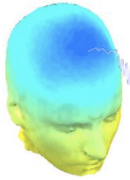
Data importing and channel analysis



Task 1

Import raw data

Re-reference data

Scroll channel data

Task 2

Import channel location file

Task 3

Import data events

Task 4

Extract data epochs

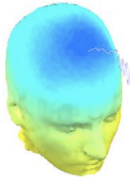
Select epochs/events

Task 5

Channel analysis

Exercise...

Data importing and channel analysis



Task 1

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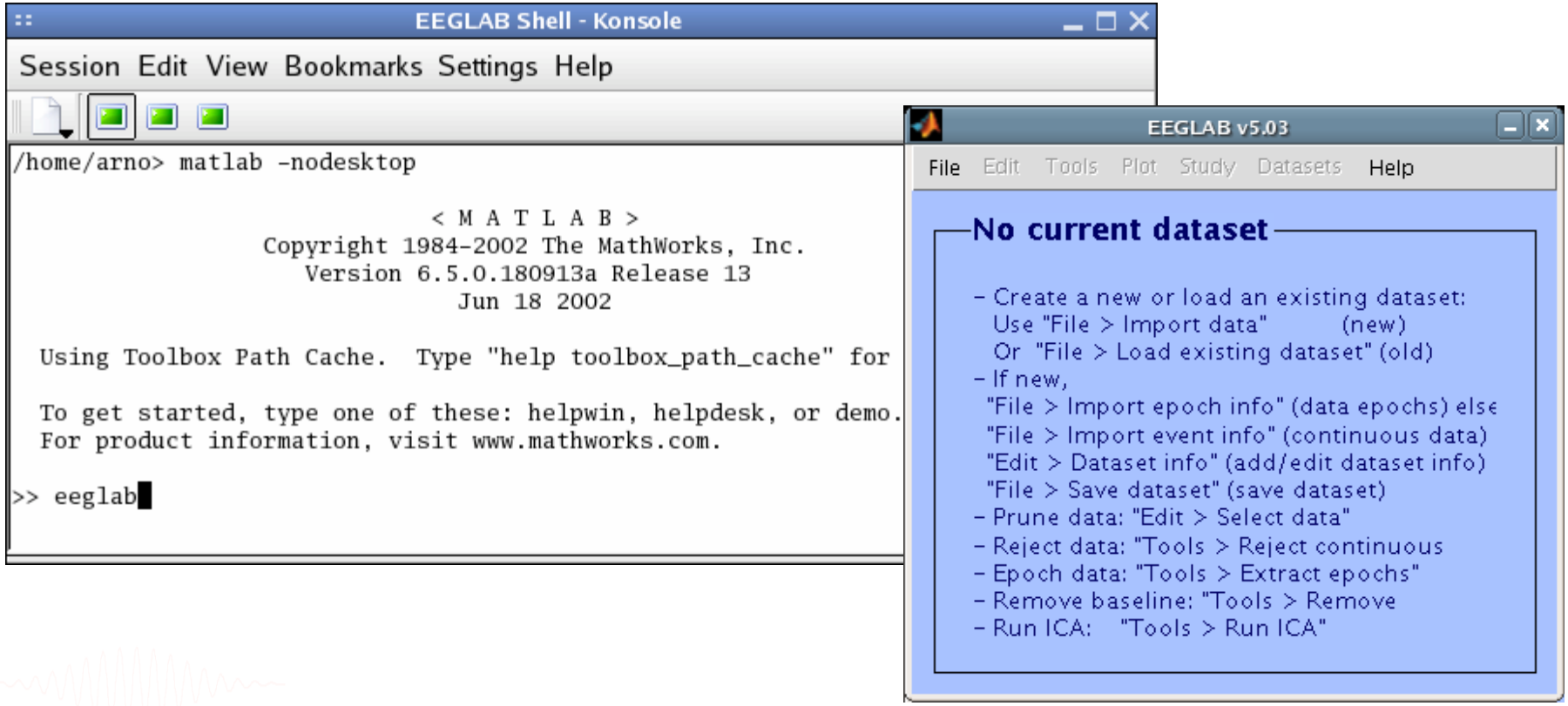
Channel analysis

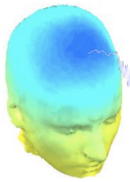
Exercise...

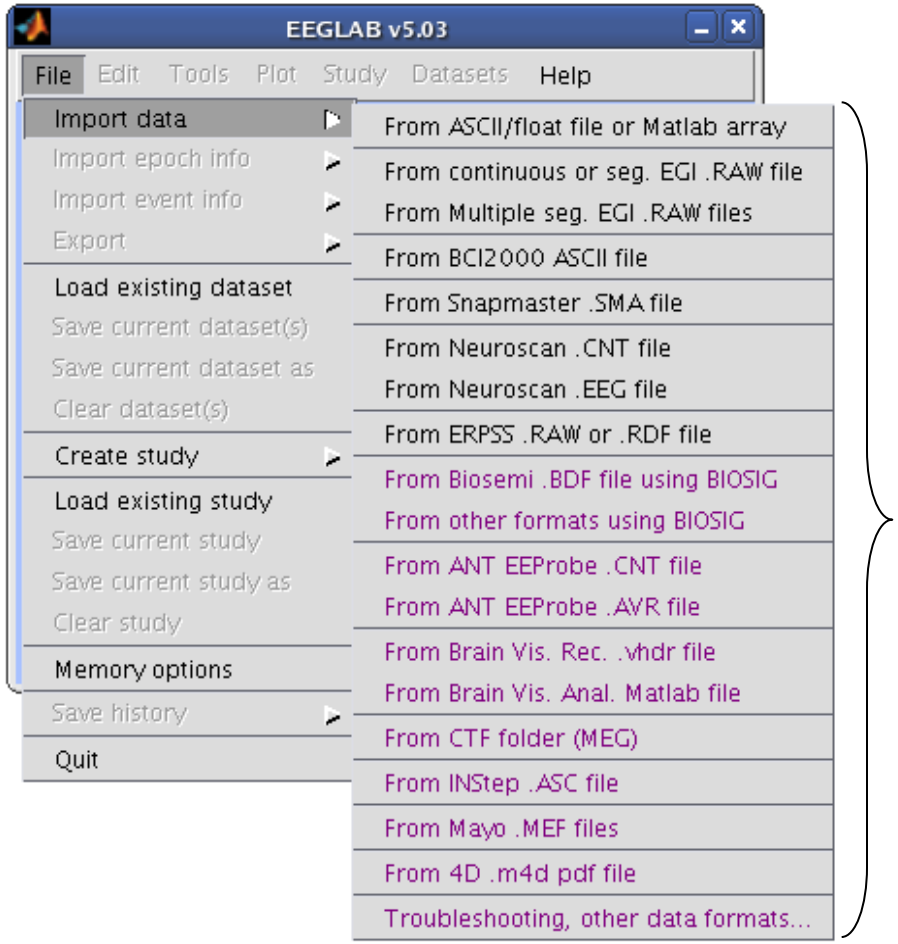
The EEGLAB Matlab software

main graphic interface



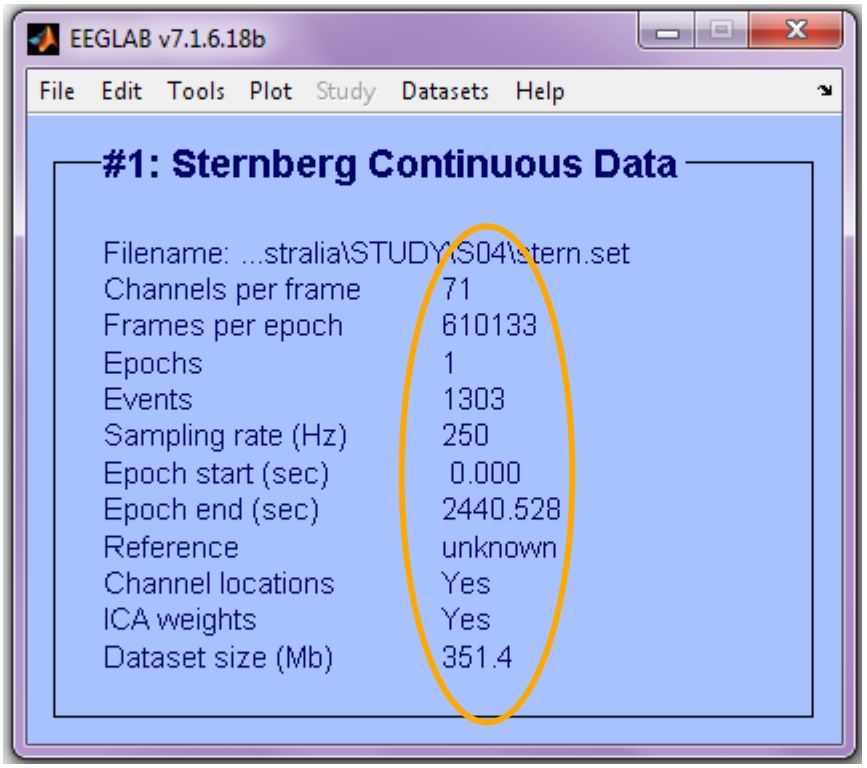
Importing a dataset





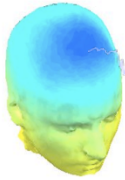
EEGLAB supports many different raw data formats

Imported EEG data



EEGLAB GUI displays dataset basics

The example data: Sternberg working memory



File

../Data/stern.set

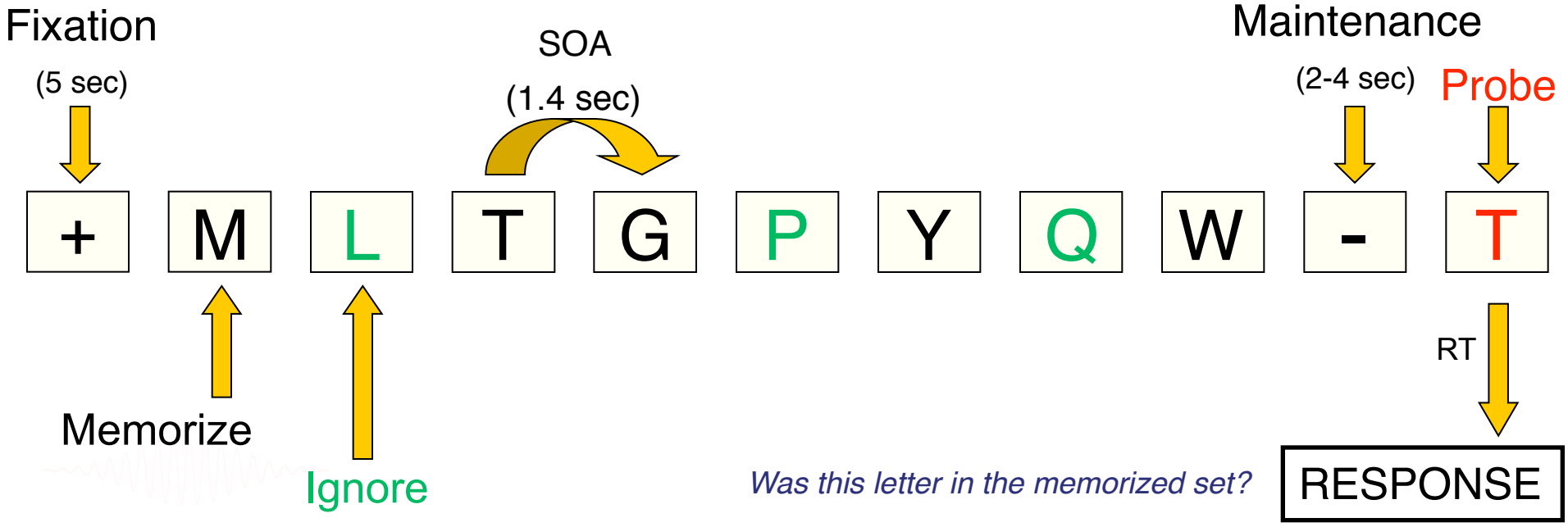
Data

Continuous data (not epoched), ref'd to right mastoid

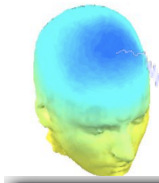
Task

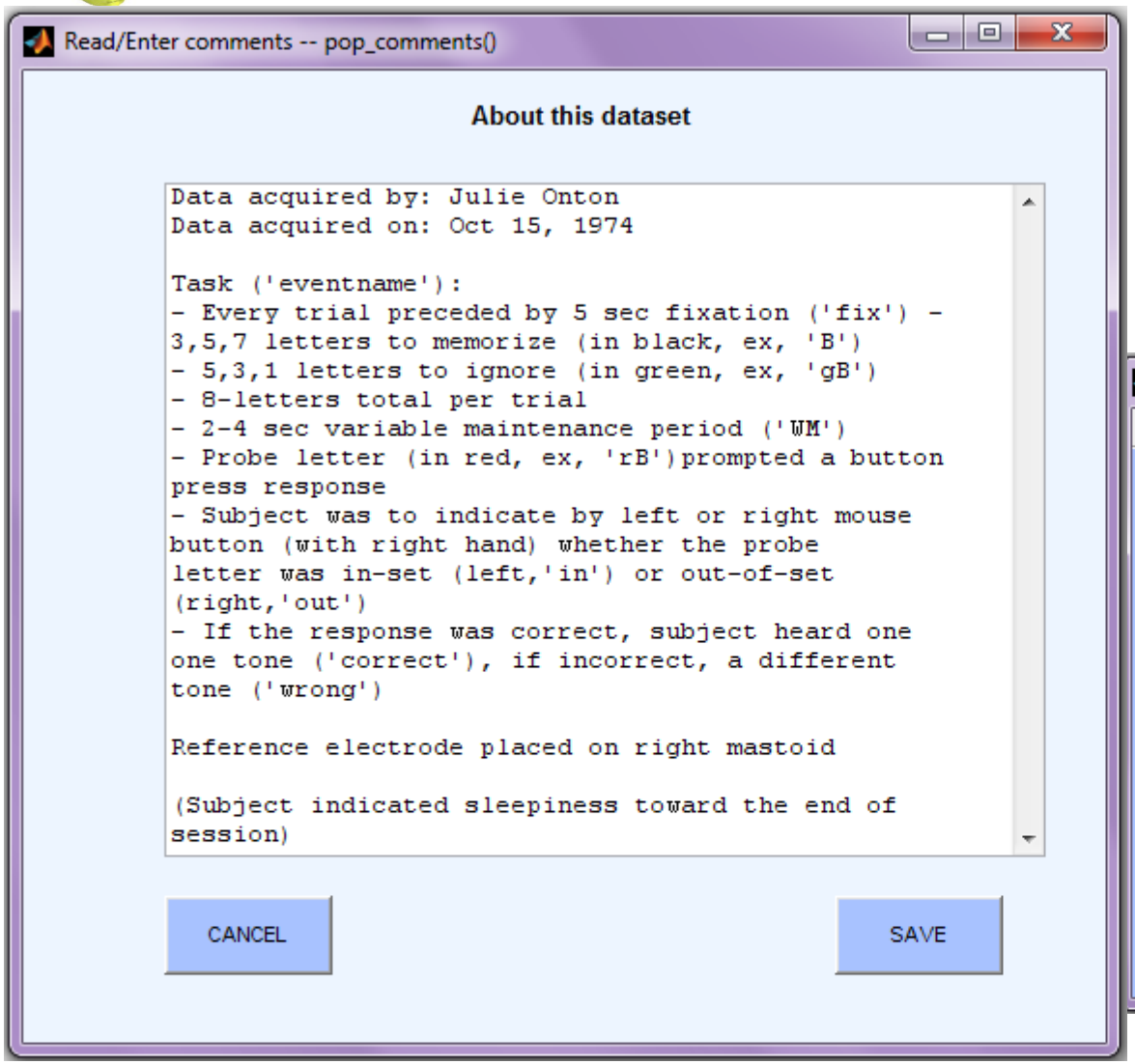
3-7 letters to memorize, among 1-5 letters to ignore

50% chance of probe letter being 'in-set'

