

Outline



- ☒ **IC vs scalp data, what have we gained?**
- ☐ **Create a script from “eegh” output**
- ☐ **Create a Matlab function**
- ☐ **Demonstration and EEG structure**
- ☐ **Exercise**

Outline



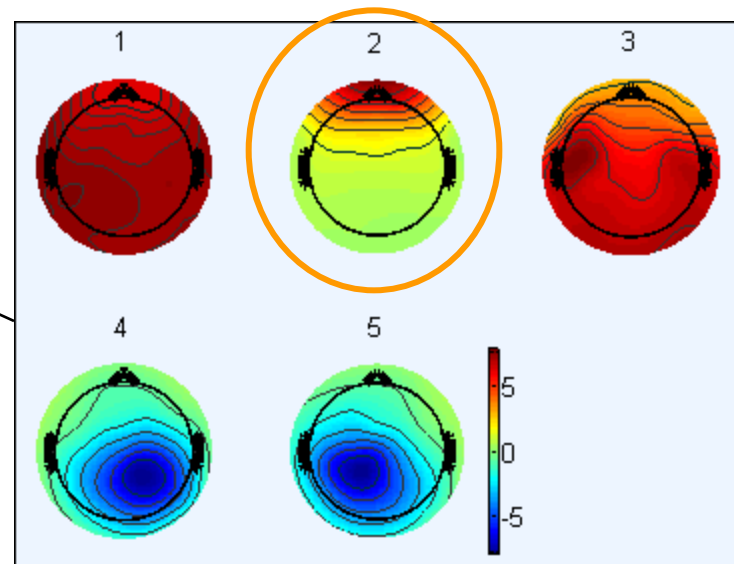
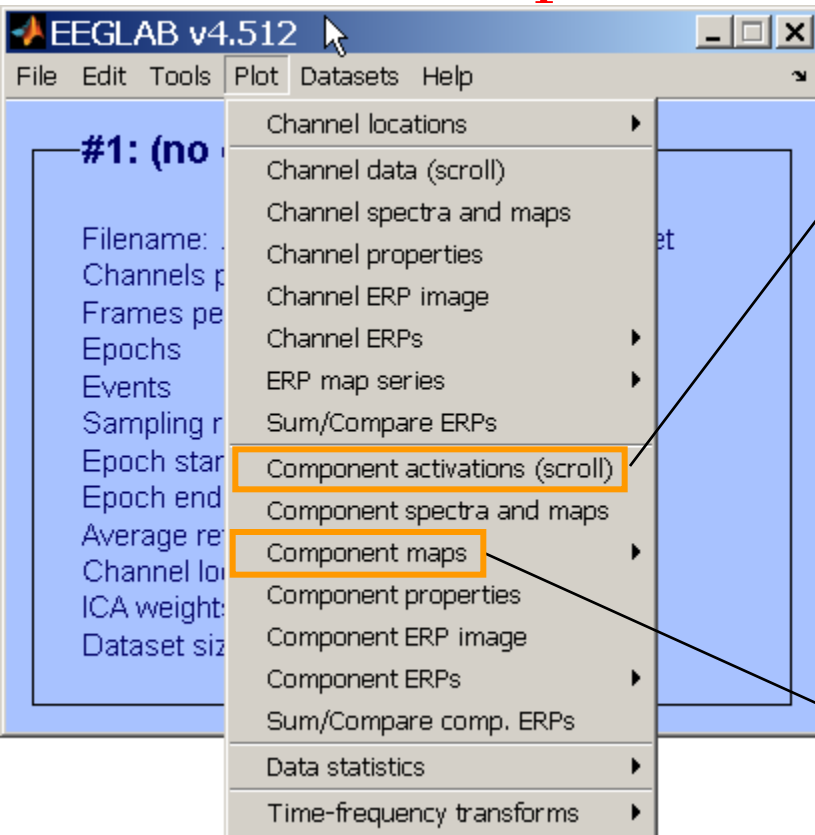
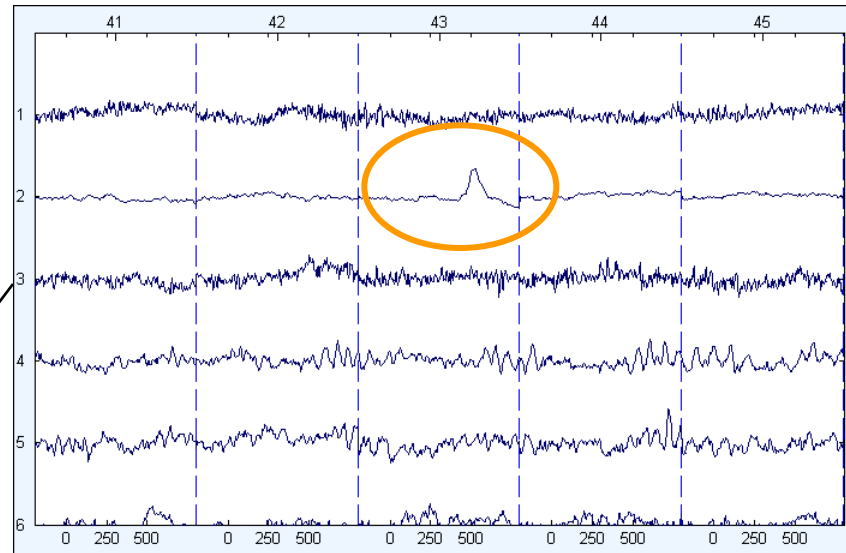
- ☐ **IC vs scalp data, what have we gained?**
- ☐ Create a script from “eegh” output
- ☐ Create a Matlab function
- ☐ Demonstration and EEG structure
- ☐ Exercise



