) = squeeze(mean(mean(cell2matrix(wavelet_subject.data_bd(:,[pici,pici])))));
    data(2,pici,:) = squeeze(mean(mean(cell2matrix(wavelet_subject.data_non_bd(:,[pici,pici])))));
end
figure
plt_bar_group(data,{'Boundary','non Boundary'}) % no ttest for each bins
title('meann in mask(ttest) position(2)*position(6)')
```