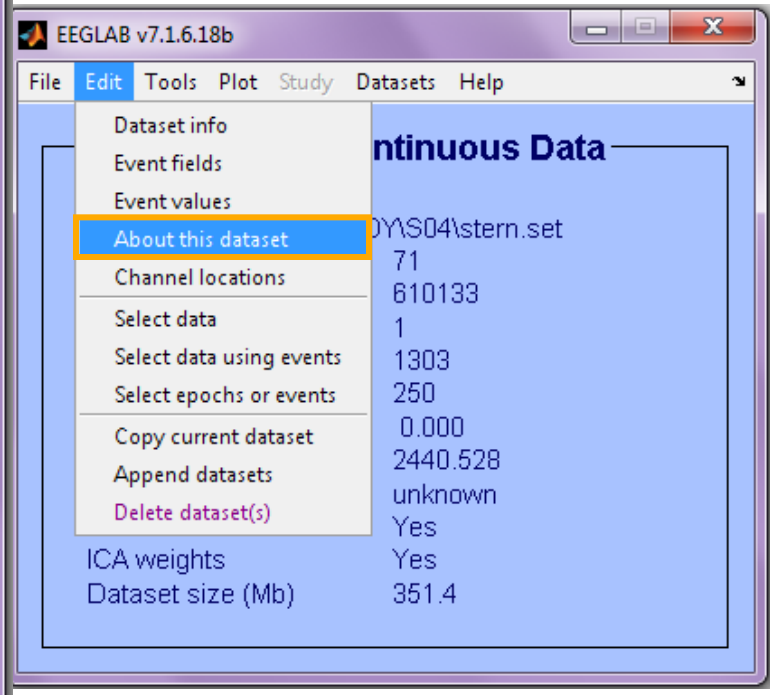


Comments in EEGLAB structure

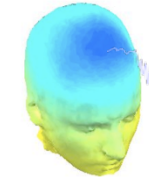


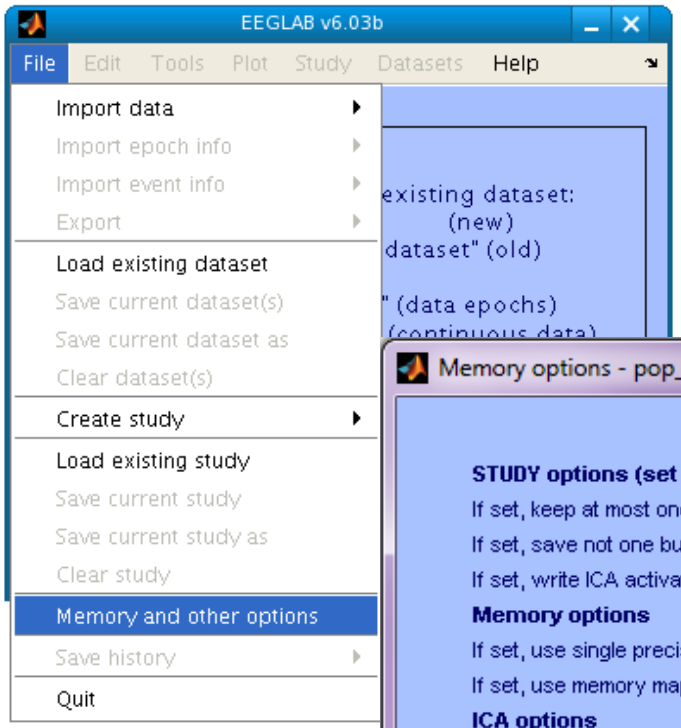



```
>> EEG.comments
```

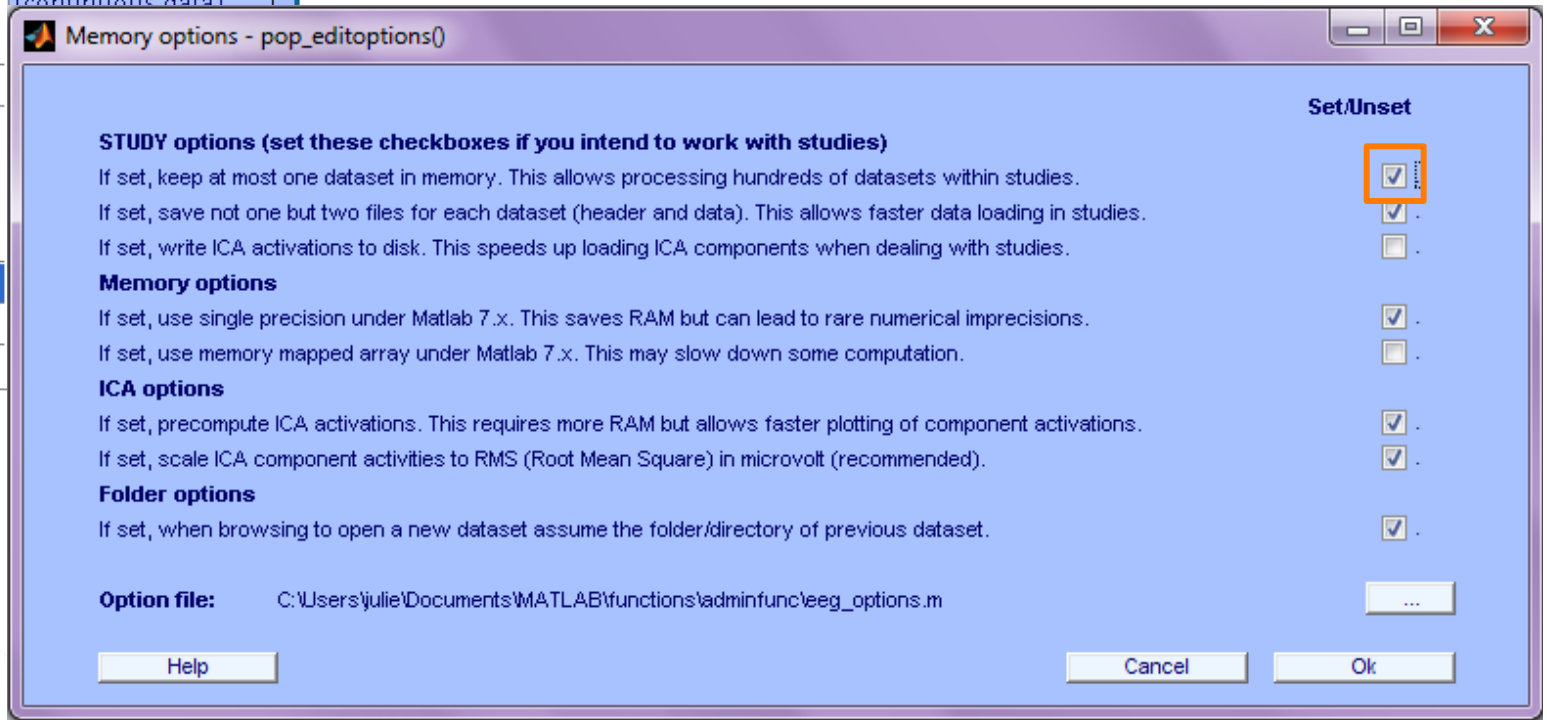


Memory options

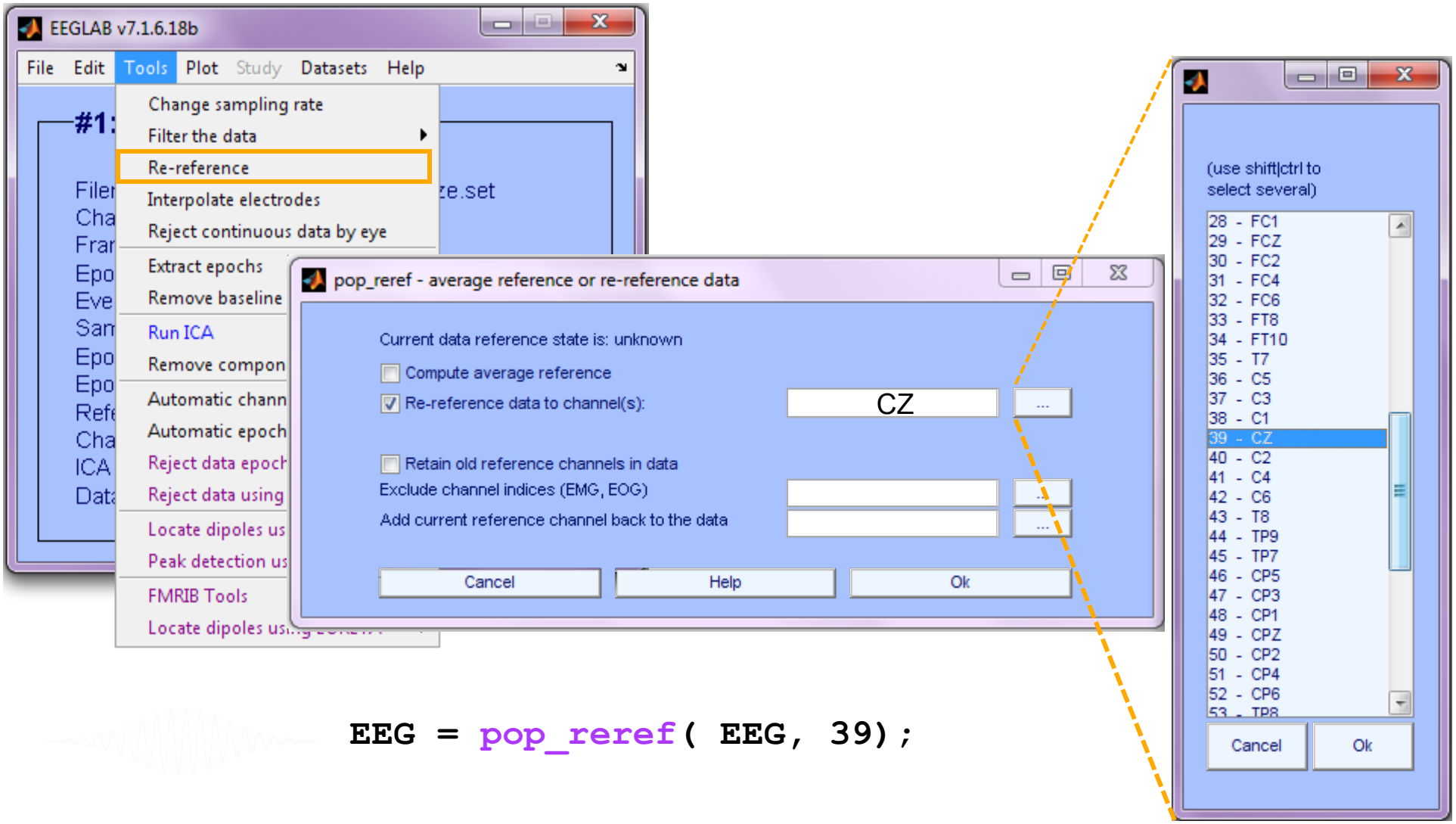




Set when loading a STUDY

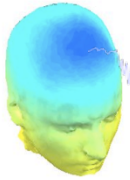


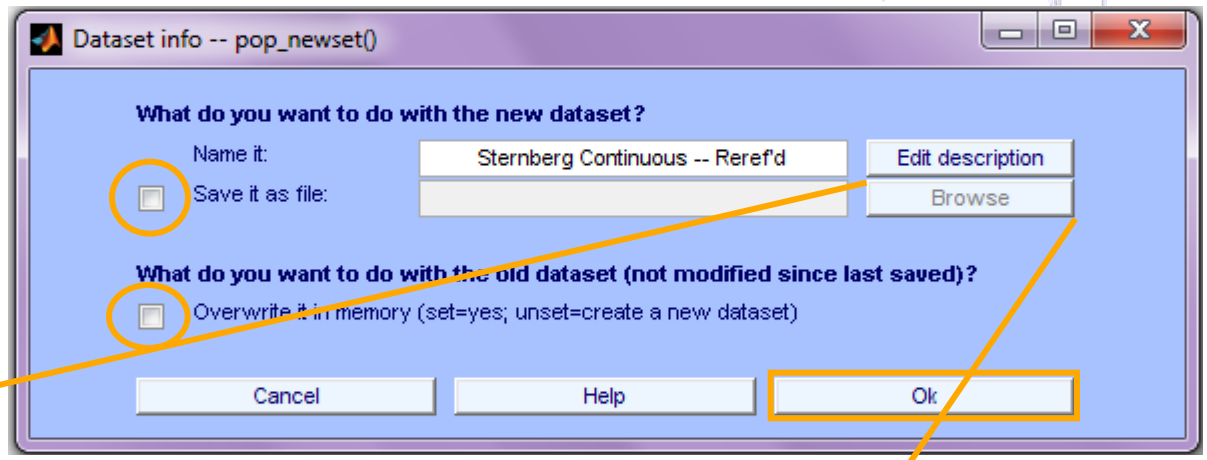
Re-reference data (if necessary/desired)

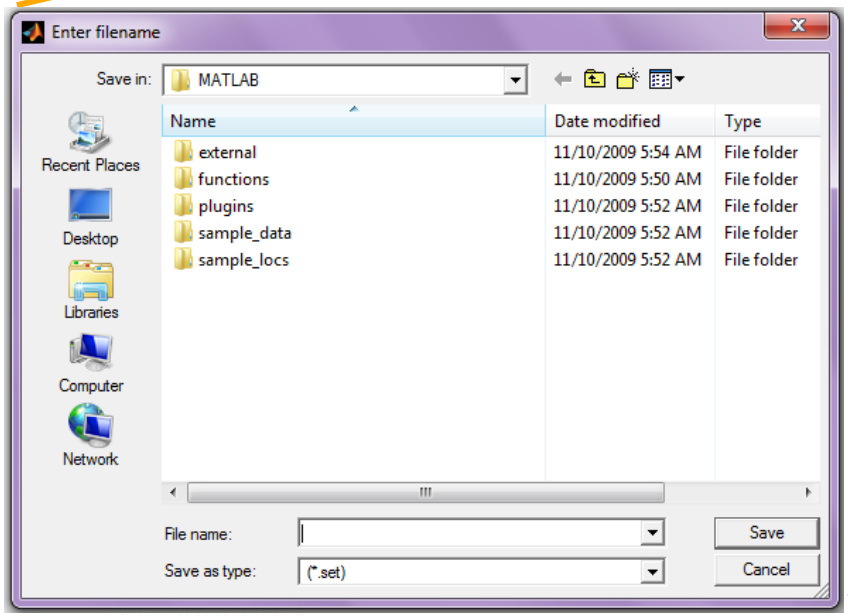


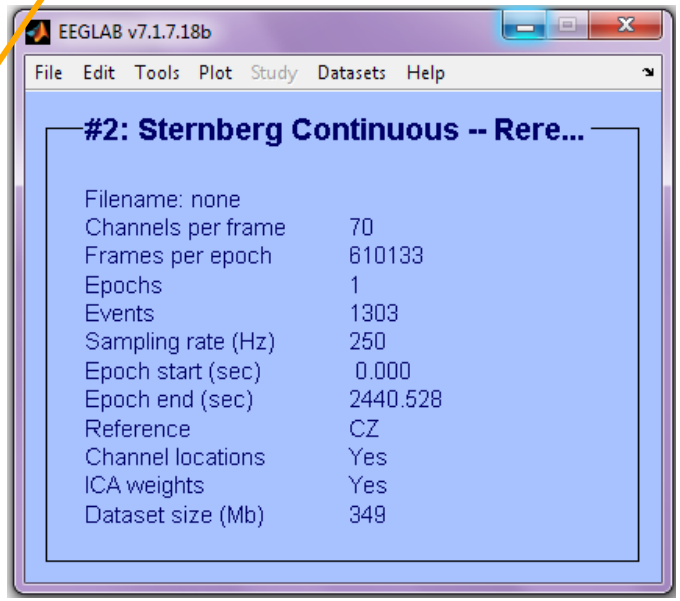

```
EEG = pop_reref( EEG, 39);
```

Save new dataset, keep old one



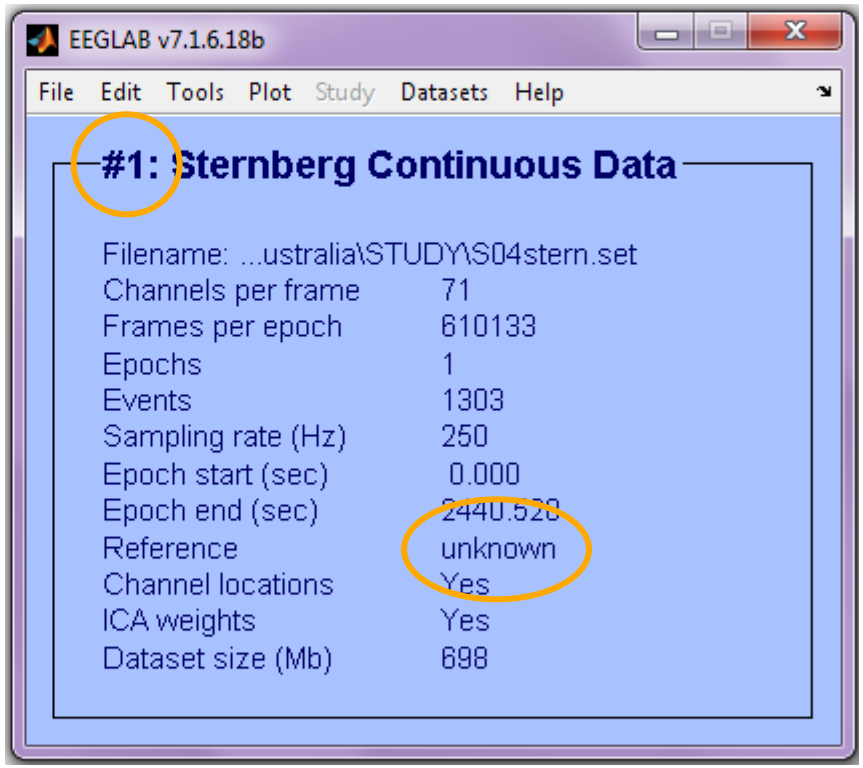


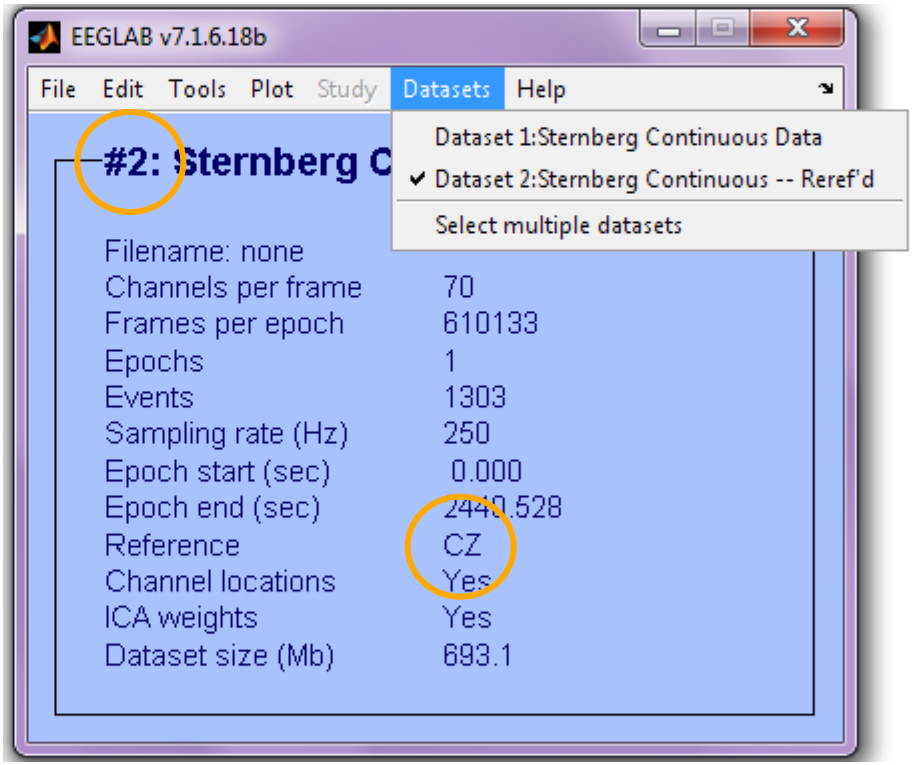




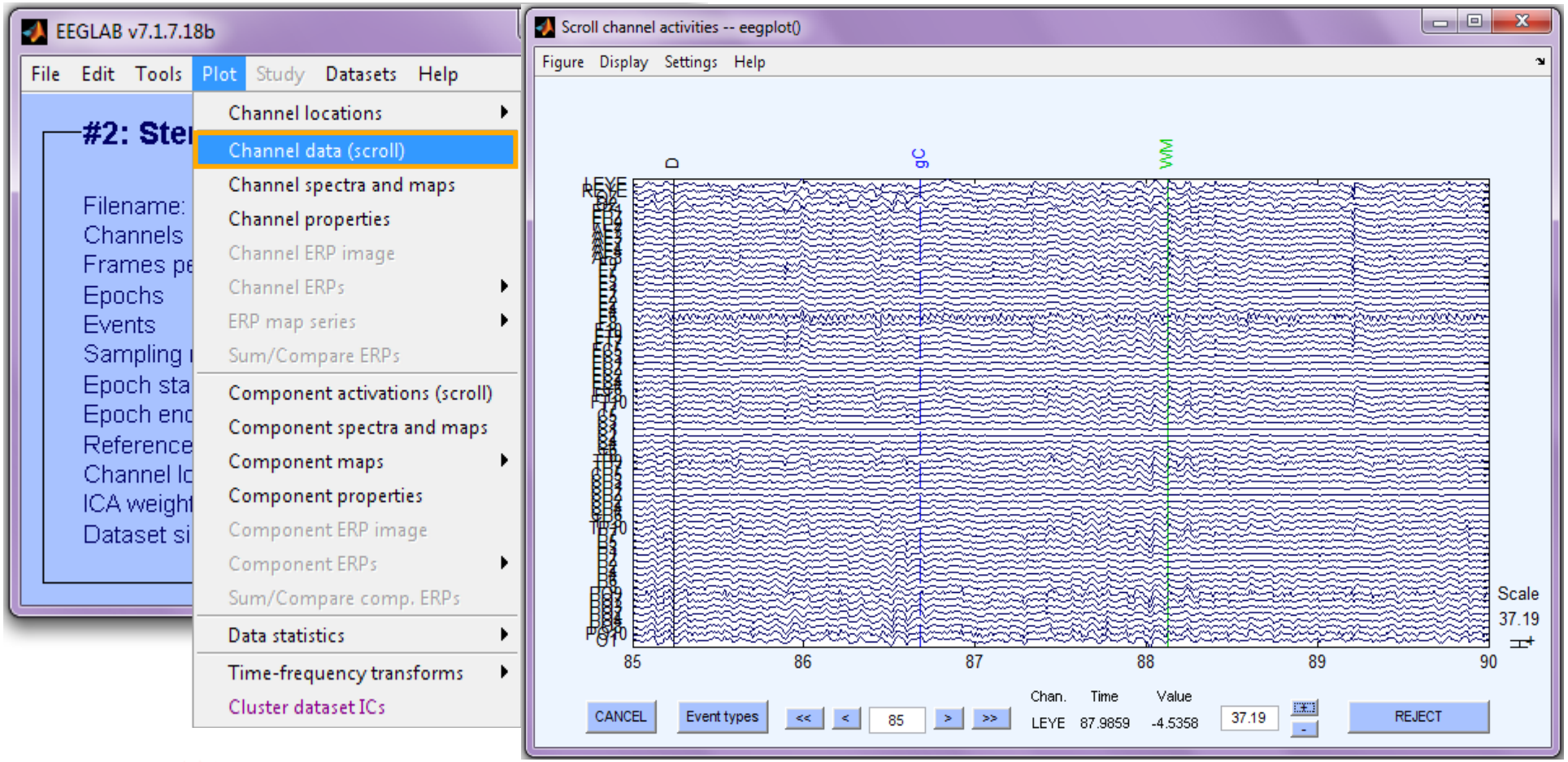

```
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG,EEG, 1, 'setname',…
'Sternberg Continuous -- Reref''d');
```

Multiple active datasets (ALLEEG)