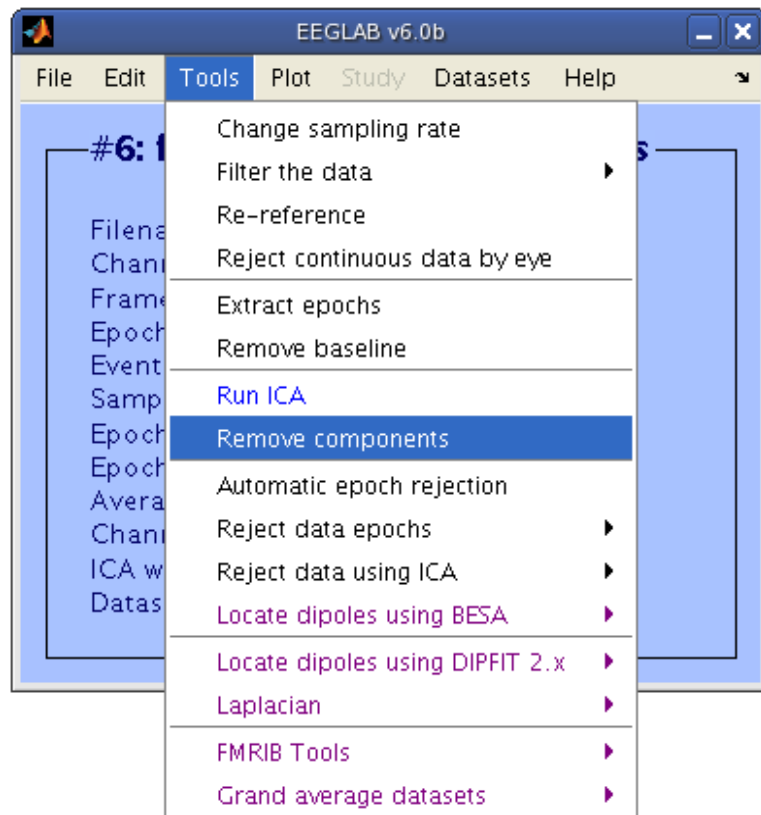
Eye blink correction



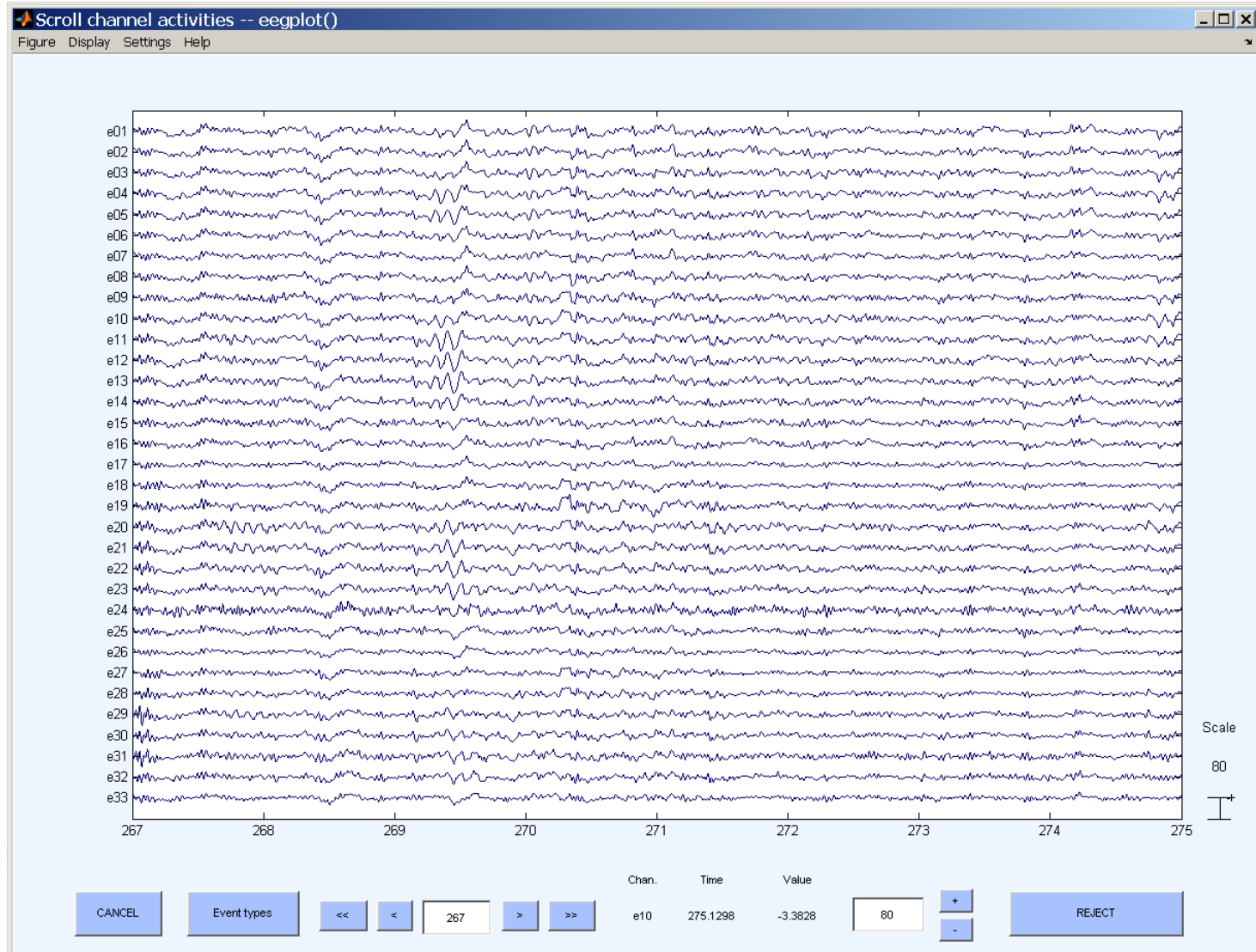
Identify eye-blink
components:



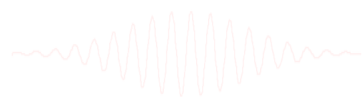
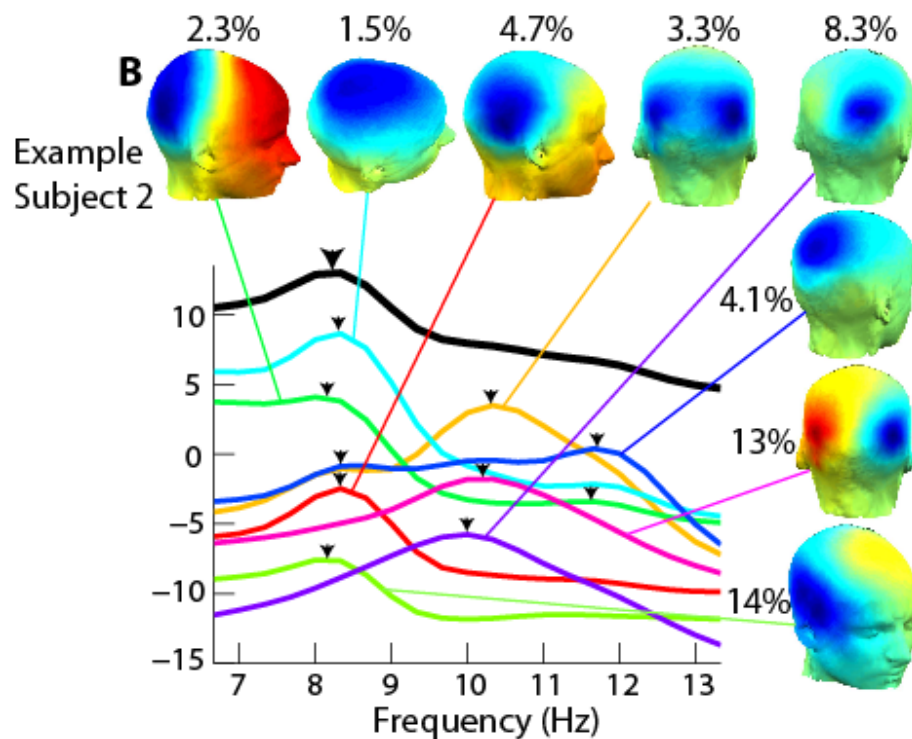
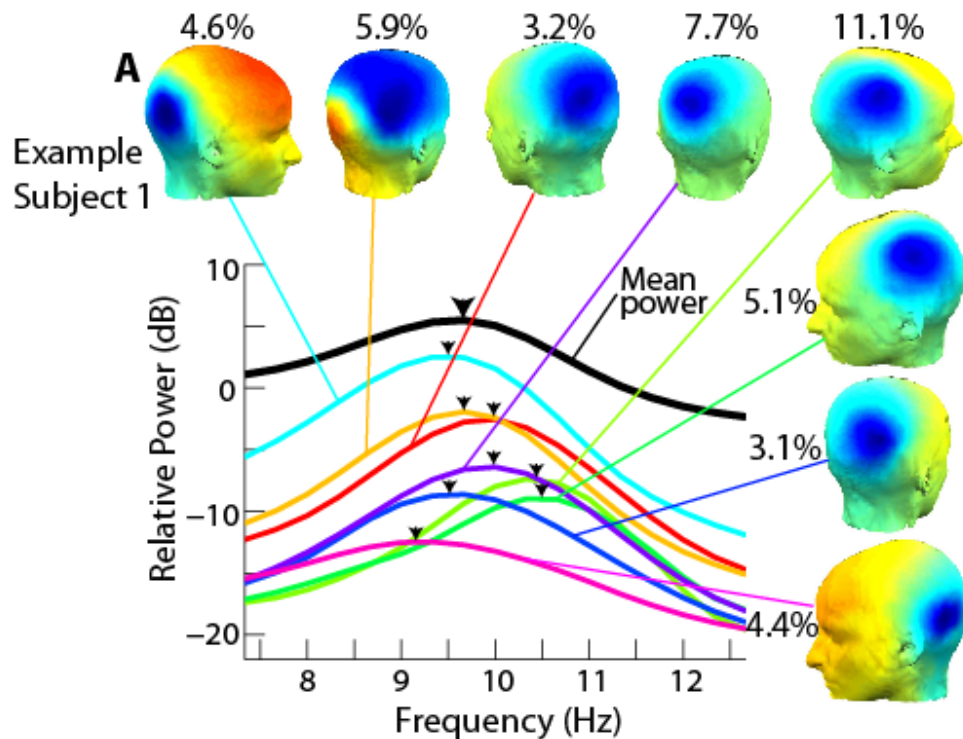
Eye blink correction



Eye blink correction



Independent power spectra and alpha peaks

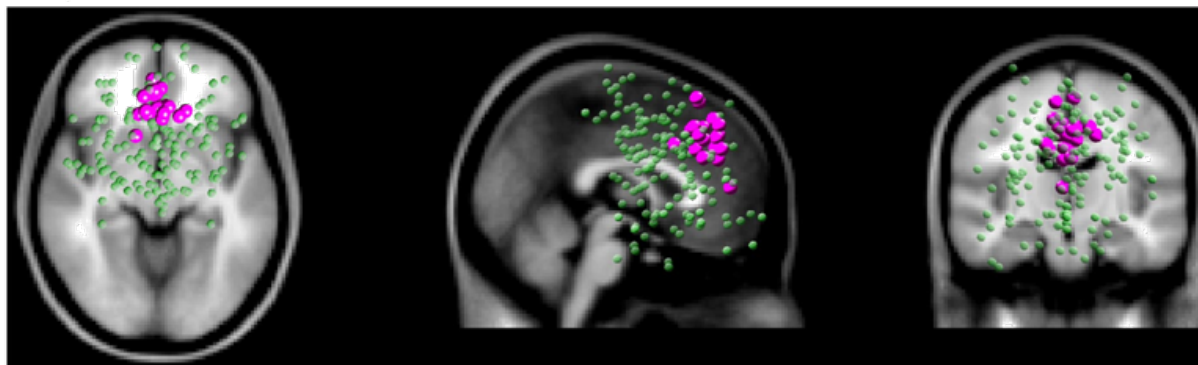


Frontal midline theta cluster



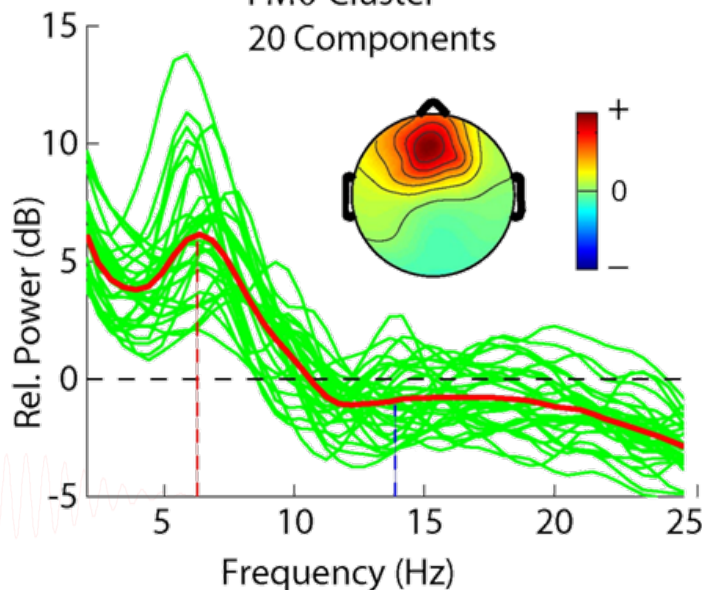
B

FM θ Cluster



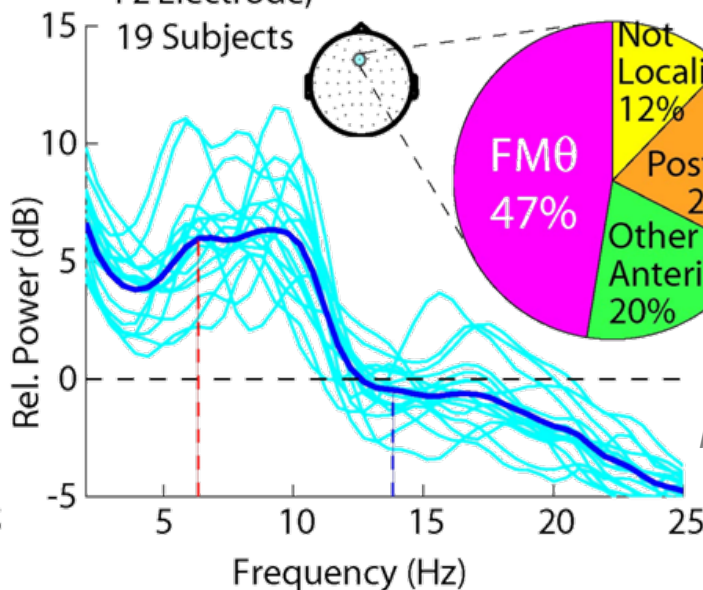
C

FM θ Cluster
20 Components



D

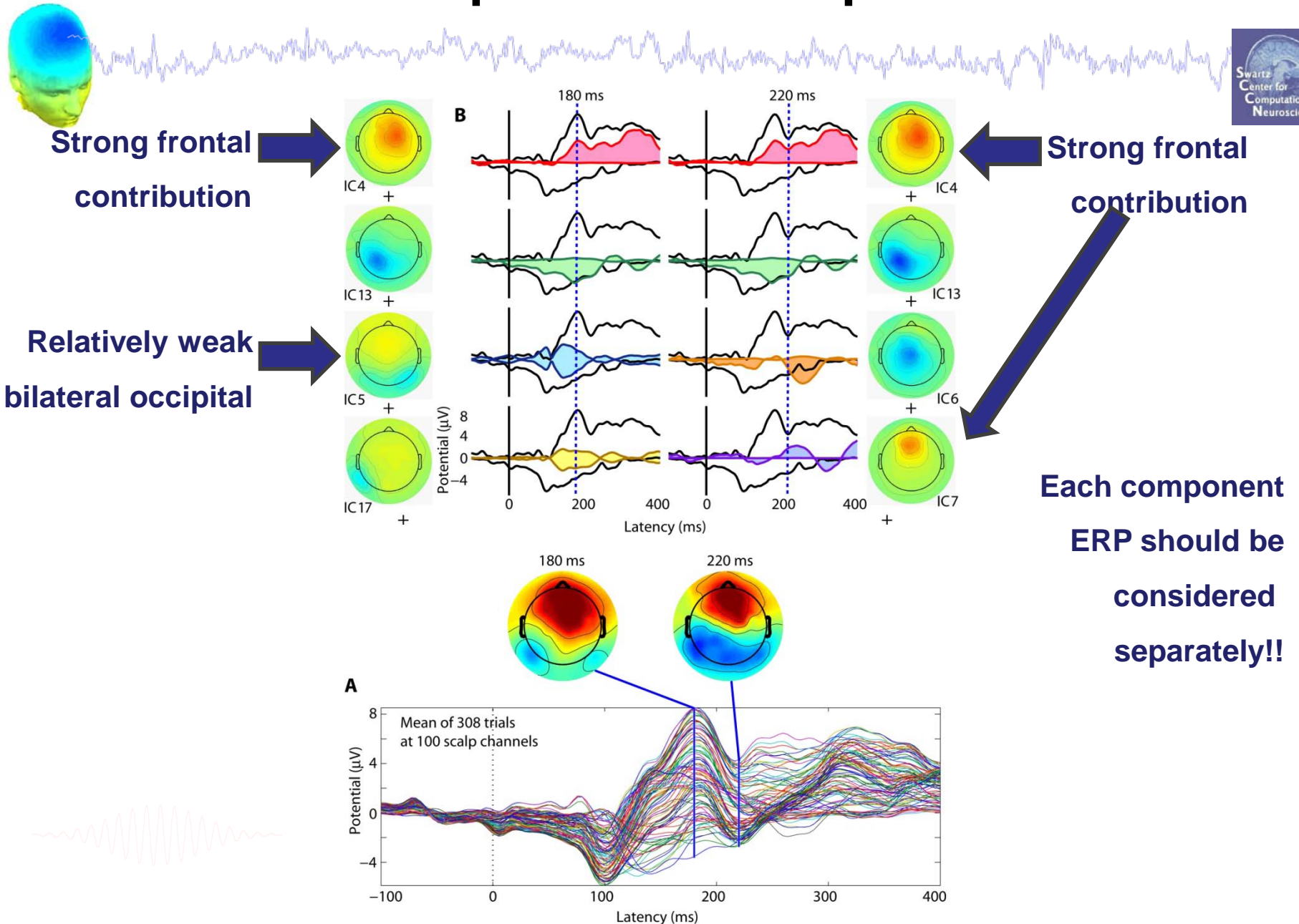
Fz Electrode,
19 Subjects



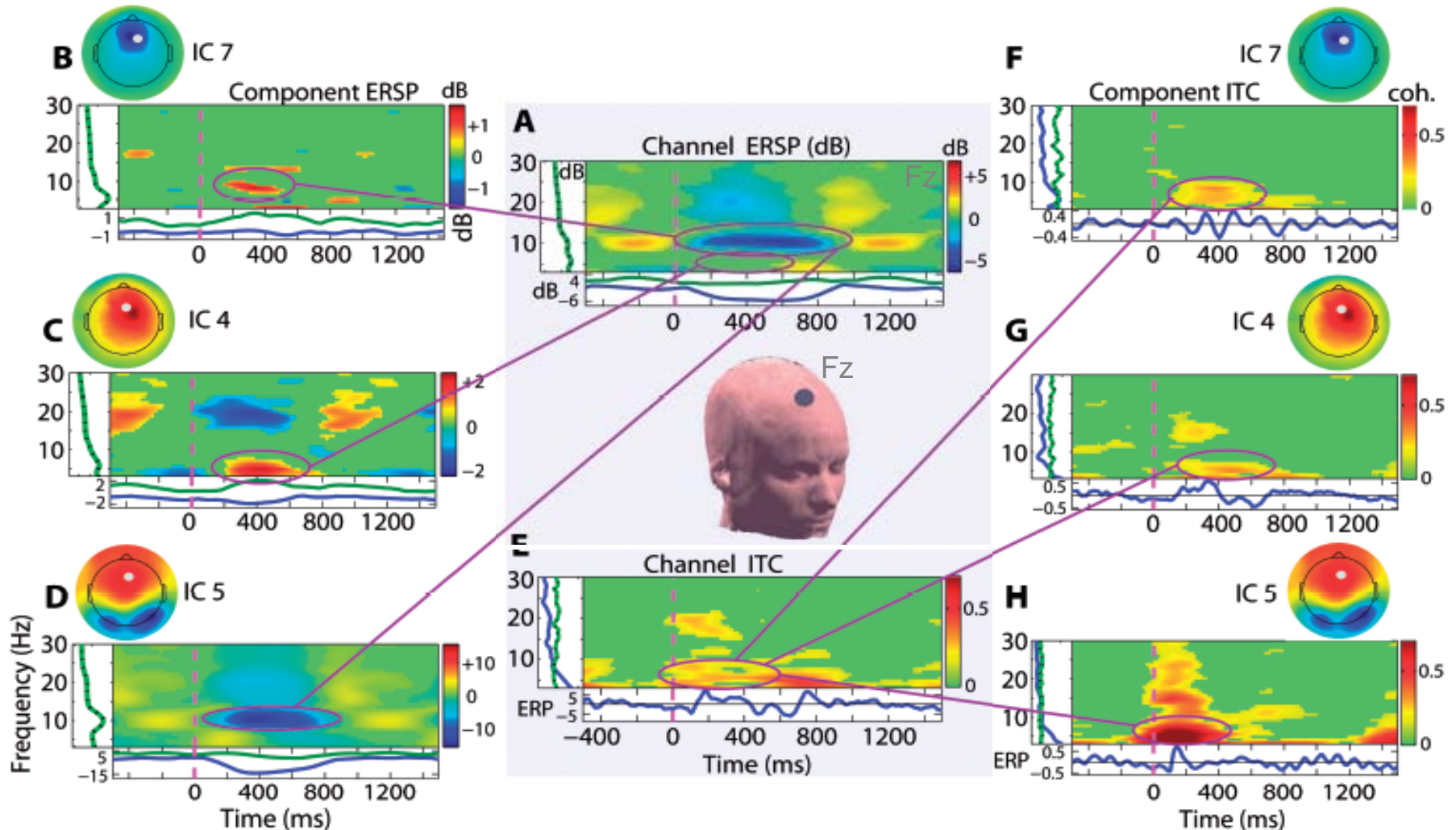
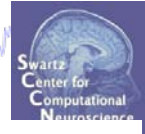