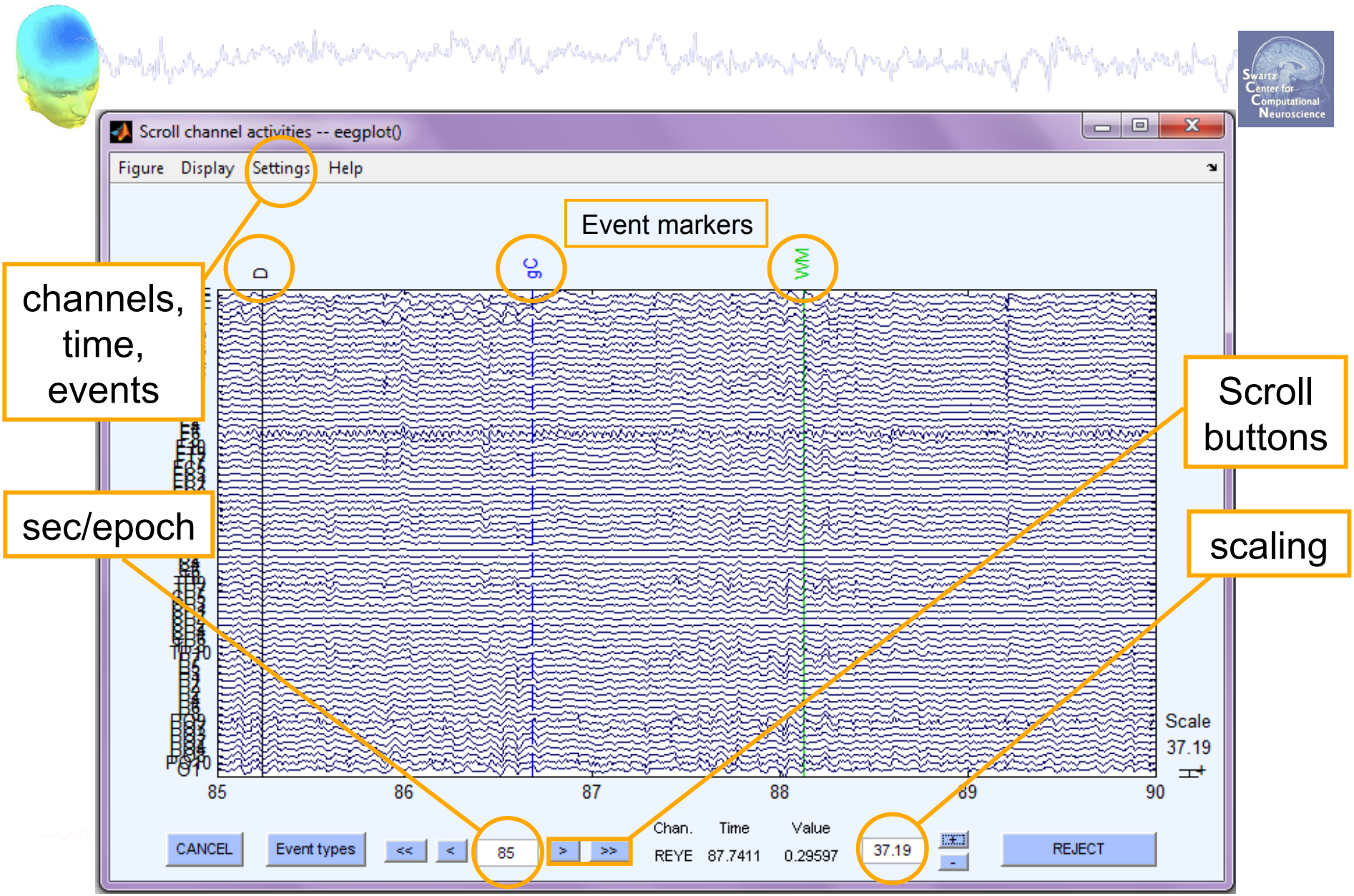


Scroll channel data

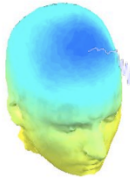



```
>> pop_eegplot(EEG,1,1,1);
```

Scroll channel data



Data importing and channel analysis



Task 1

- Import raw data
- Re-reference data
- Scroll channel data

Task 2

- Import channel location file

Task 3

- Import data events

Task 4

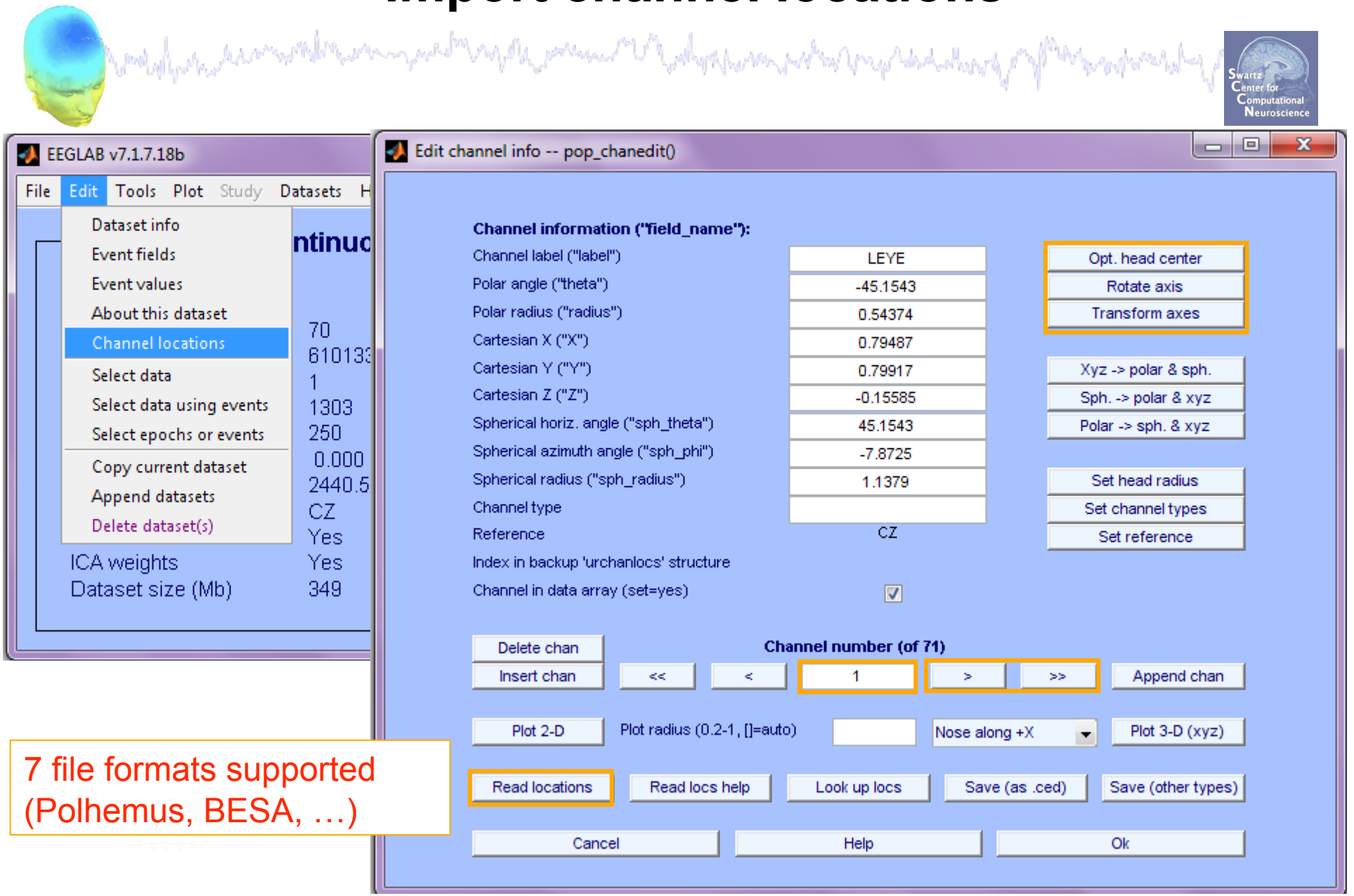
- Extract data epochs
- Select epochs/events

Task 4

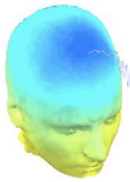
- Channel analysis

Exercise...

Import channel locations



7 file formats supported (Polhemus, BESA, …)



Edit channel info -- pop_chanedit()

Channel information ("field_name"):

Channel label ("label")	LEYE
Polar angle ("theta")	-45.1543
Polar radius ("radius")	0.54374
Cartesian X ("X")	0.79487
Cartesian Y ("Y")	0.79917
Cartesian Z ("Z")	-0.15585
Spherical horiz. angle ("sph_theta")	45.1543
Spherical azimuth angle ("sph_phi")	-7.8725
Spherical radius ("sph_radius")	1.1379
Channel type	EEG
Reference	CZ
Index in backup 'urchanlocs' structure	
Channel in data array (set=yes)	☑

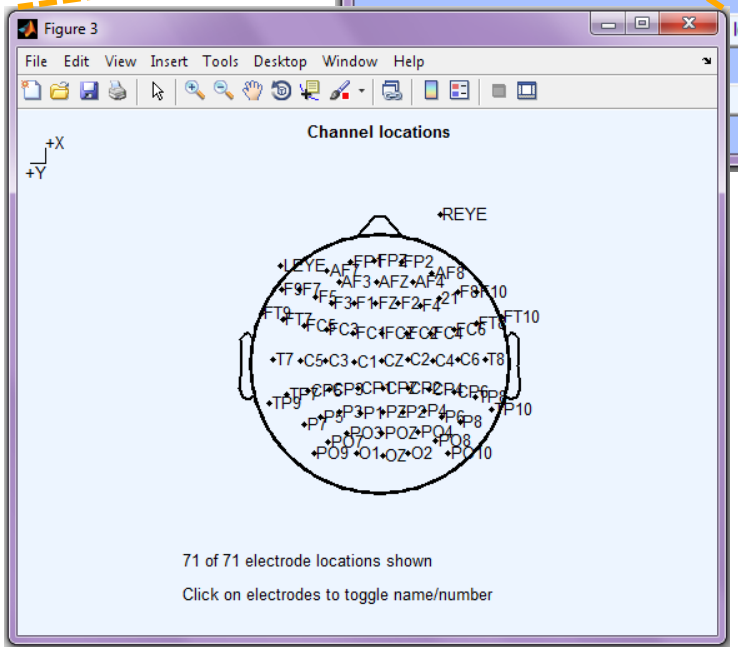
Opt. head center
Rotate axis
Transform axes
Xyz -> polar & sph.
Sph. -> polar & xyz
Polar -> sph. & xyz
Set head radius
Set channel types
Set reference

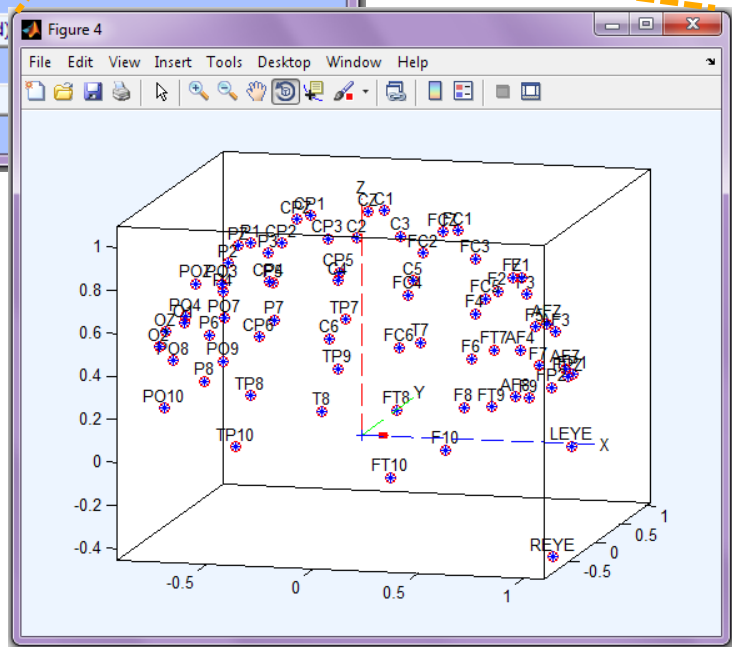
Set channel type
Channel indices 1:33
Type (e.g. EEG) EEG
Cancel Help Ok

Delete chan
Insert chan
Channel number (of 71)
<< < 1 > >>
Append chan

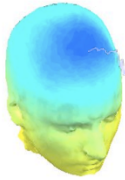
Plot 2-D
Plot radius (0.2-1, []=auto)
Nose along +X
Plot 3-D (xyz)

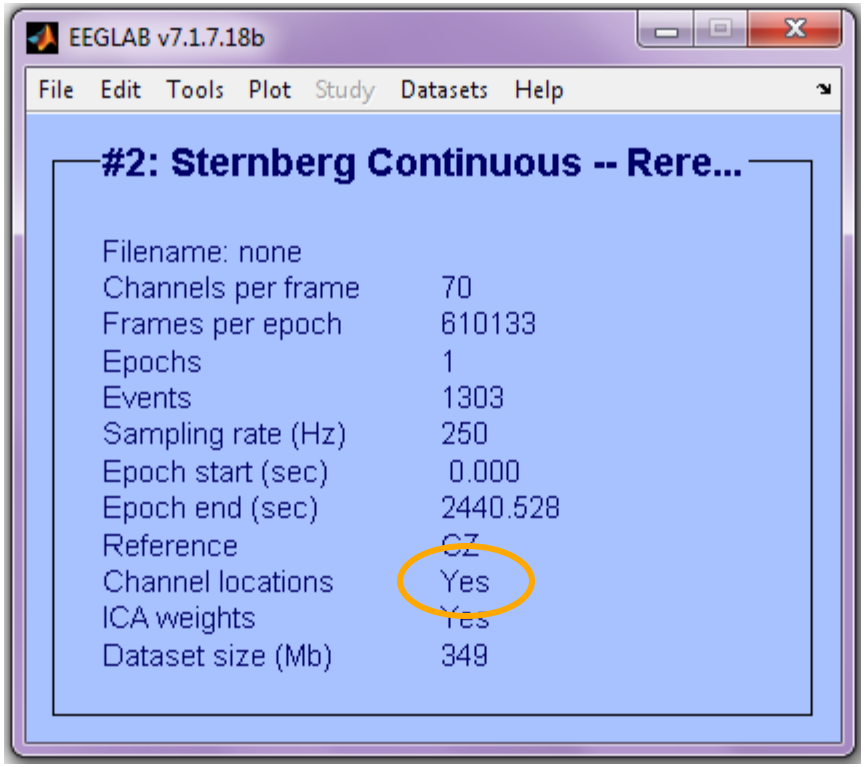
locs help
Look up locs
Save (as .ced)
Help



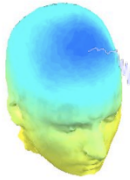


Imported channel locations





Data importing and channel analysis



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- Import raw data
- Re-reference data
- Scroll channel data

Task 2

- Import channel location file

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- Import data events

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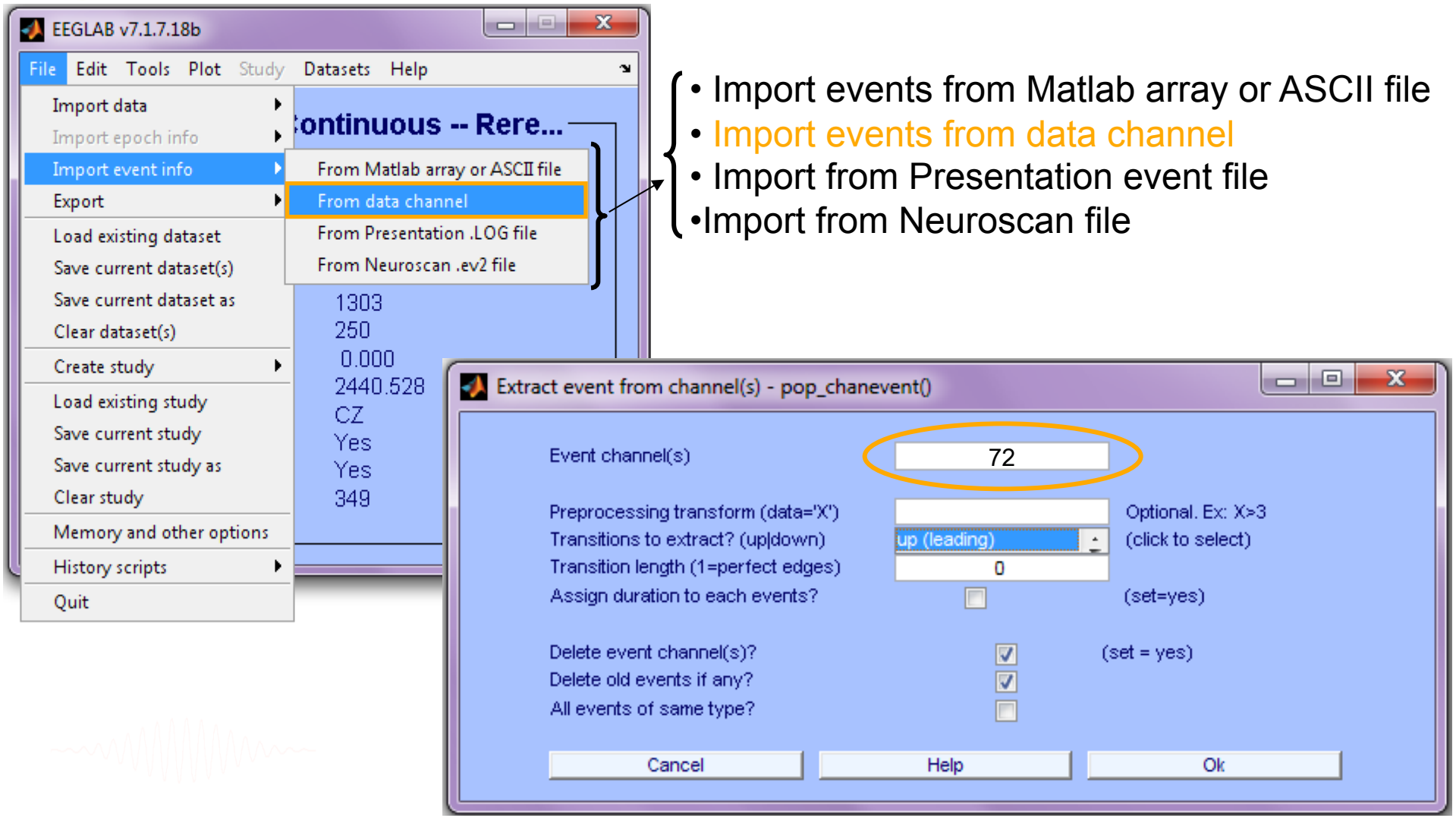
- Extract data epochs
- Select epochs/events

Task 4

- Channel analysis

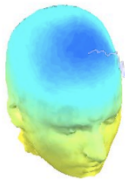
Exercise...

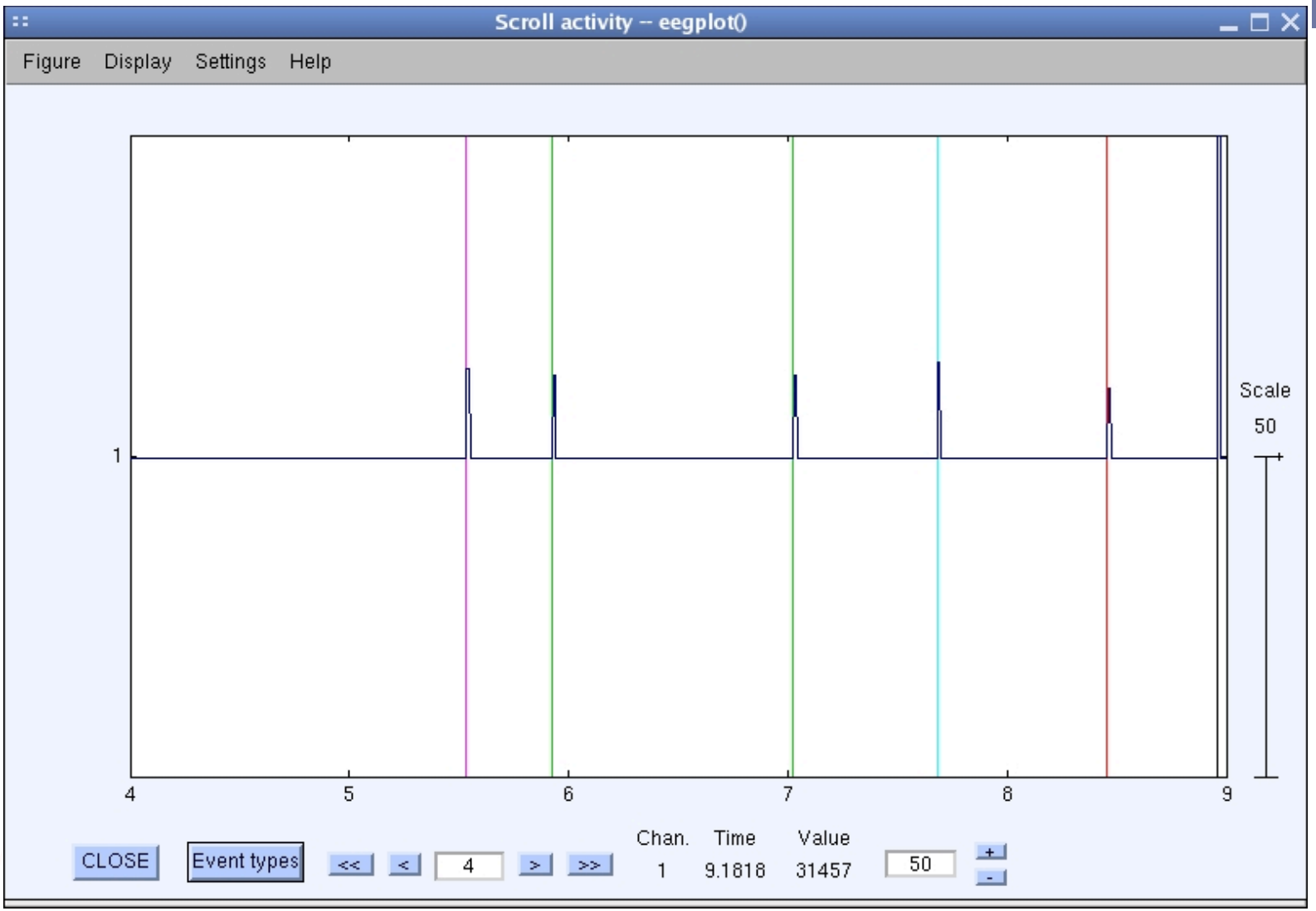
Import data events



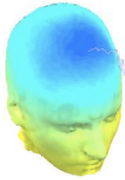
- Import events from Matlab array or ASCII file
- Import events from data channel
- Import from Presentation event file
- Import from Neuroscan file

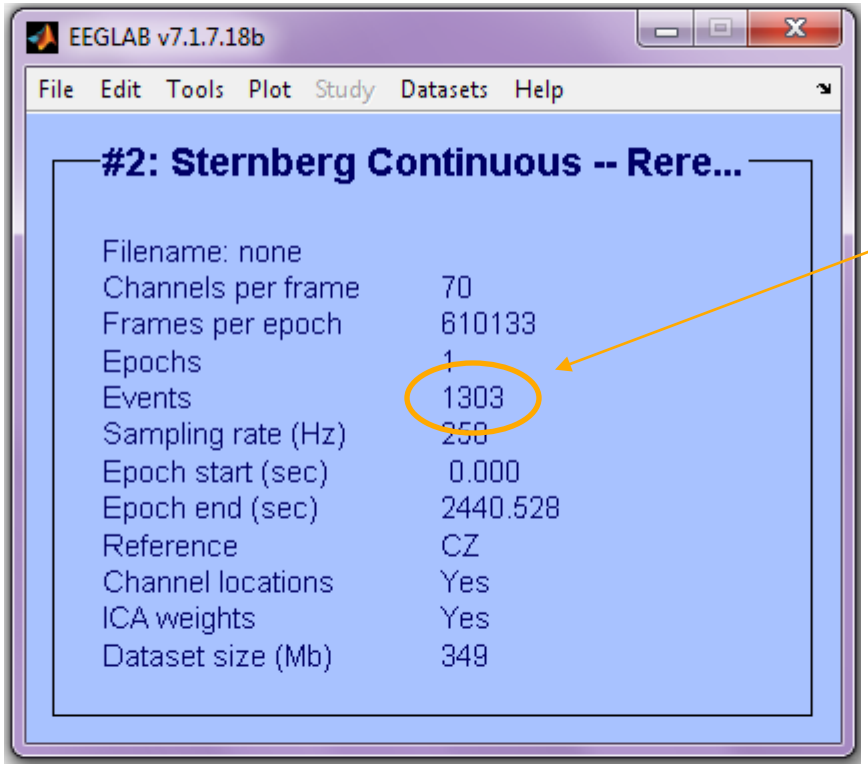
Appearance of an event channel





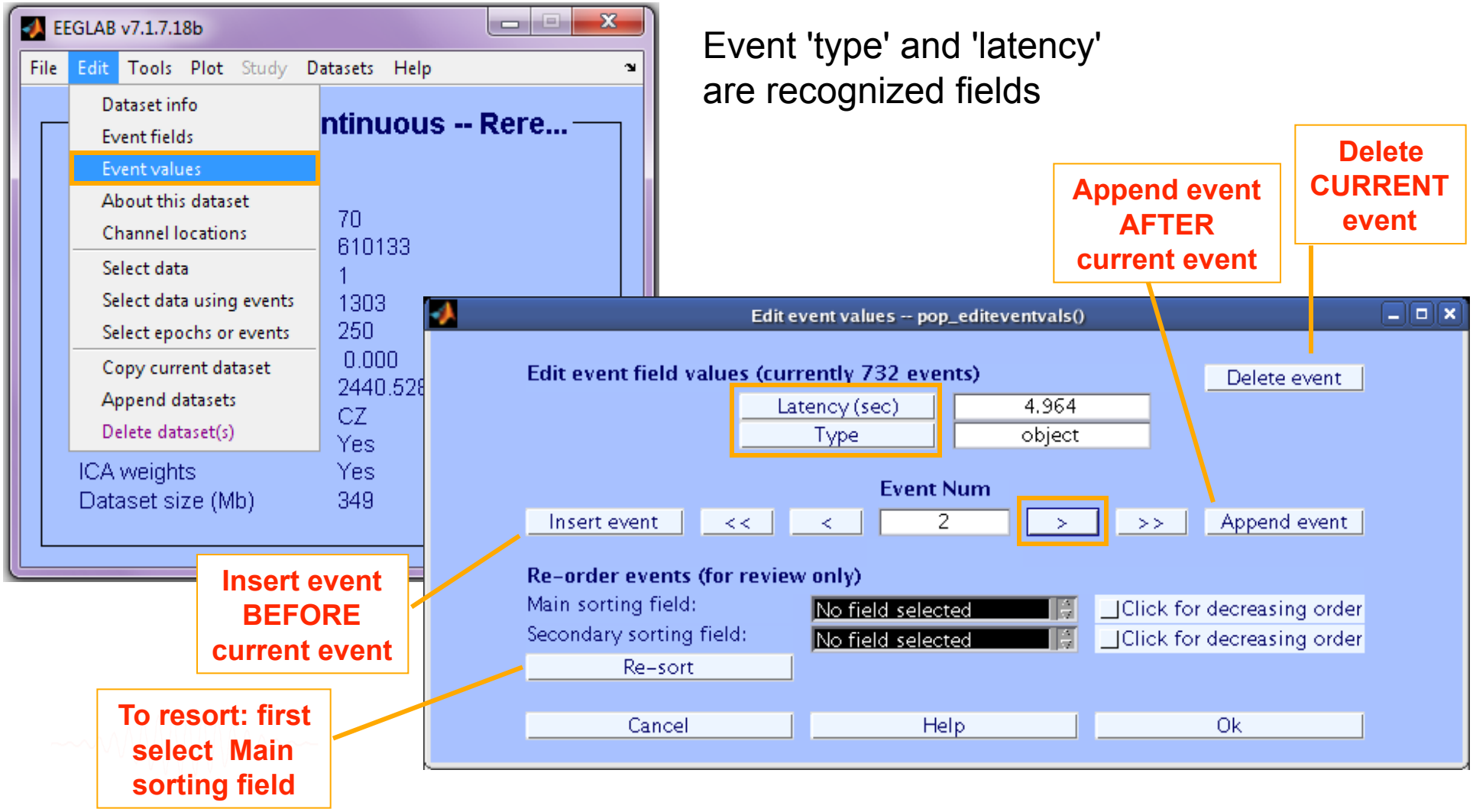
Imported data events





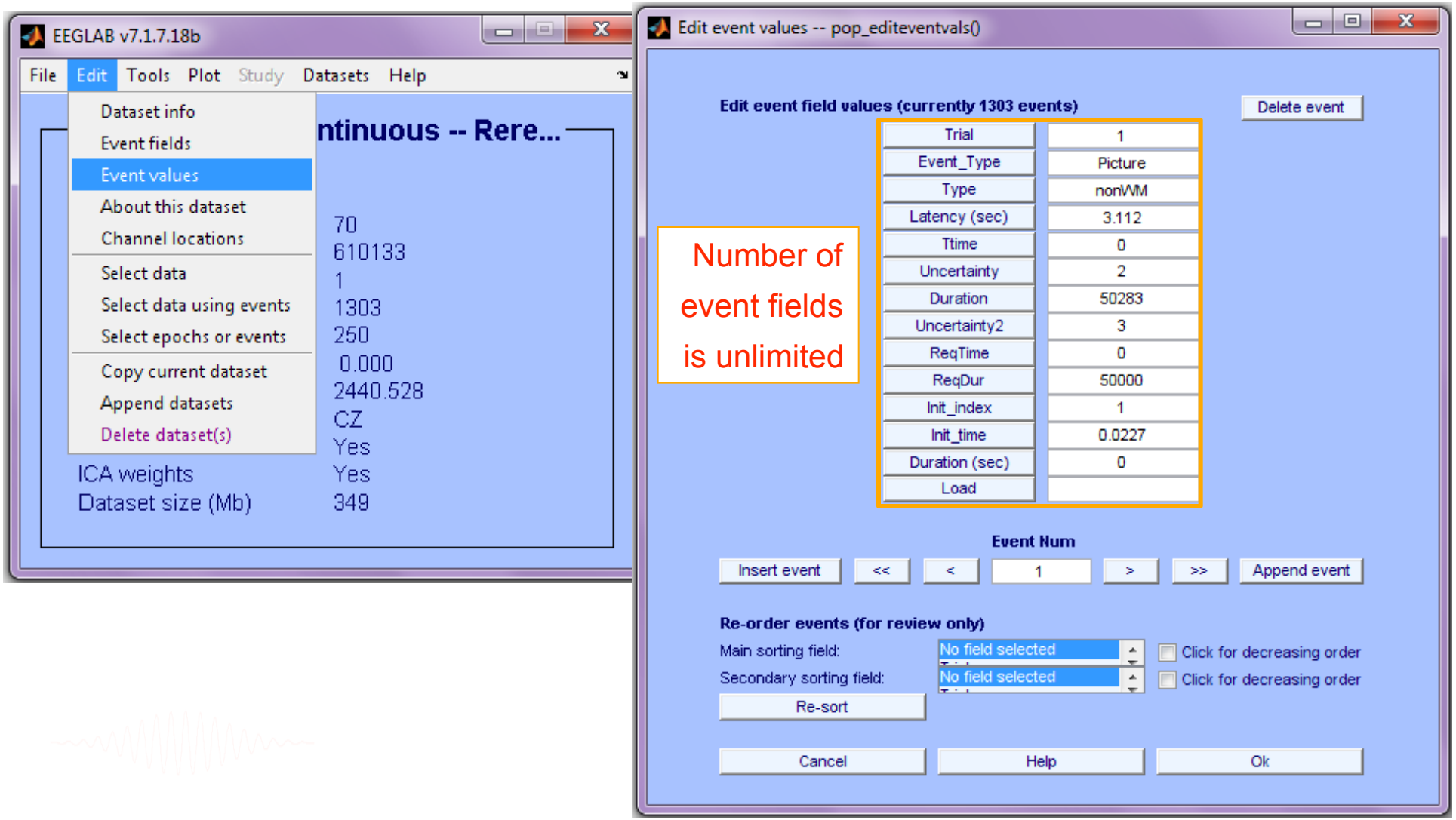
If event import was successful, you will see an appropriate number here

Review event values

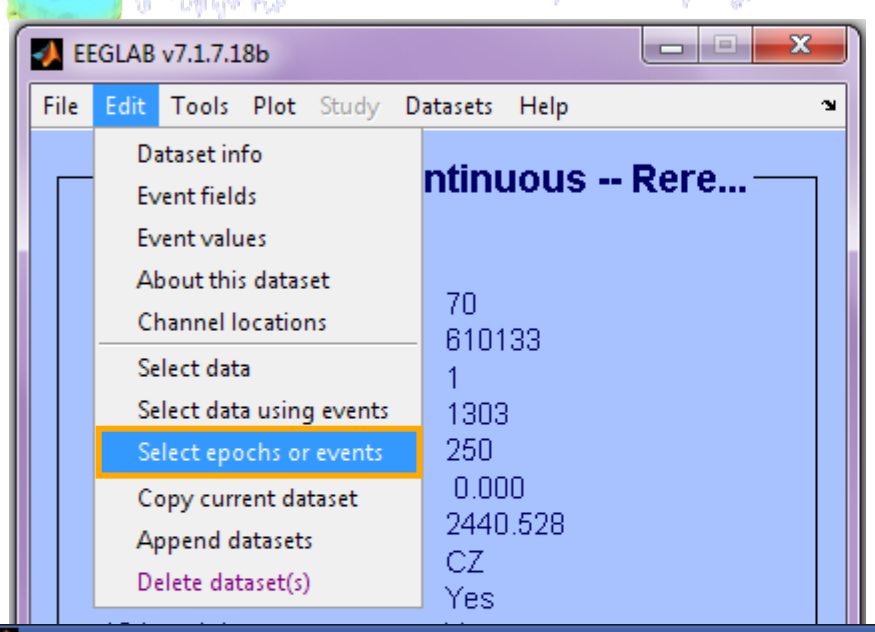


Event 'type' and 'latency' are recognized fields

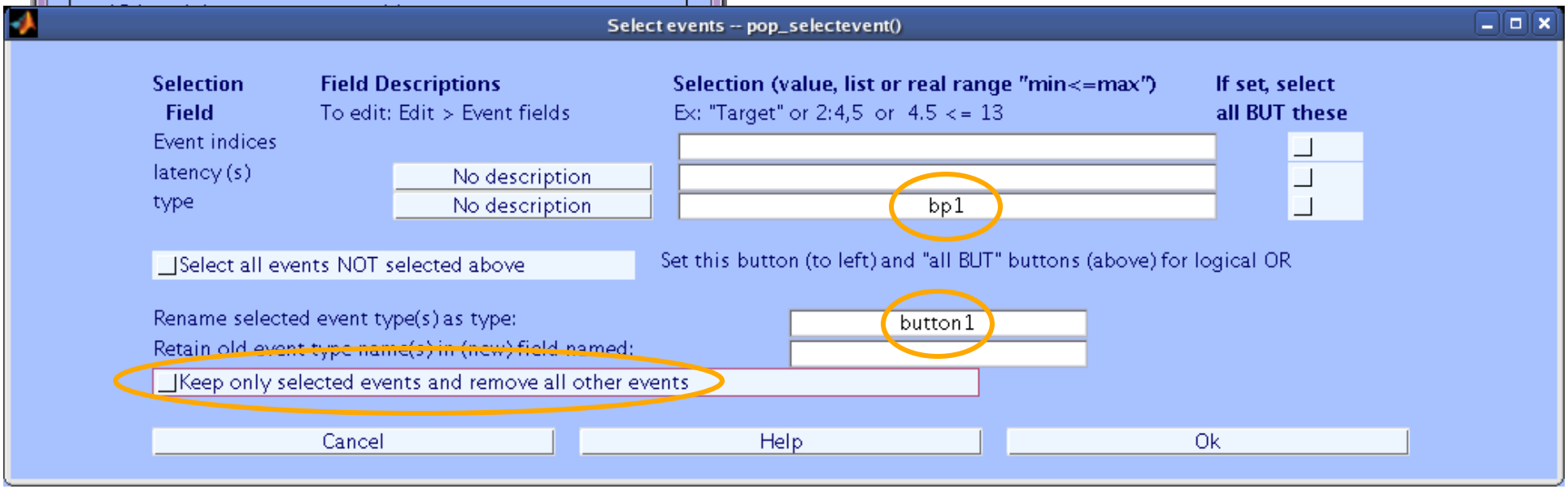
Review event values



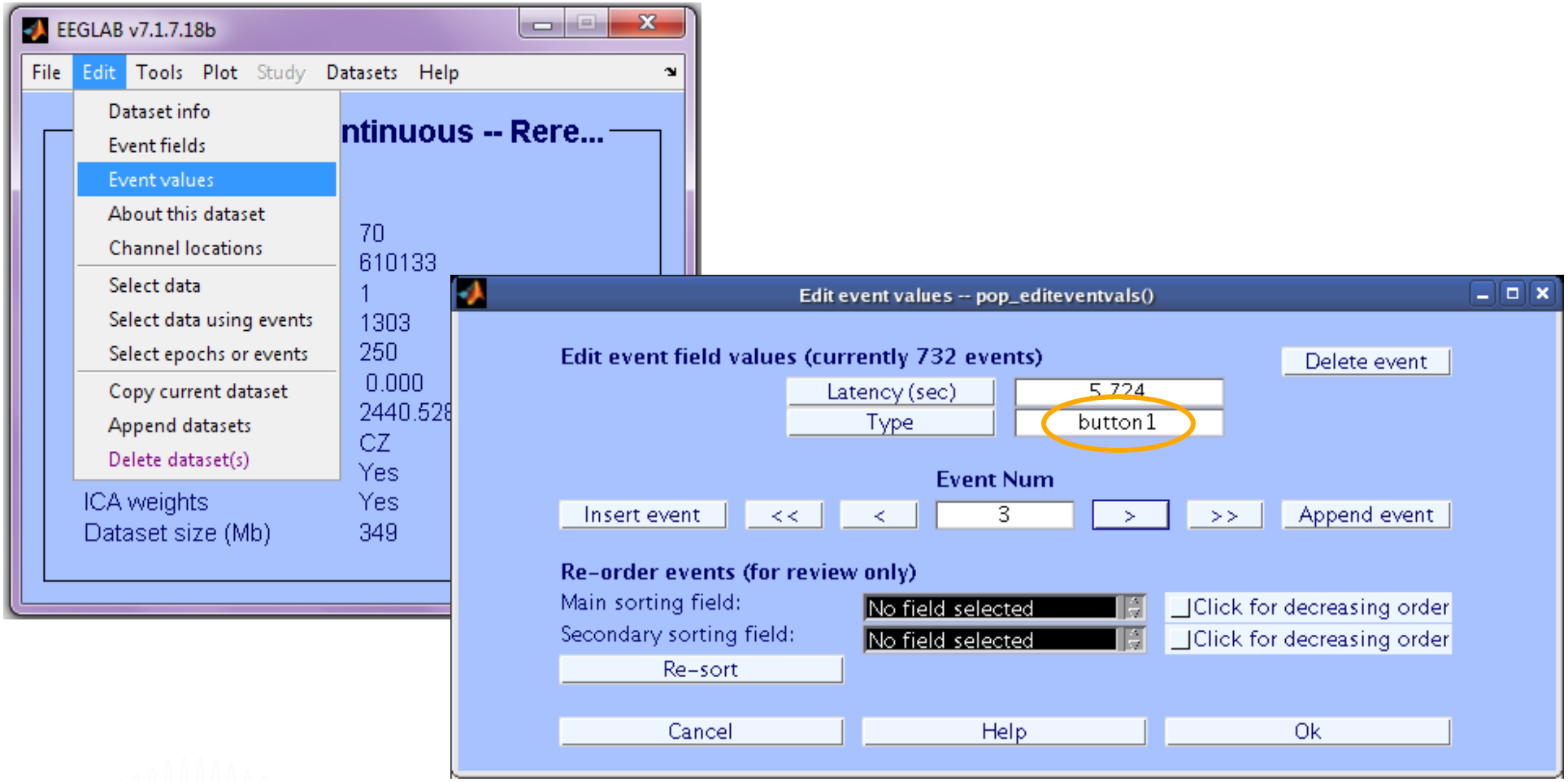
Renaming events



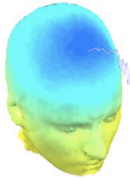
1) input original 'type' code
2) input new 'type' code
3) Keep/delete all other events