E

*Onton and Makeig,
NeuroImage. (2005)*

Component vs scalp ERP



Channel vs component ERSP



Onton and Makeig, *Prog. Brain Res.* (2006)

Outline



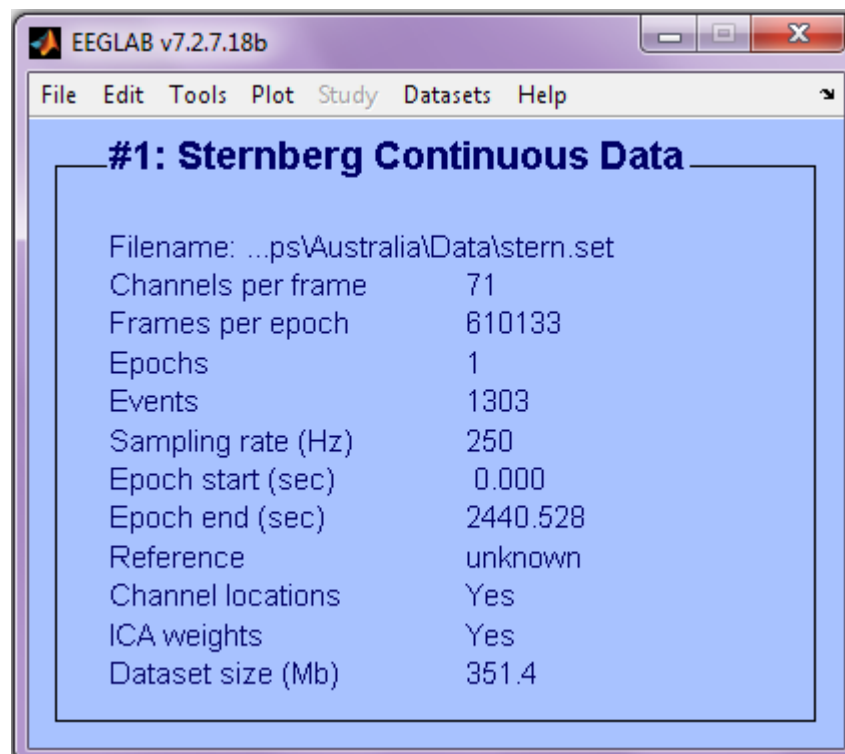
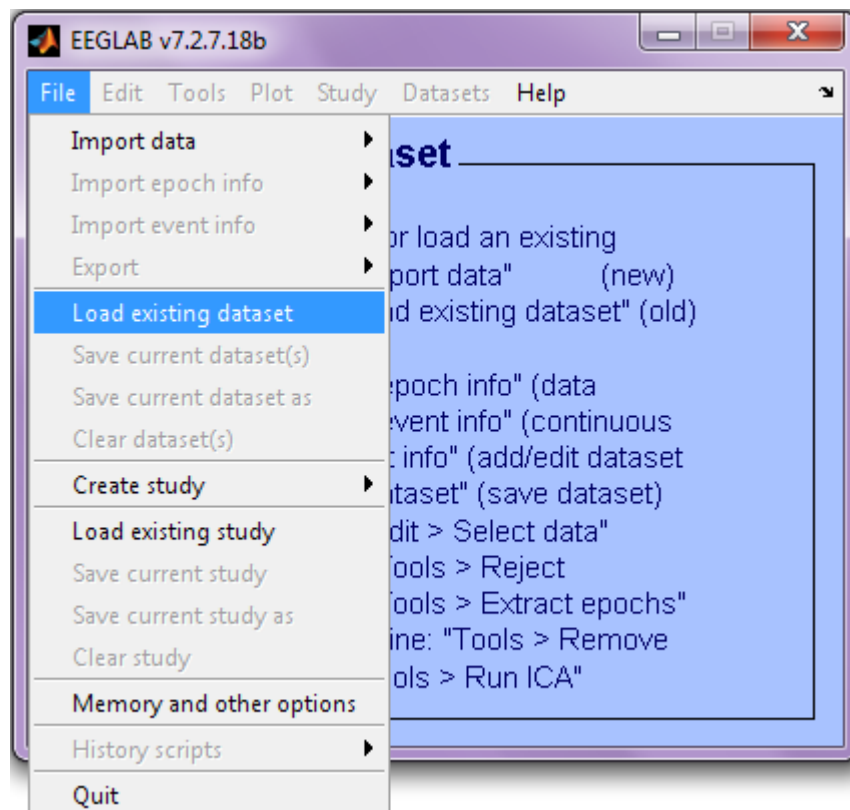
- ☒ **IC vs scalp data, what have we gained?**
- ☐ **Create a script from “eegh” output**
- ☐ **Create a Matlab function**
- ☐ **Demonstration and EEG structure**
- ☐ **Exercise**