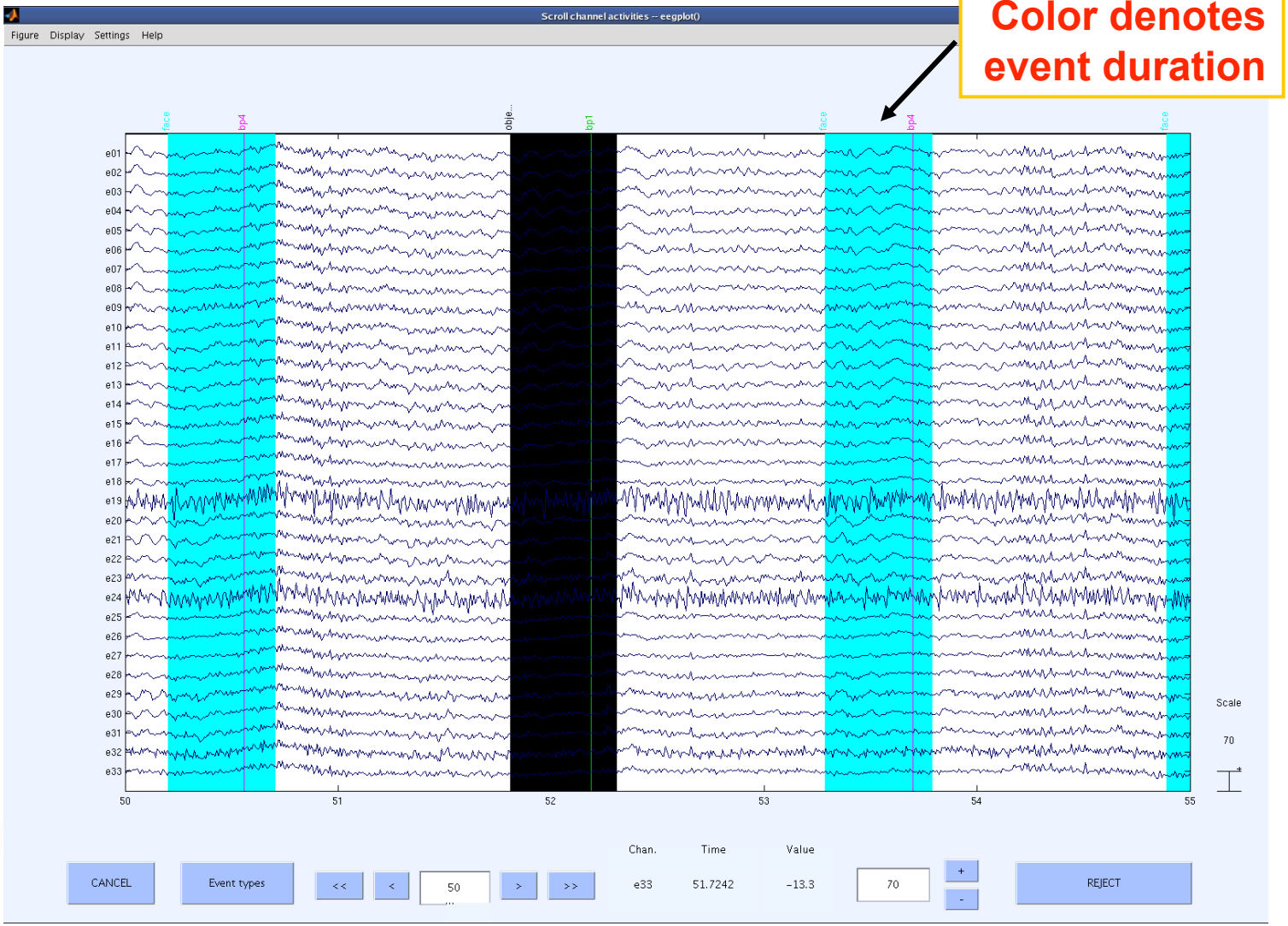


Renaming events

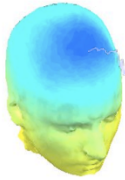


Event durations





Data importing and channel analysis



Task 1

- Import raw data
- Re-reference data
- Scroll channel data

Task 2

- Import channel location file

Task 3

- Import data events

Task 4

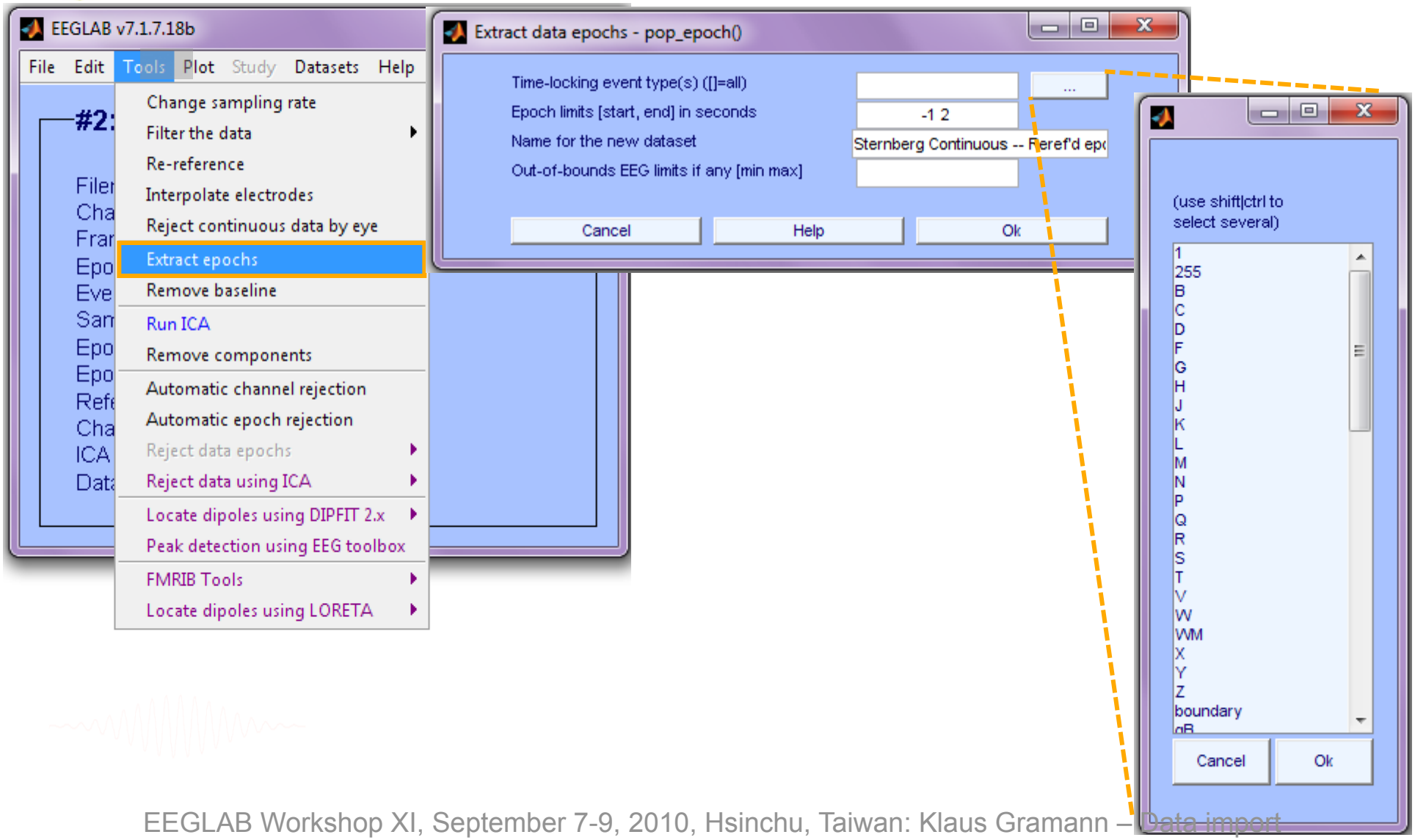
- Extract data epochs
- Select epochs/events

Task 4

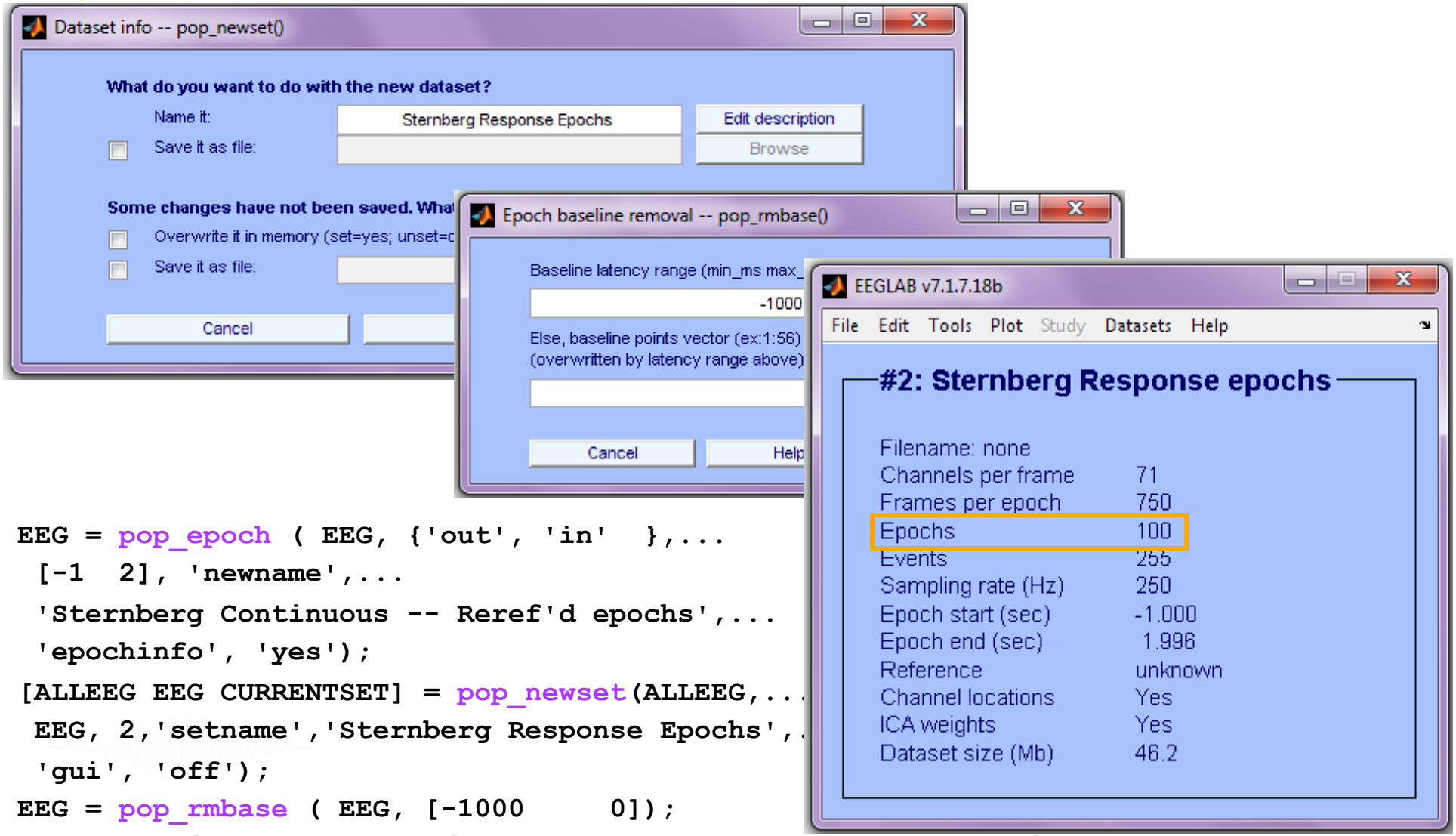
- Channel analysis

Exercise...

Extract epochs

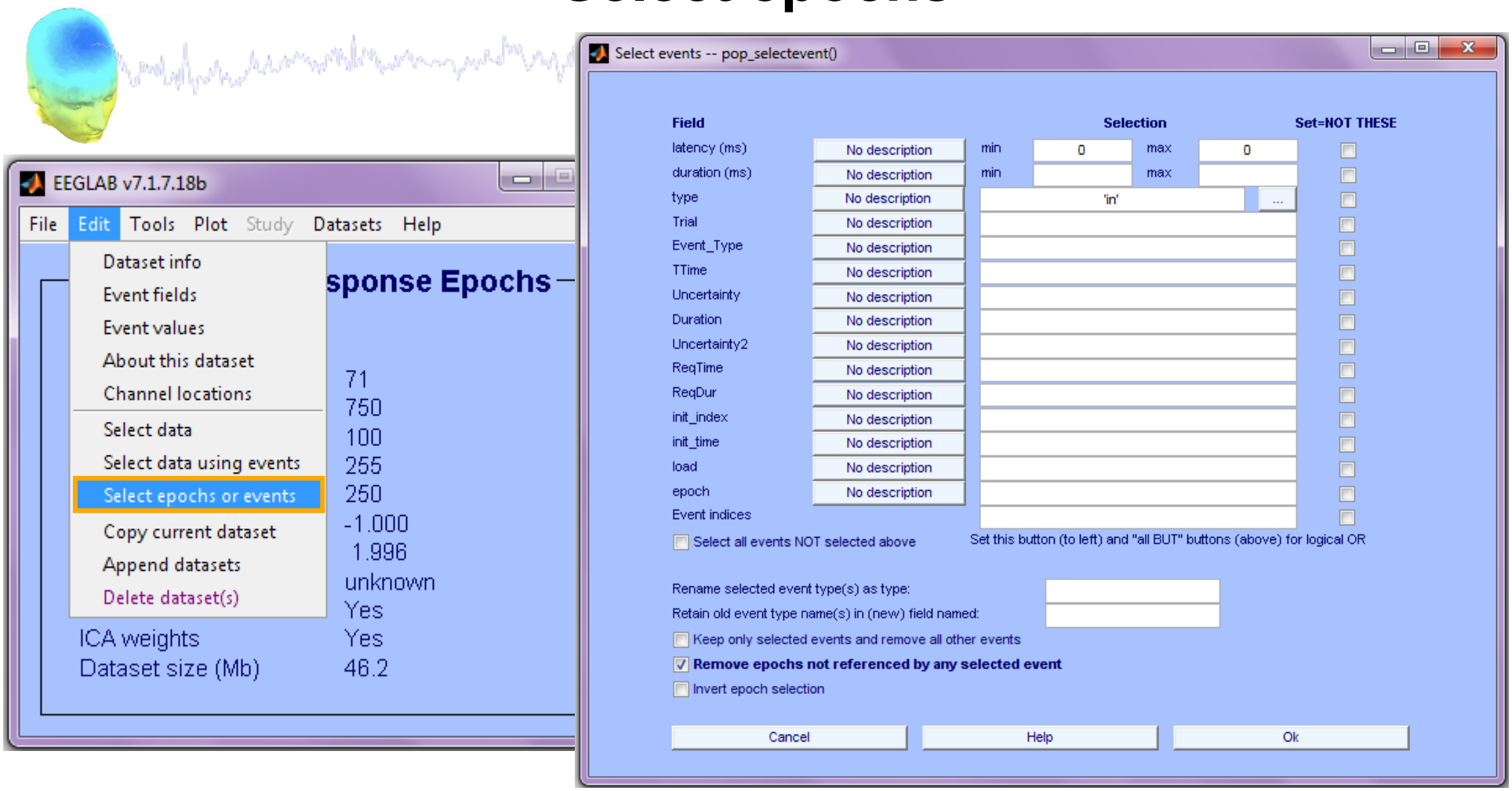


Extract epochs



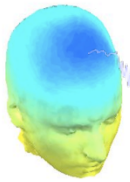

```
EEG = pop_epoch ( EEG, {'out', 'in'  },...
 [-1  2], 'newname',...
 'Sternberg Continuous -- Reref'd epochs',...
 'epochinfo', 'yes');
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG,...
 EEG, 2,'setname','Sternberg Response Epochs',...
 'gui', 'off');
EEG = pop_rmbase ( EEG, [-1000     0]);
```

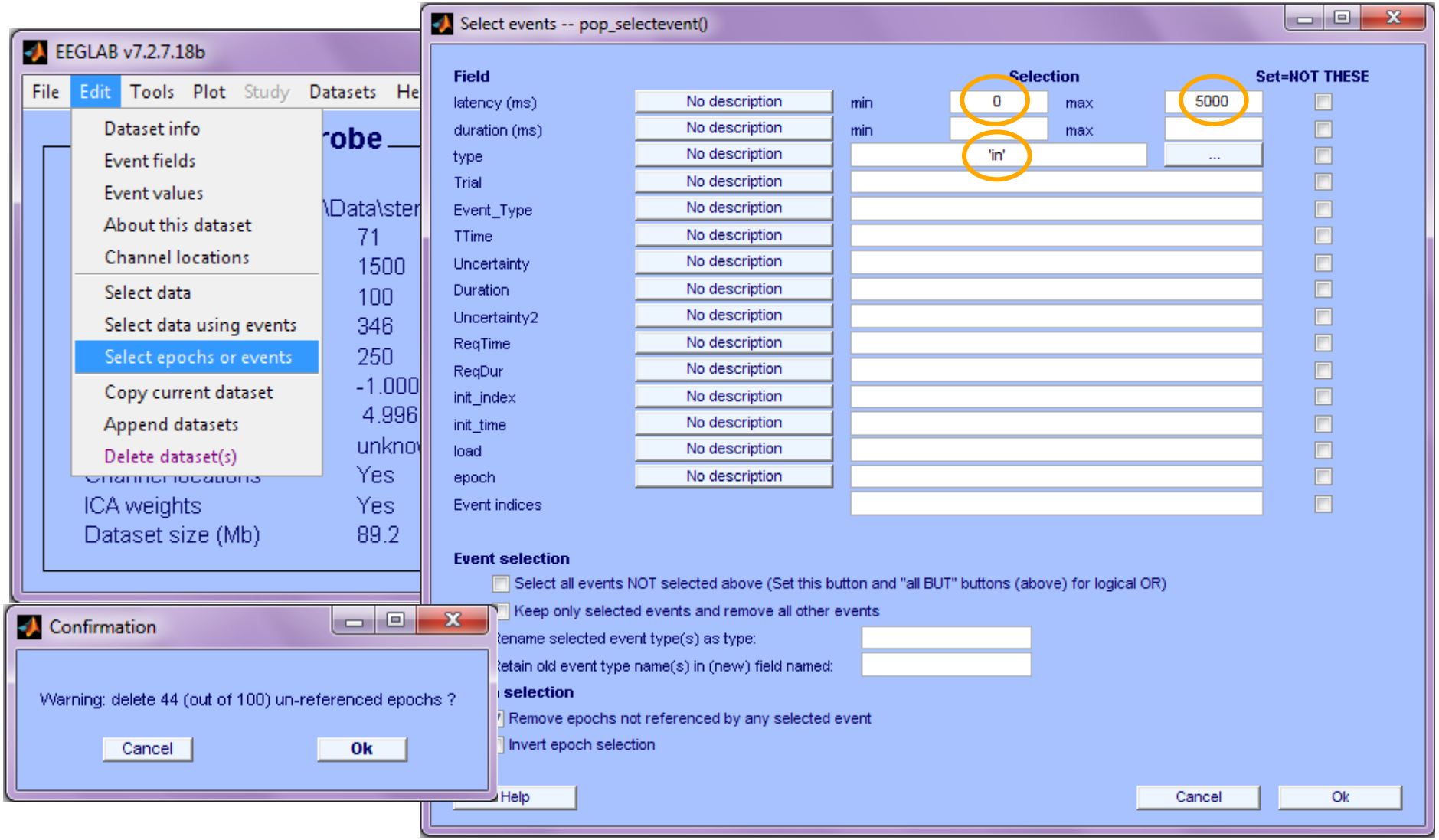
Select epochs



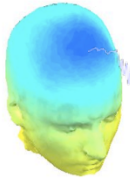

```
>> EEG = pop_selectevent(EEG,'type',{'in'},...
    'deleteevents', 'off','deleteepochs','on');
>> [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG,EEG,4,...
  'setname','faces only epochs');
```

Select epochs with specific events





Repeat for ‘out-of-set’ responses



Save without overwriting and go back to all epochs

Repeat process for ‘out’ trials

Dataset info -- pop_newset()

What do you want to do with the new dataset?

Name it: Sternberg: Probe- In Set

Save it as file:

Some changes have not been saved. What do you want to

Overwrite it in memory (set=yes; unset=create a new data

Save it as file: C:\Users\julie\Documents\Worksho

Help

Select events -- pop_selectevent()

Field		Selection			Set=NOT THESE
latency (ms)	No description	min	0	max 5000	
duration (ms)	No description	min		max	
type	No description	'out'	...		
Trial	No description				
Event_Type	No description				
TTime	No description				
Uncertainty	No description				
Duration	No description				
Uncertainty2	No description				
ReqTime	No description				
ReqDur	No description				
init_index	No description				
init_time	No description				

is button and "all BUT" buttons (above) for logical OR)

her events

ned:

ted event

Cancel Ok

Dataset info -- pop_newset()

What do you want to do with the new dataset?

Name it: Sternberg: Probe Out of Set Edit description

Save it as file: Browse

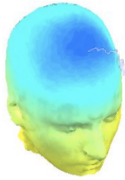
Some changes have not been saved. What do you want to do with the old dataset?

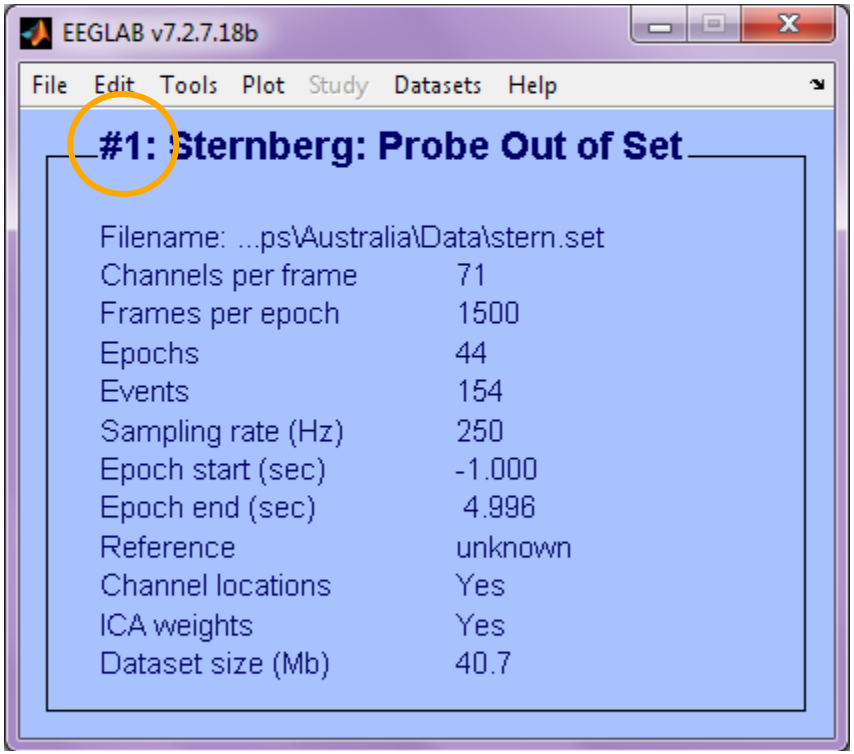
Overwrite it in memory (set=yes; unset=create a new dataset)

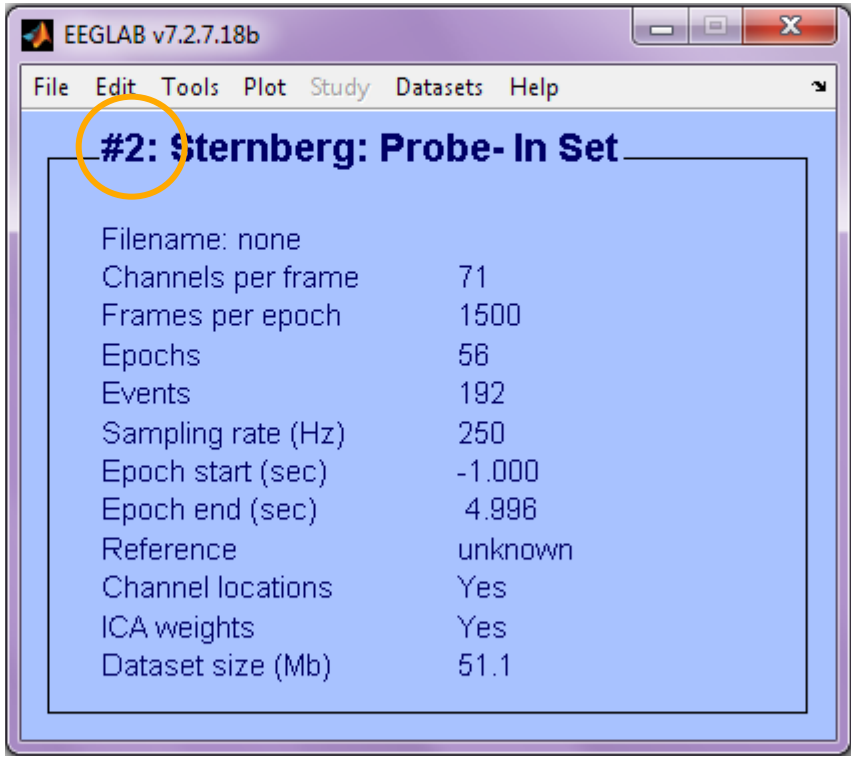
Save it as file: C:\Users\julie\Documents\Workshops\Aust Browse

Help Cancel Ok

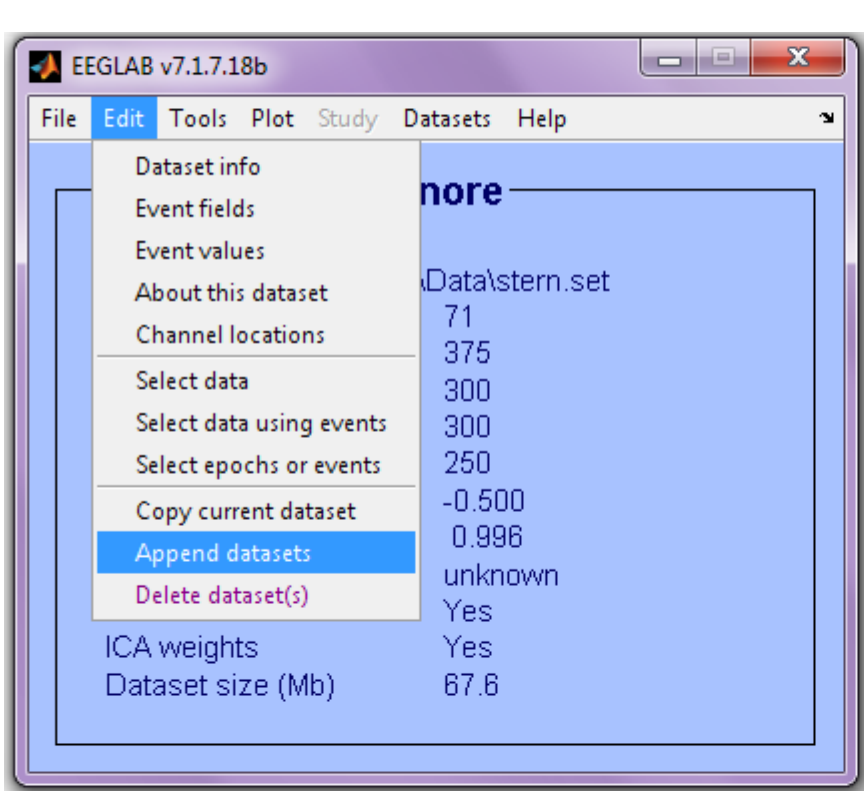
Separate datasets with different conditions

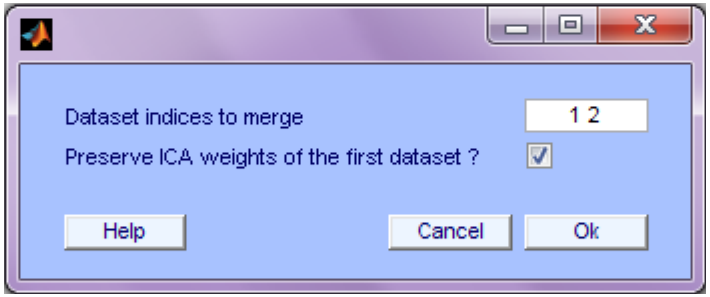




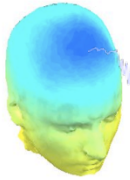


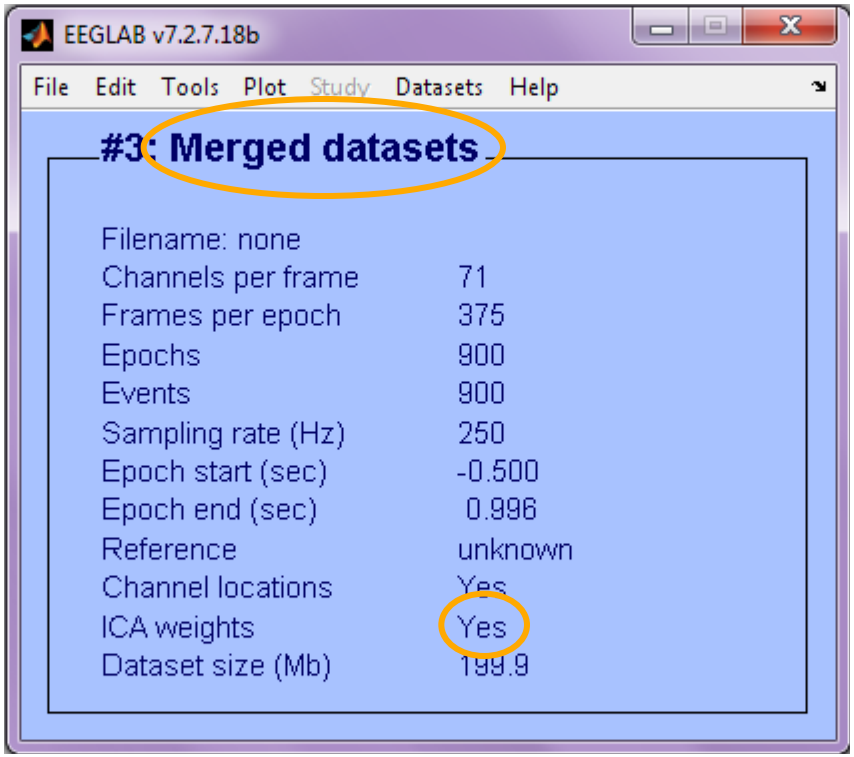
Merge (append) datasets



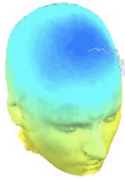


Merged datasets





Data importing and channel analysis



Task 1

Import raw data

Re-reference data

Scroll channel data

Task 2

Import channel location file

Task 3

Import data events

Task 4

Extract data epochs

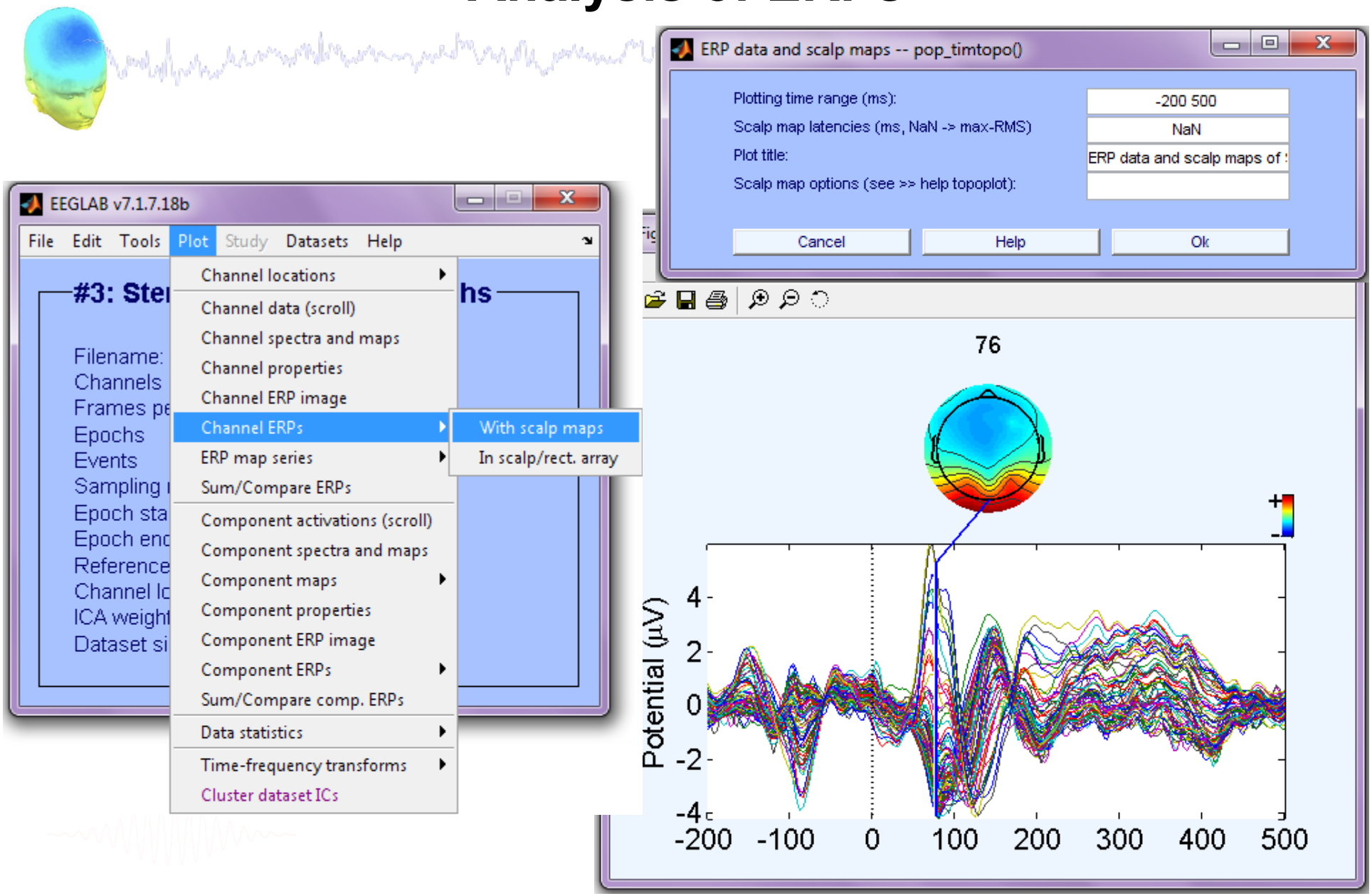
Select epochs/events

Task 4

Channel analysis

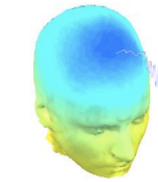
Exercise...

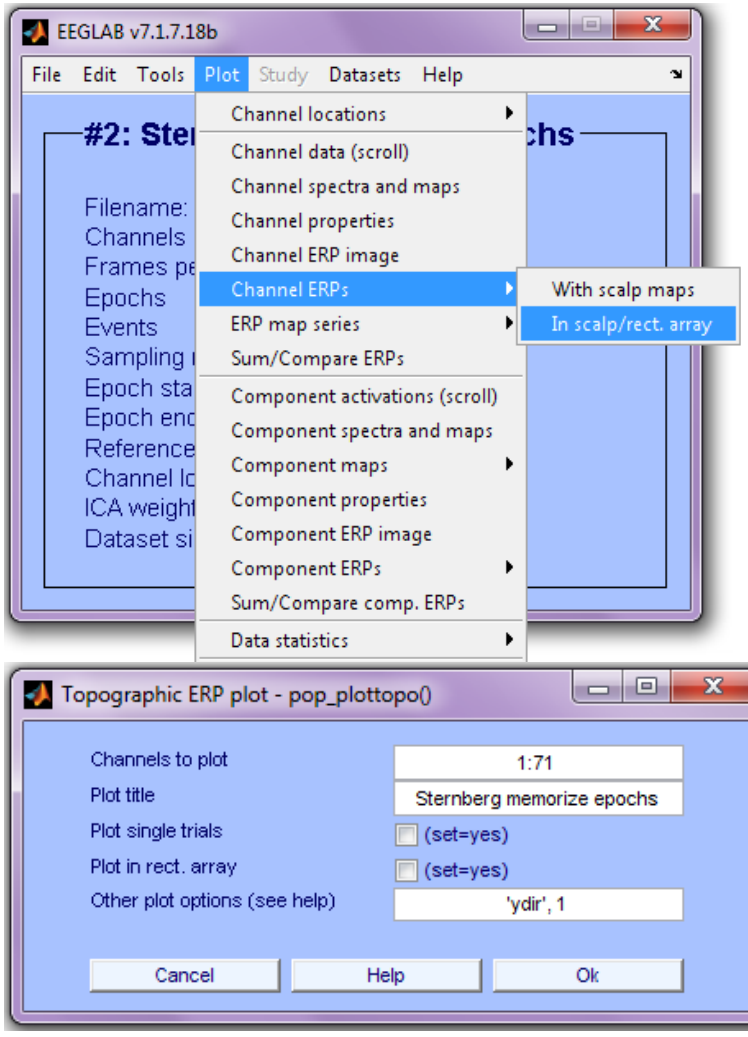
Analysis of ERPs

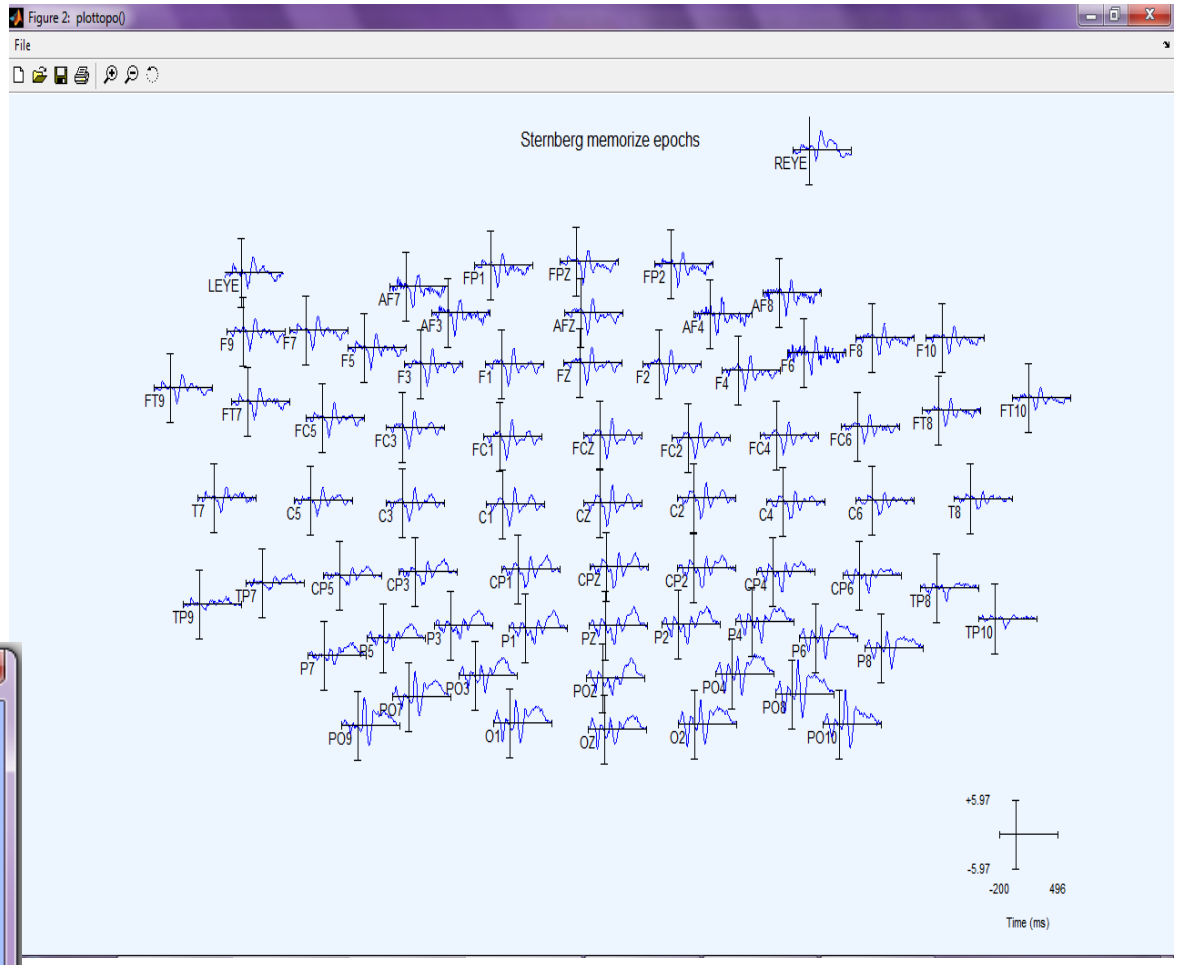



```
>> pop_timtopo(EEG,[-200 500],[NaN],'ERP data and scalp maps');
```