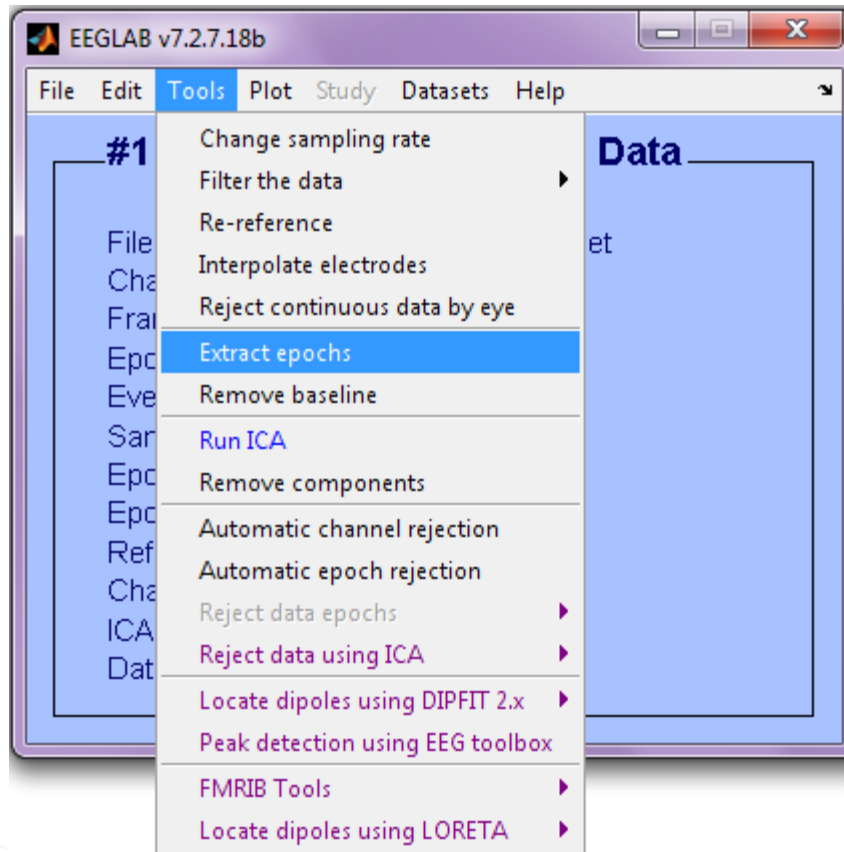
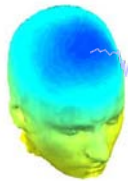
Create a script from 'eegh' output



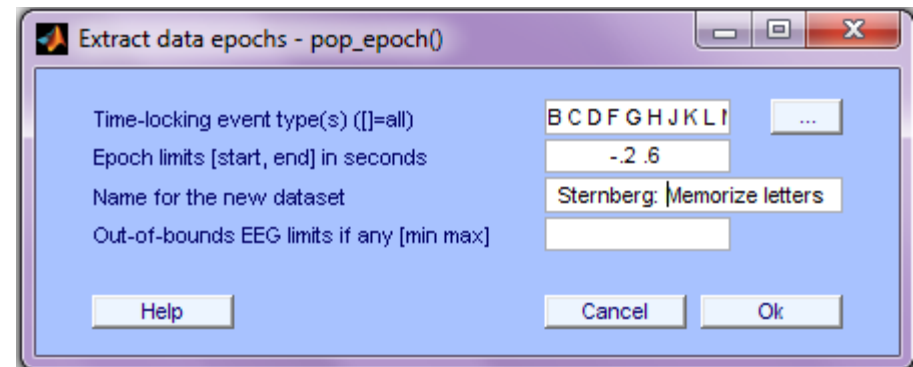
Perform a simple operation:
Start by loading a continuous dataset



Create a script from 'eegh' output



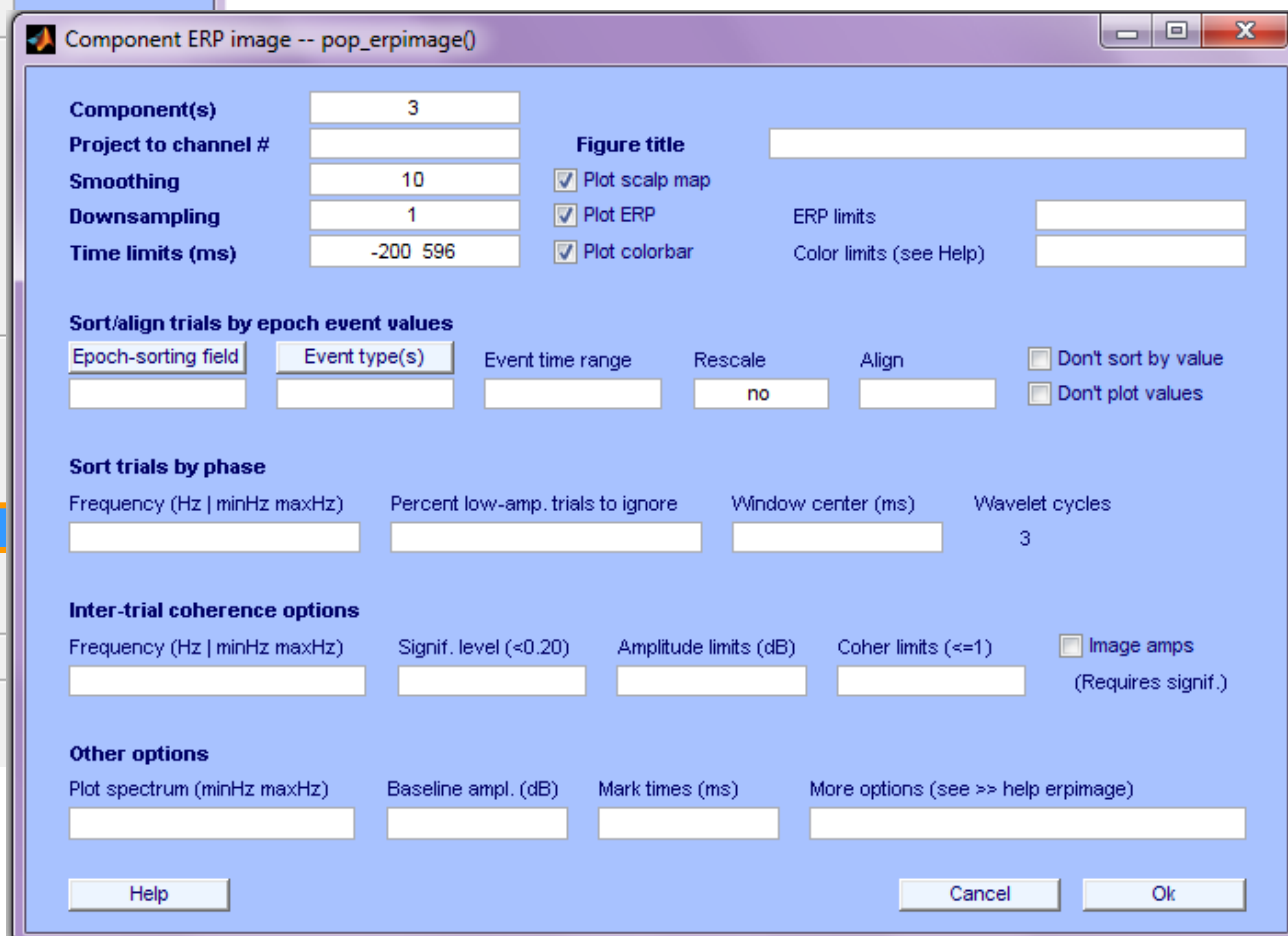
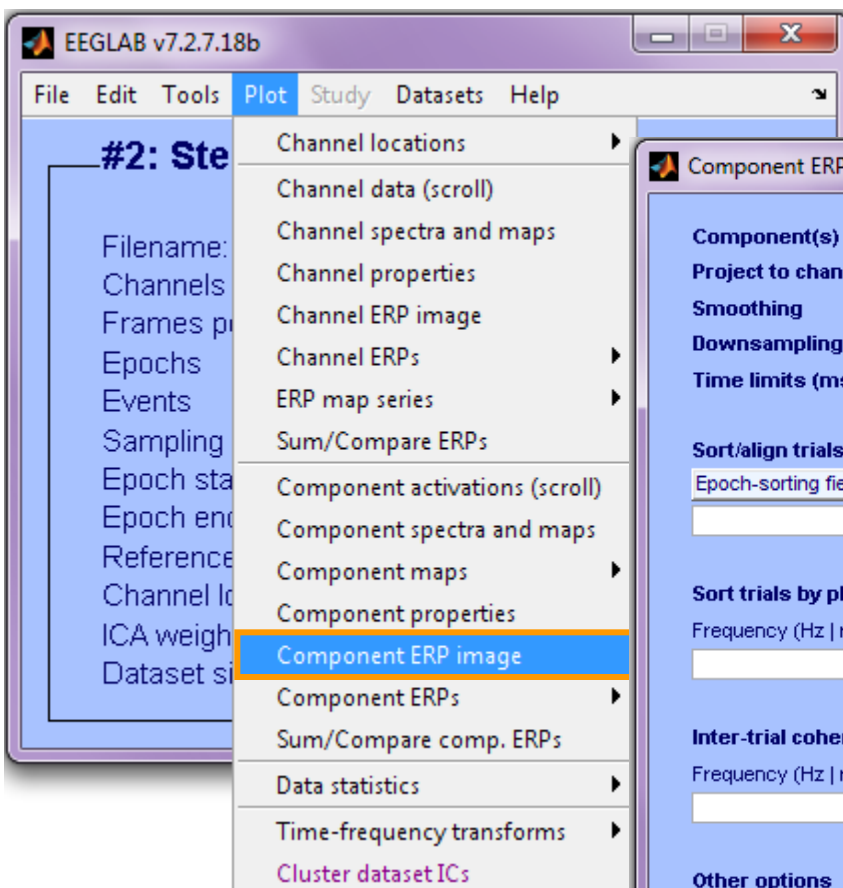
Epoch on Memorize letters