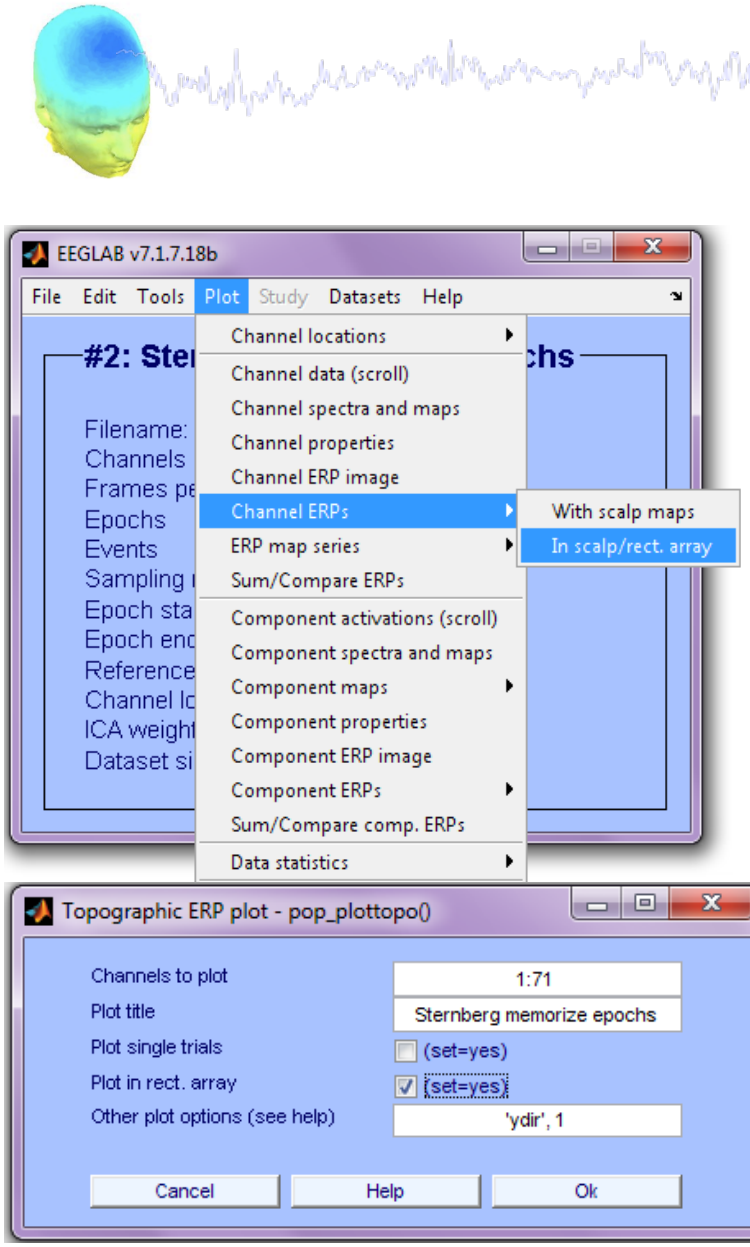
Analysis of ERPs

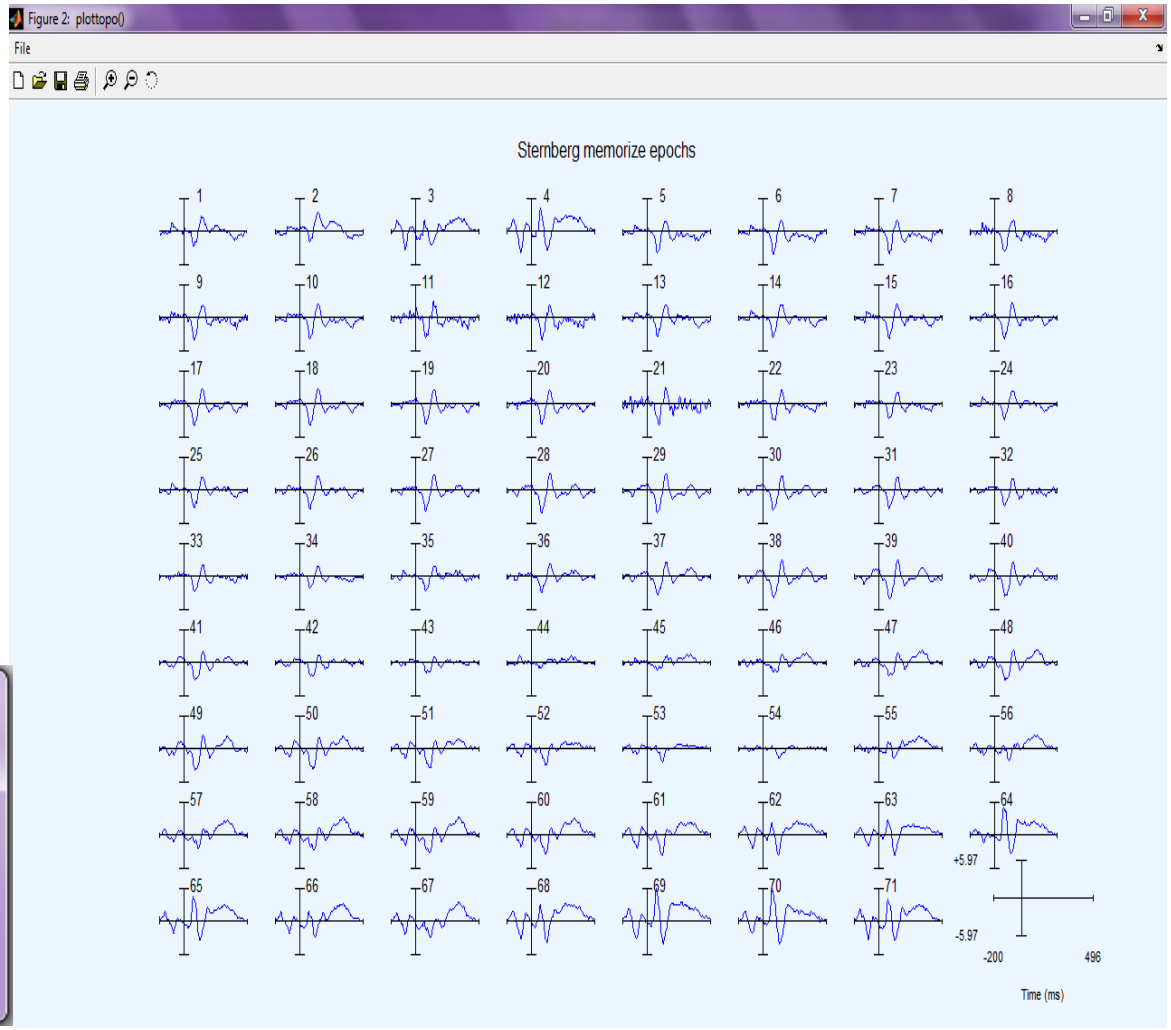




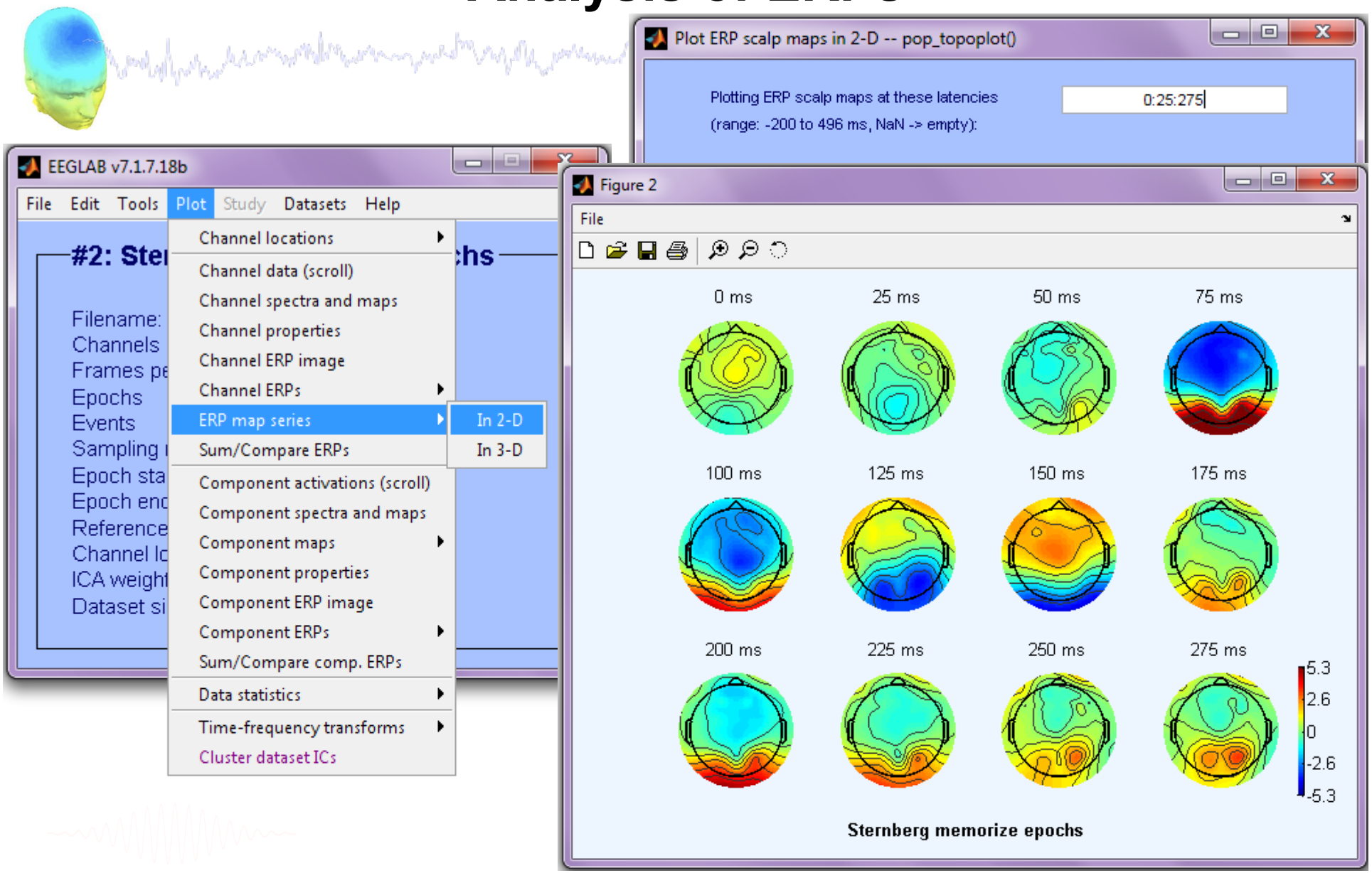


Channel ERP in rectangular array



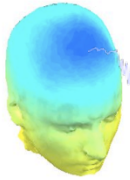


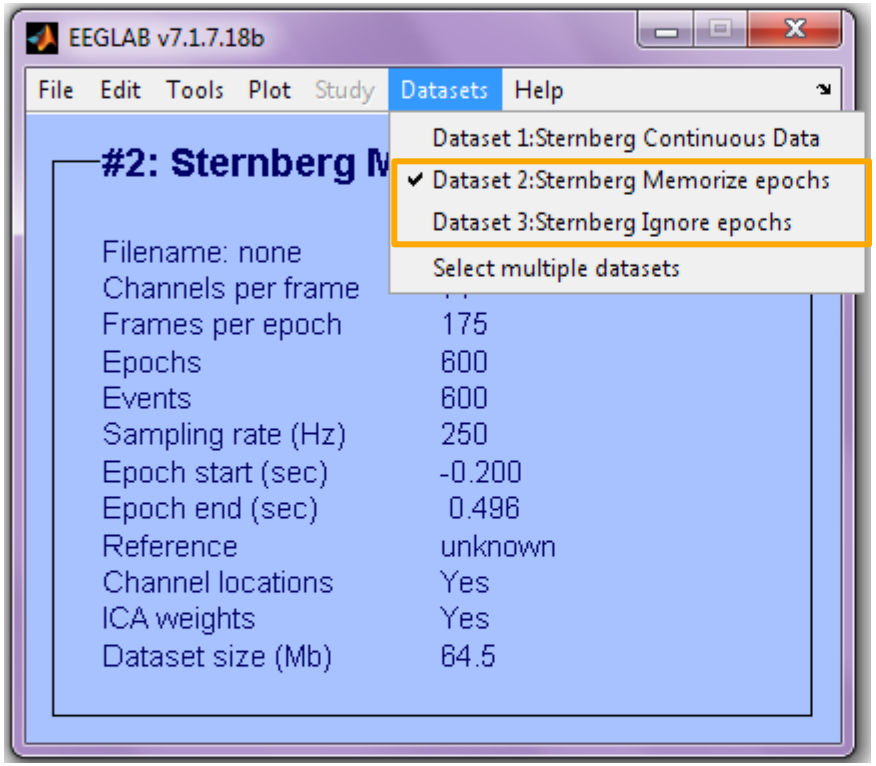
Analysis of ERPs




```
pop_topoplot(EEG,1,[0:25:275],'Memorize',[3 4],0,'electrodes','off');
```

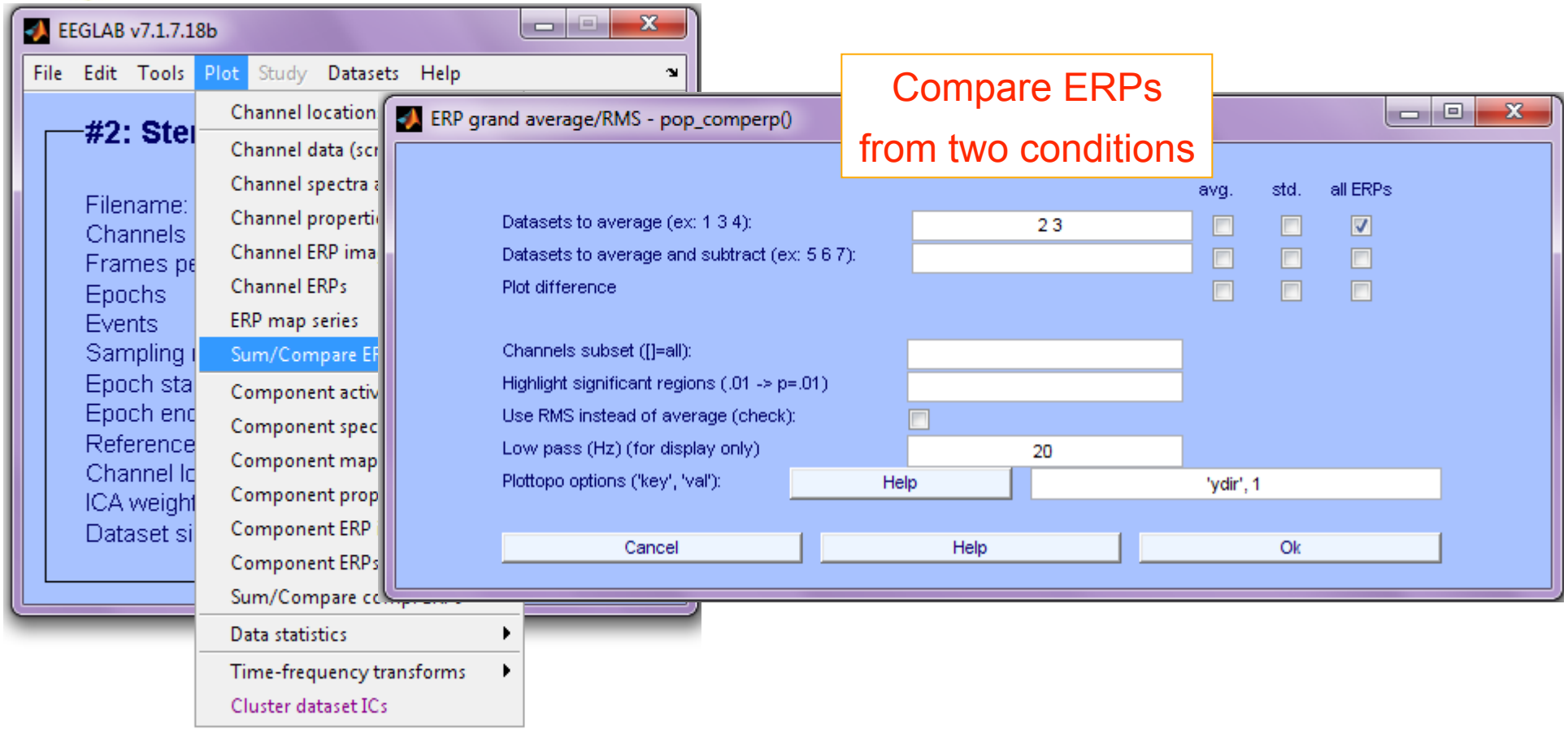
Compare ERPs across conditions





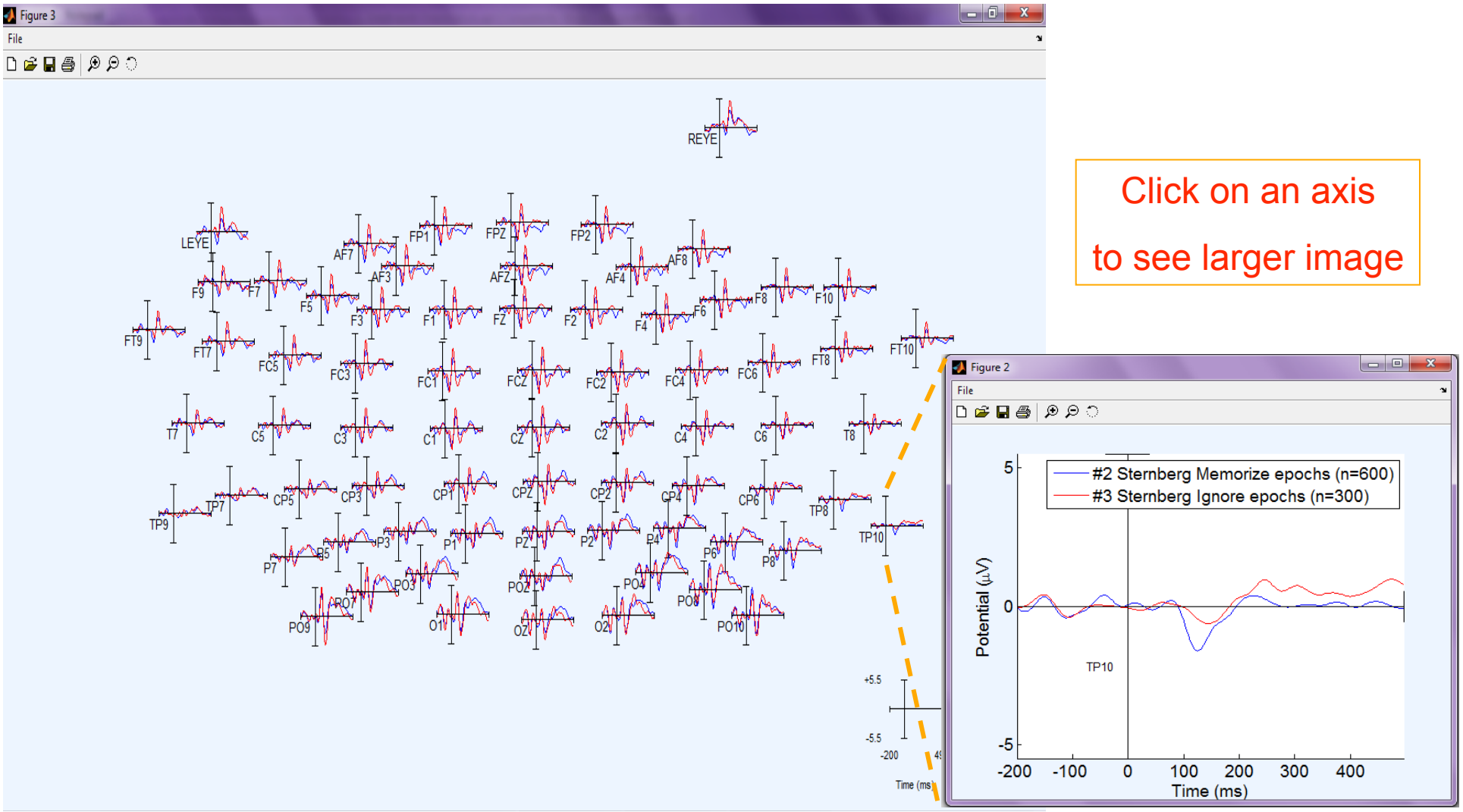
How do 'Memorize' and 'Ignore' ERPs differ?