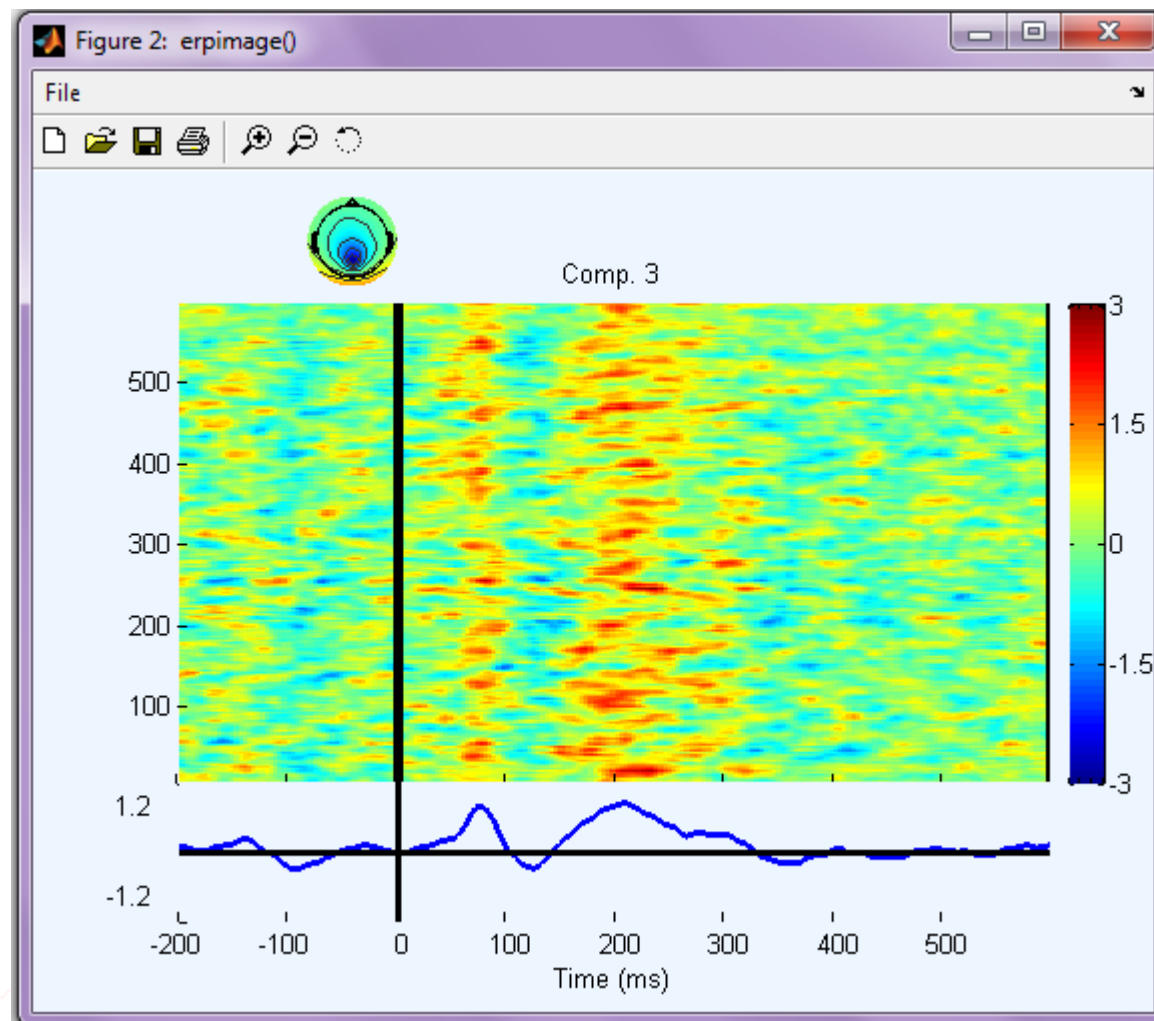
Create a script from 'eegh' output



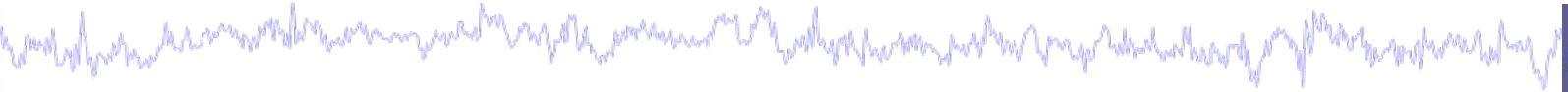
Plot an IC ERP image



Create a script from 'eegh' output

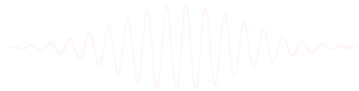


Retrieve commands from eegh



Write a script to do this:

```
>> eegh
```



Retrieve commands from eegh



```
>> eegh
```

```
[ALLEEG EEG CURRENTSET ALLCOM] = eeglab;
```

```
EEG = pop_loadset('filename', 'stern.set', 'filepath', ...  
    'C:\..\Data\');
```

```
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 0);
```

```
EEG = pop_epoch( EEG, {'B' 'C' 'D' ...}, [-0.2 0.6], ...  
    'newname', , 'Memorize epochs', 'epochinfo', 'yes');
```

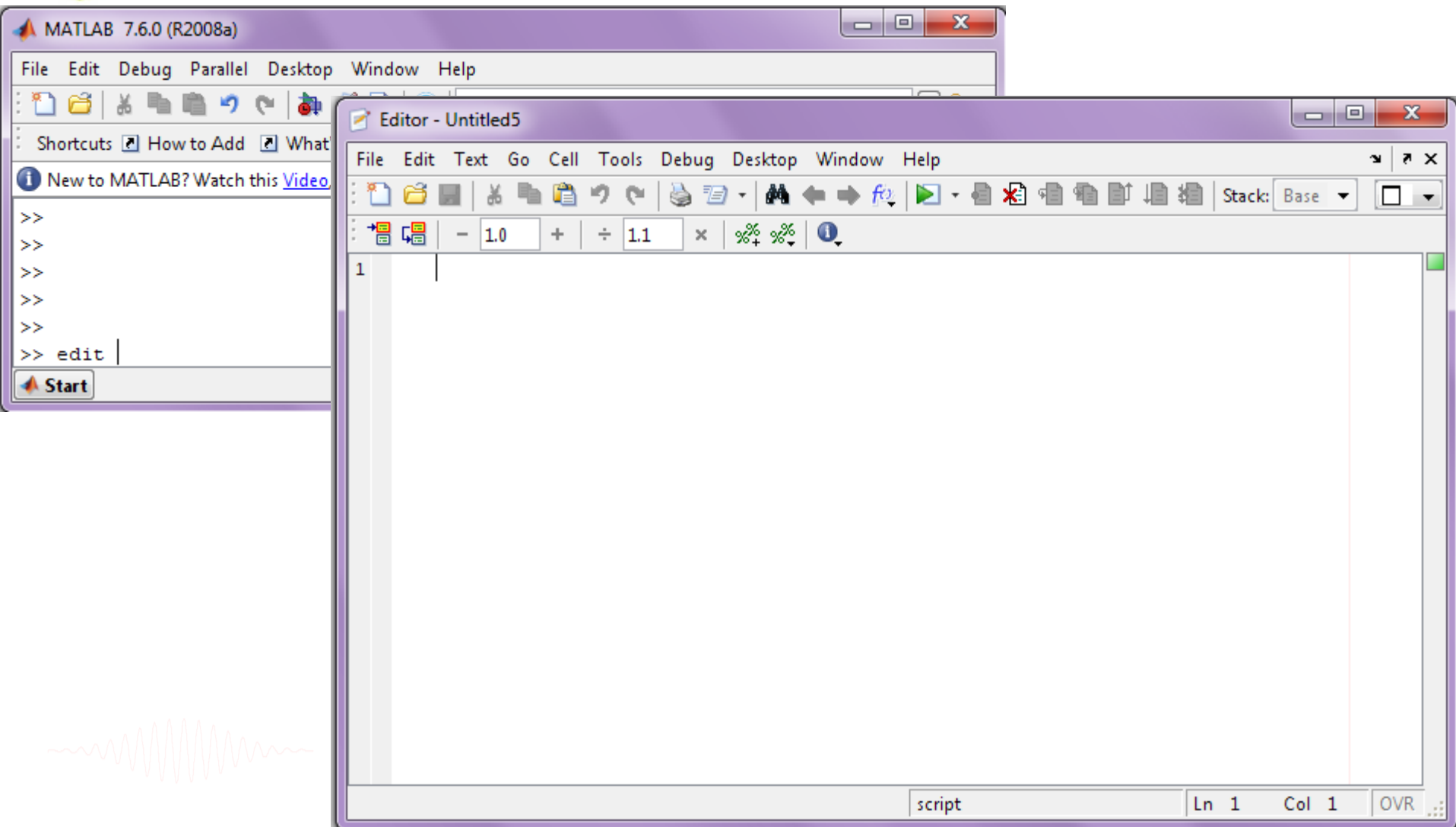
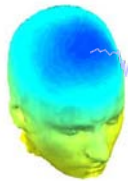
```
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 1);
```

```
EEG = pop_rmbase( EEG, [-200 0]);
```

```
[ALLEEG EEG] = eeg_store(ALLEEG, EEG, CURRENTSET);
```

```
figure; pop_erpimage(EEG,0, [3],[], , 'Comp. 3', 10, 1, {}, [], ...  
    '', 'yerplabel', '', 'erp', 'on', 'cbar', 'on', 'topo', ...  
    {mean(EEG.icawinv(:, [3]), 2) EEG.chanlocs EEG.chaninfo }));
```

Create a Matlab script



Create a Matlab script

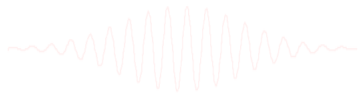
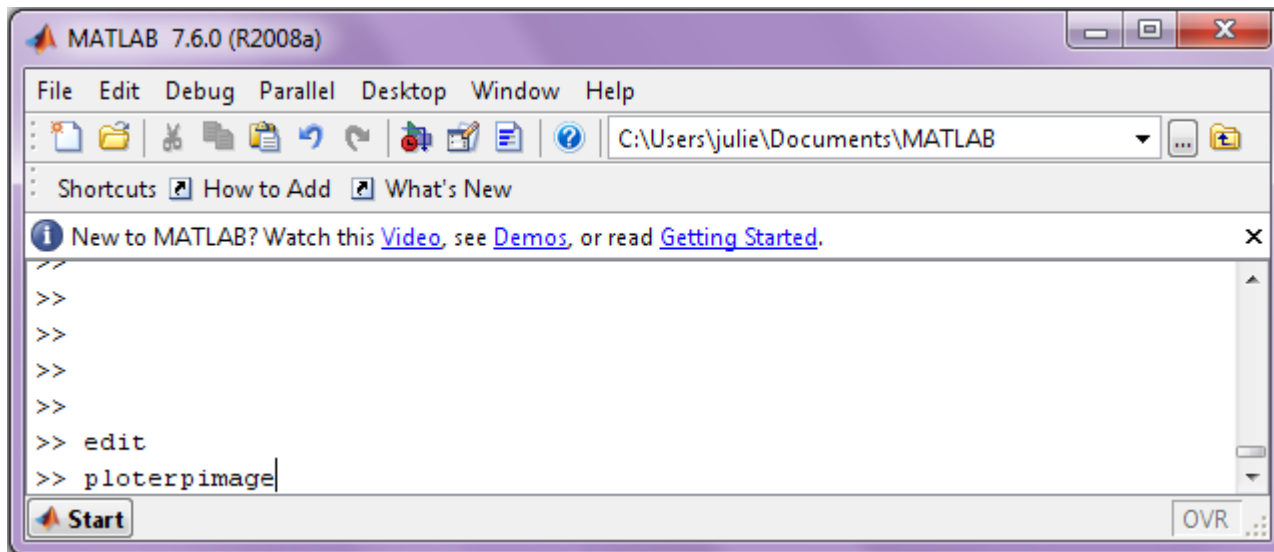


Copy and paste from Matlab window:

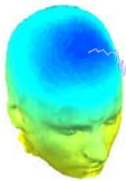
```
1 [ALLEEG EEG CURRENTSET ALLCOM] = eeglab;  
2 EEG = pop_loadset( 'filename', 'stern.set', 'filepath', 'C:\\Users\\julie\\Docum  
3 [ALLEEG, EEG, CURRENTSET] = eeg_store( ALLEEG, EEG, 0 );  
4 EEG = pop_epoch( EEG, { 'B' 'C' 'D' 'F' 'G' 'H' 'J' 'K' 'L' 'M' 'N'  
5 [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 1, 'gui', 'off');  
6 EEG = pop_rmbase( EEG, [-200 0]);  
7 [ALLEEG EEG] = eeg_store(ALLEEG, EEG, CURRENTSET);  
8 figure; pop_erpimage(EEG,0, [3],[], 'Comp. 3',10,1,{},[], ' ' , 'verplabel', ' ' , 'er
```

Save as 'ploterpimage.m'
In MATLAB folder

Run your new script



Matlab basics -- Briefly



Variable = word with an assigned value (type 'whos')

Examples:

% vector of numbers:

```
mynumbers = [1, 2, 3, 5:10];
```

(Square brackets: concatenate anything within)

% access vector elements:

```
>> mynumbers(2)
```

```
ans =
```

```
2
```

% cell array of strings:

```
mylabels = {'stimulus','response'};
```

% access cell array elements:

```
>> mylabels{2}
```

```
ans =
```

```
response
```

Parameterize a script



```
>> eegh
[ALLEEG EEG CURRENTSET ALLCOM] = eeglab;

EEG = pop_loadset('filename', 'stern.set', 'filepath', ...
    '\...\EEGLAB_Workshop\Data\');
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 0);

EEG = pop_epoch( EEG, {'B' 'C' 'D' ...}, [-0.2 0.6], ...
    'newname', 'Memorize epochs', 'epochinfo', 'yes');
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 1);
EEG = pop_rmbase( EEG, [-200 0]);
[ALLEEG EEG] = eeg_store(ALLEEG, EEG, CURRENTSET);

figure; pop_erpimage(EEG,0, [3],[], 'Comp. 3', 10, 1, {}, [], ...
    '', 'yerplabel', '', 'erp', 'on', 'cbar', 'on', 'topo', ...
    {mean(EEG.icawinv(:, [3]), 2) EEG.chanlocs EEG.chaninfo }));
```

Parameterize a script

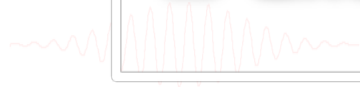


```
% Variables-----  
dataset = 'stern.set';  
datpath = 'C:\MATLAB\...\EEGLAB_Workshop\Data\';  
epochletts = {'B' 'C' 'D' ...};  
datsetname = 'Memorize epochs';  
comp = [3];  
[ALLEEG EEG CURRENTSET ALLCOM] = eeglab;  
EEG = pop_loadset('filename', dataset, 'filepath', datpath);  
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 0);  
EEG = pop_epoch( EEG, epochletts , [-0.2 0.6],...  
'newname', datsetname, 'epochinfo', 'yes');  
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 1);  
EEG = pop_rmbase( EEG, [-200 0]);  
[ALLEEG EEG] = eeg_store(ALLEEG, EEG, CURRENTSET);  
figure; pop_erpimage(EEG,0, [comp],[],['Comp.',int2str(comp)],...  
10,1,{},[],'', 'yerplabel', '', 'erp', 'on', 'cbar', 'on', 'topo',...  
{mean(EEG.icawinv(:,[comp ]),2),EEG.chanlocs EEG.chaninfo});
```

Outline



- ☒ IC vs scalp data, what have we gained?
- ☒ Create a script from “eegh” output
- ☐ Create a Matlab function
- ☐ Demonstration and EEG structure
- ☐ Exercise



Write a Matlab function



Matlab functions (as opposed to ‘scripts’):

1. Take arguments
2. Can return variables
3. Do not draw variables from the global workspace
 1. Need all variables called internally or passed as arguments

Advantages of using functions:

1. Can be used for any dataset by simply changing input variables
2. One line of code can equal pages of hidden code (very tidy)

Example function



```
1 function ploterpfunc(dataset,datapath,epochletts,datsetname,comp);
2
3
4 [ALLEEG EEG CURRENTSET ALLCOM] = eeglab;
5 EEG = pop_loadset('filename', dataset,'filepath',datapath);
6 [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 0);
7 EEG = pop_epoch( EEG, epochletts , [-0.2 0.6],...
8 'newname', datsetname, 'epochinfo', 'yes');
9 [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG, EEG, 1);
10 EEG = pop_rmbase( EEG, [-200 0]);
11 [ALLEEG EEG] = eeg_store(ALLEEG, EEG, CURRENTSET);
12 figure; pop_erpimage(EEG,0, [comp],[],['Comp.',int2str(comp)],...
13 10,1,{},[],[], 'erplabel', 'erpl', 'on', 'cbar', 'on',...
14 'topo',{mean(EEG.icawinv(:,[comp]),2),EEG.chanlocs EEG.chaninfo});
15
16
```

Save as 'ploterpfunc.m'
In MATLAB folder

Example function



% Variables-----

dataset = 'stern.set';

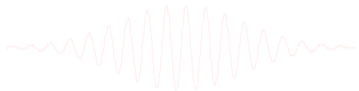
datapath = '...\EEGLAB_Workshop\Data\';

epochletts = {'B' 'C' 'D' ...};

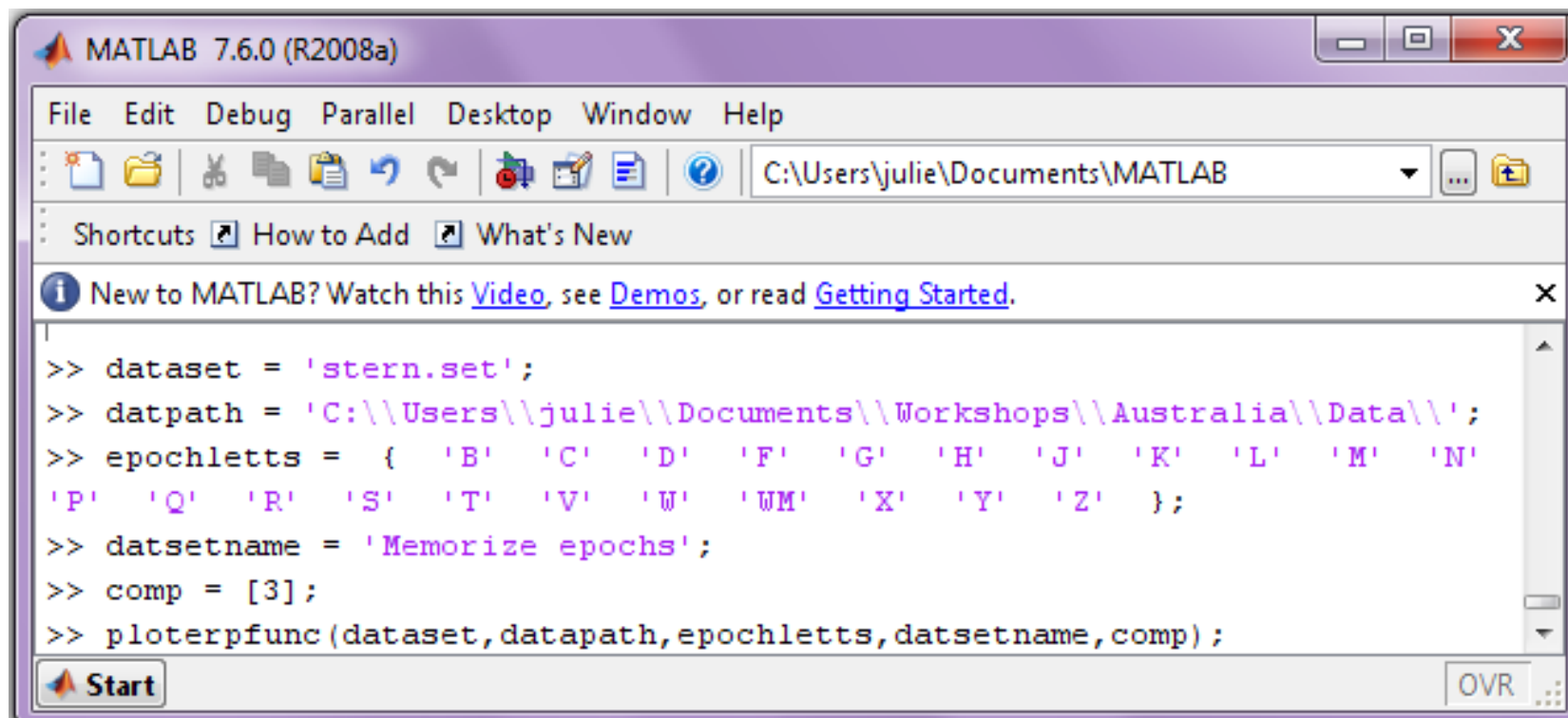
datsetname = 'Memorize epochs';

comp = [3];

ploterfunc(dataset, datapath, epochletts, datsetname, comp);



Run your function in Matlab



The image shows a screenshot of the MATLAB 7.6.0 (R2008a) software interface. The window title is "MATLAB 7.6.0 (R2008a)". The menu bar includes "File", "Edit", "Debug", "Parallel", "Desktop", "Window", and "Help". The toolbar contains various icons for file operations and debugging. The current directory is "C:\Users\julie\Documents\MATLAB". A message box says "New to MATLAB? Watch this [Video](#), see [Demos](#), or read [Getting Started](#)." The command window shows the following script:

```
>> dataset = 'stern.set';  
>> datpath = 'C:\\Users\\julie\\Documents\\Workshops\\Australia\\Data\\';  
>> epochletts = { 'B' 'C' 'D' 'F' 'G' 'H' 'J' 'K' 'L' 'M' 'N'  
                  'P' 'Q' 'R' 'S' 'T' 'V' 'W' 'WM' 'X' 'Y' 'Z' };  
>> datsetname = 'Memorize epochs';  
>> comp = [3];  
>> ploterpfunc(dataset, datpath, epochletts, datsetname, comp);
```

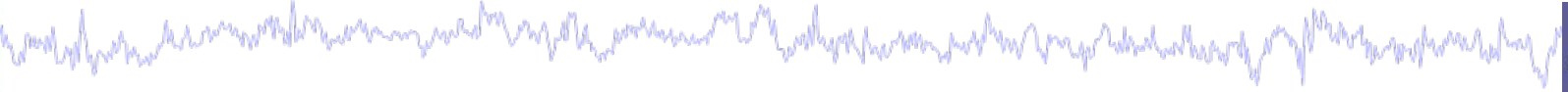
At the bottom left is a "Start" button, and at the bottom right is an "OVR" button.

Outline

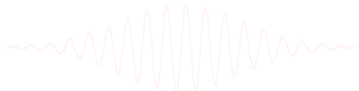


- ☒ IC vs scalp data, what have we gained?
- ☒ Create a script from “eegh” output
- ☒ Create a Matlab function
- ☐ **Demonstration and EEG structure**
- ☐ **Exercise**

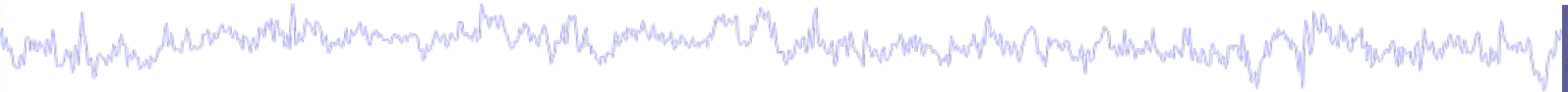
Demonstration: script across multiple conditions



- Open stern.set
 - ✓ Examine EEG structure
- Epoch on memorize letters (dataset 2)
- Epoch on ignore letters (overwrite dataset 1)
 - ✓ Examine EEG and ALLEEG structure
- Plot -> Sum/compare IC ERPs



Exercise



Script it yourself!

Try a similar exercise outlined in:

...\Scripts\Tutorial_4_BasicScripting.m