Compare ERPs across conditions




```
>>pop_comperp(ALLEEG,1,[2 3],[],'addavg','off','addstd','off', …
  'addall','on','diffavg','off','diffstd','off','lowpass',20, …
  'tplotopt',{'ydir',1});
```

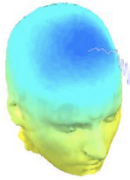
Compare ERPs across conditions



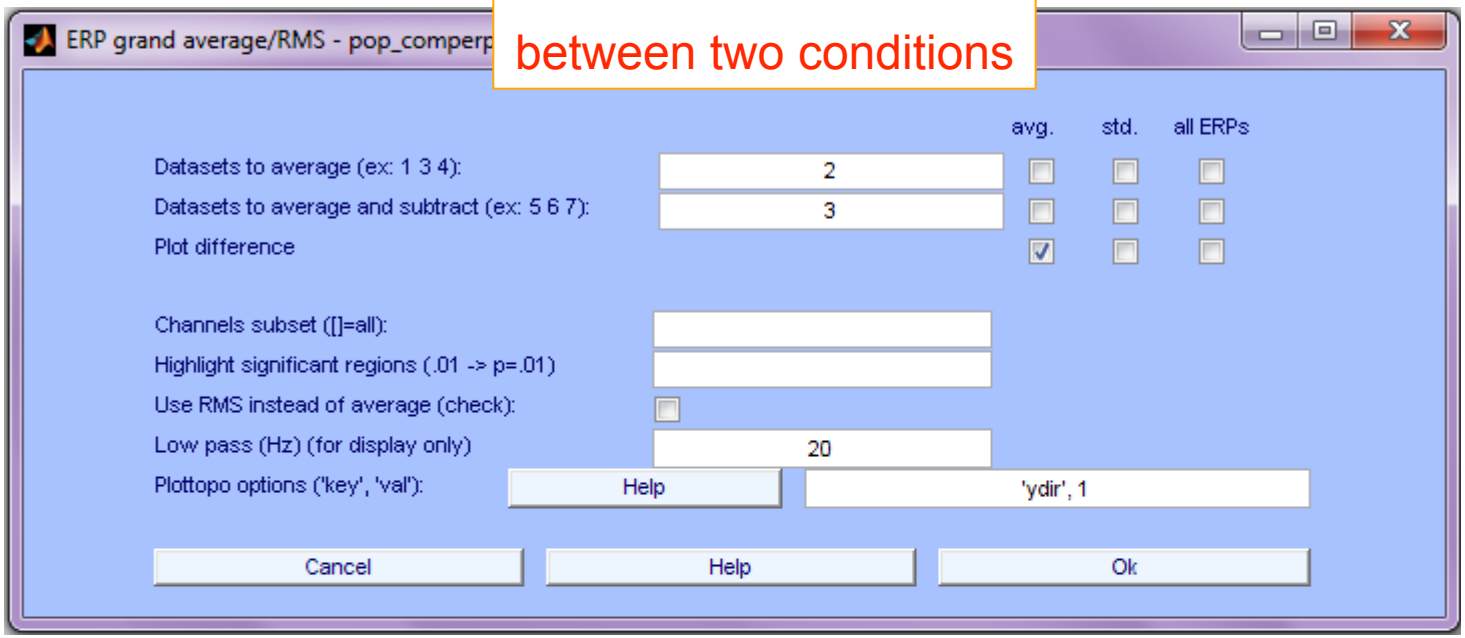
Click on an axis

to see larger image

Analysis of ERP *differences*

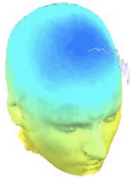


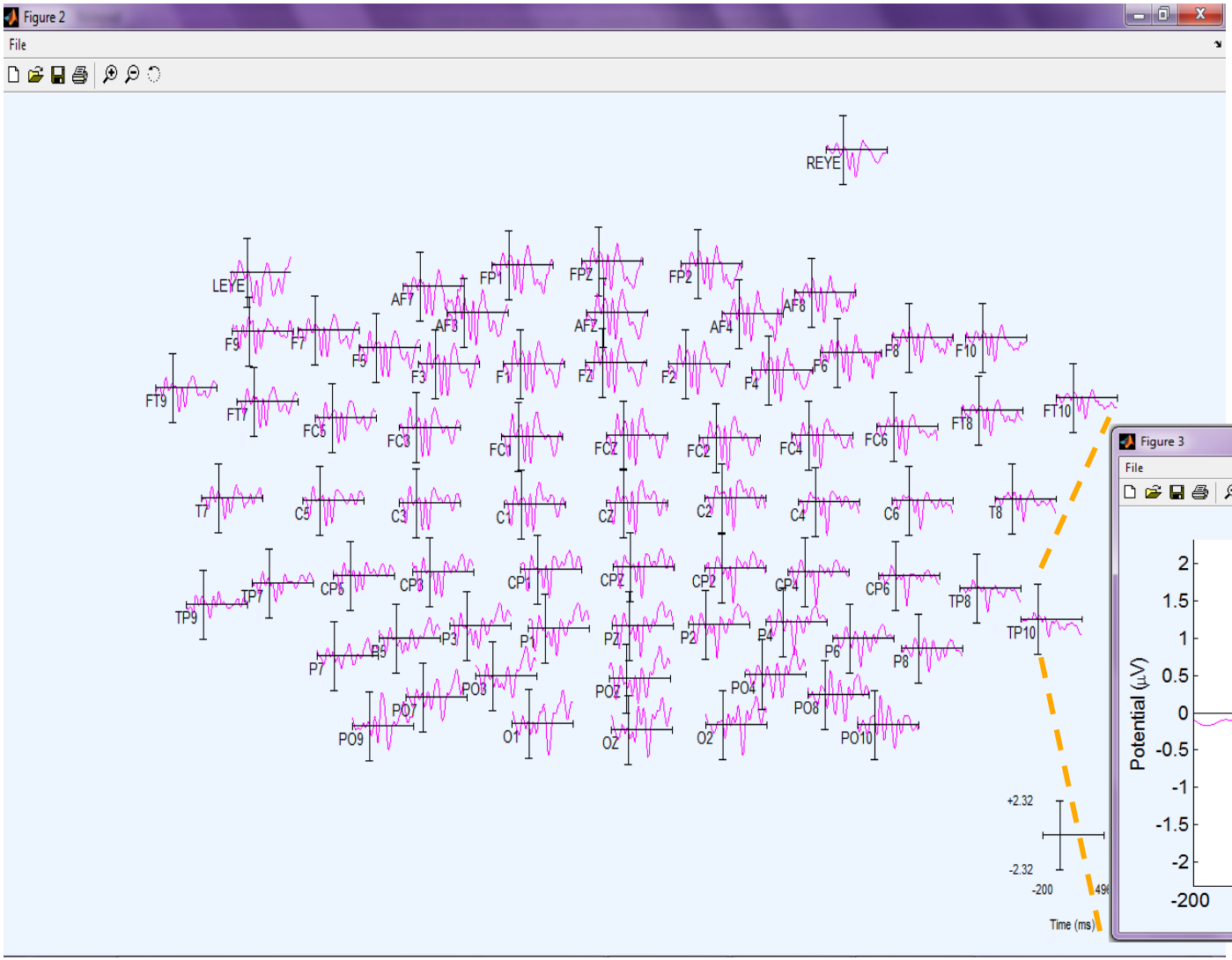
Plot *difference* between two conditions



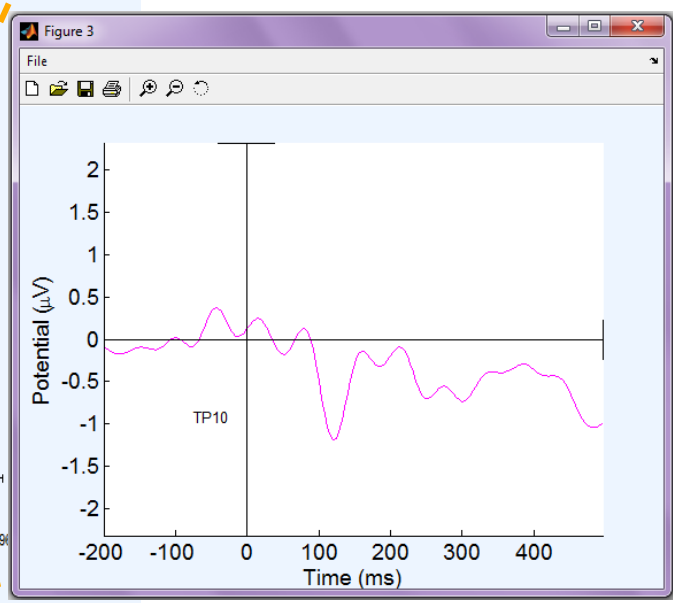

```
>> pop_comperp(ALLEEG,1, 2, 3,'addavg','off',…
'addstd','off', 'diffavg','on','diffstd','off', …
'lowpass',20, 'tplotopt',{'ydir',1});
```

Analysis of ERP differences

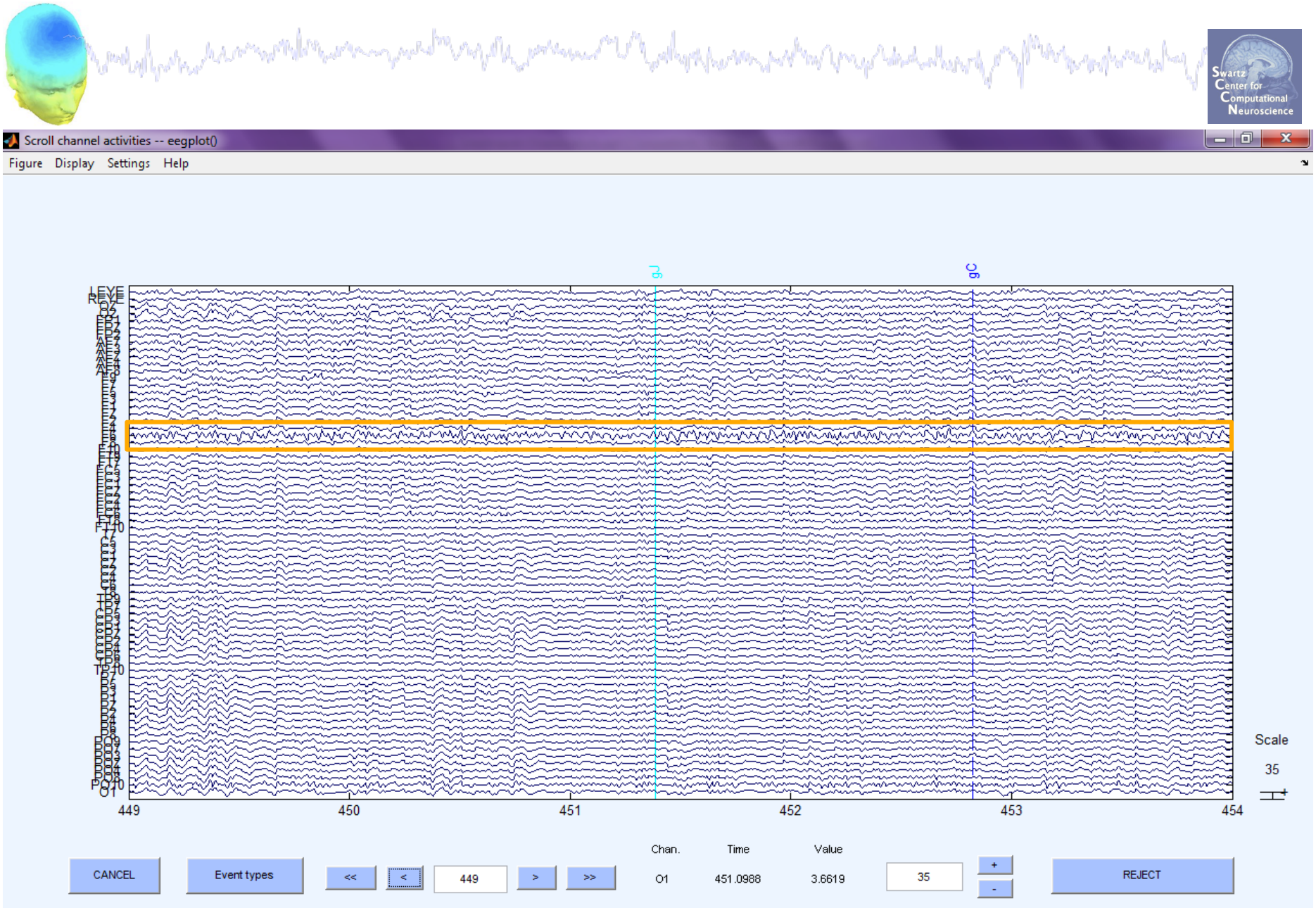




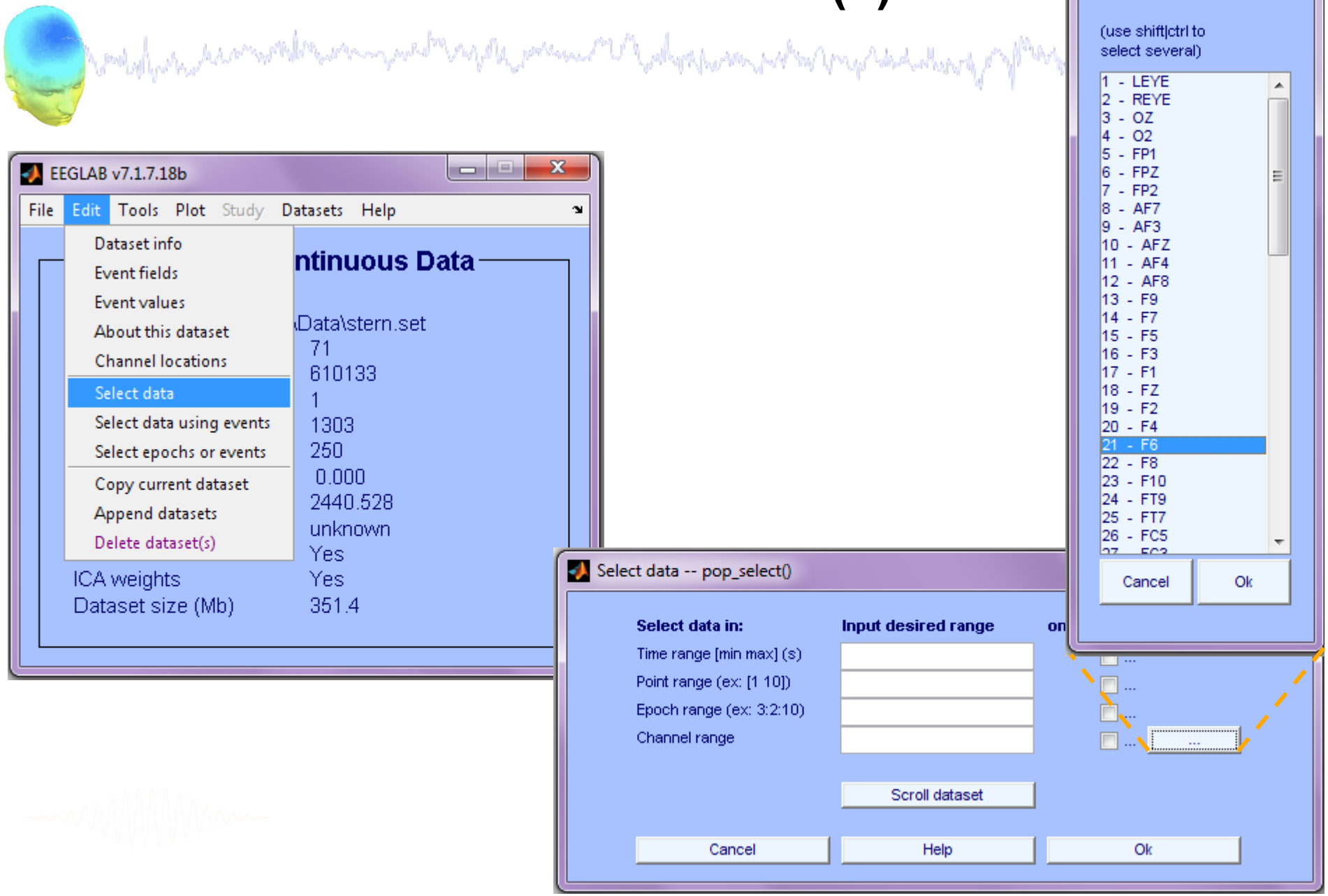
ERP
difference
between
2 conditions



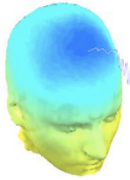
Remove channel

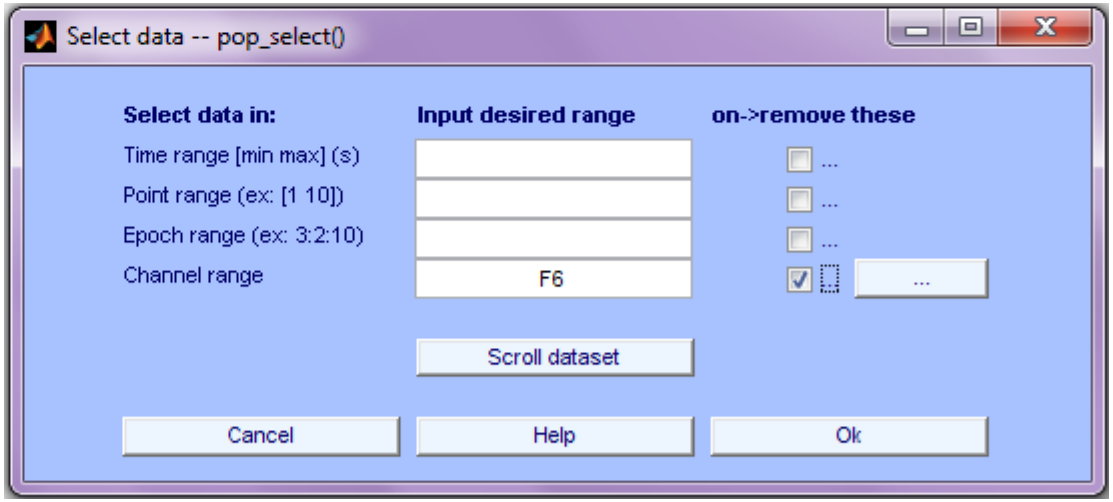


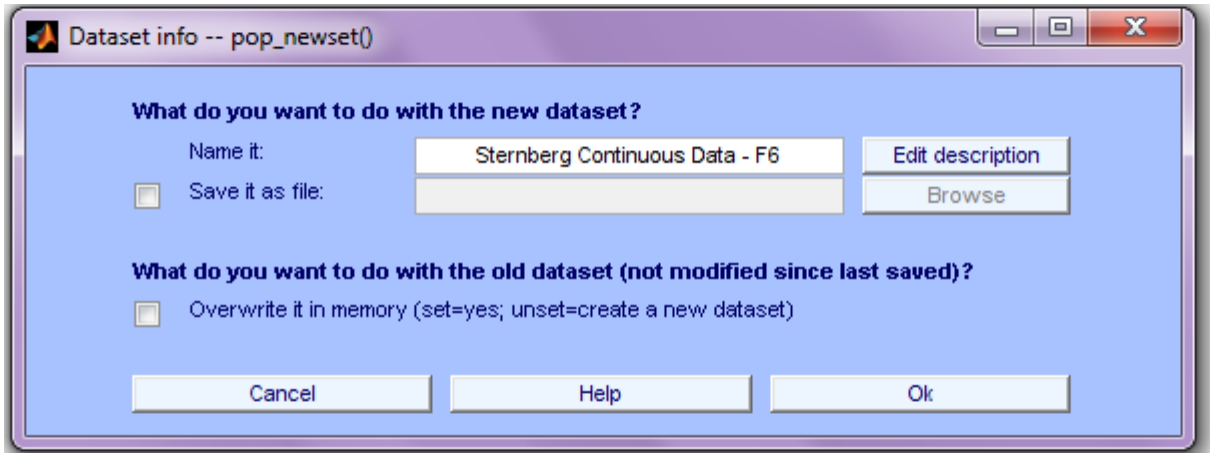
Remove channel(s)



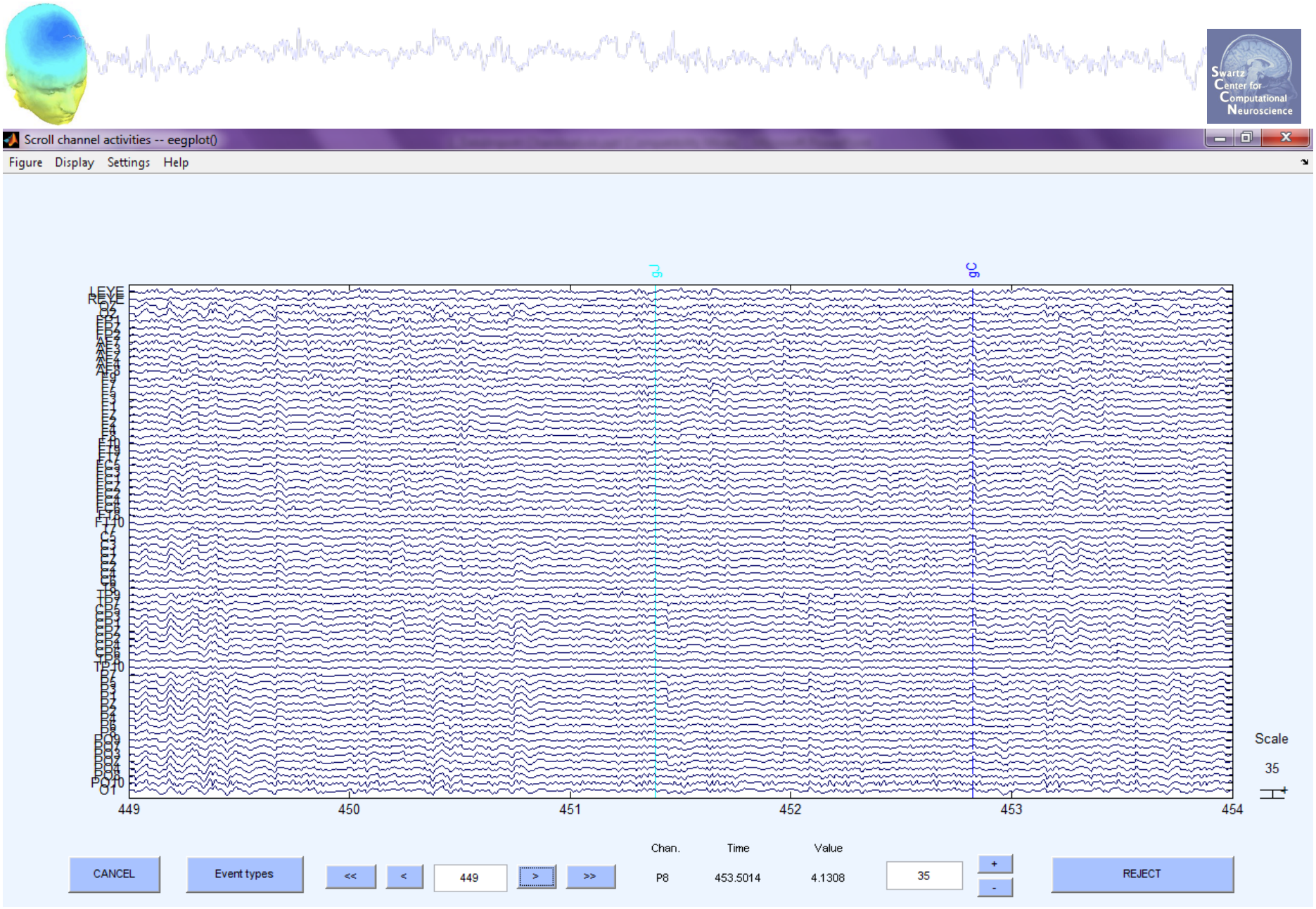
Removing channel(s)



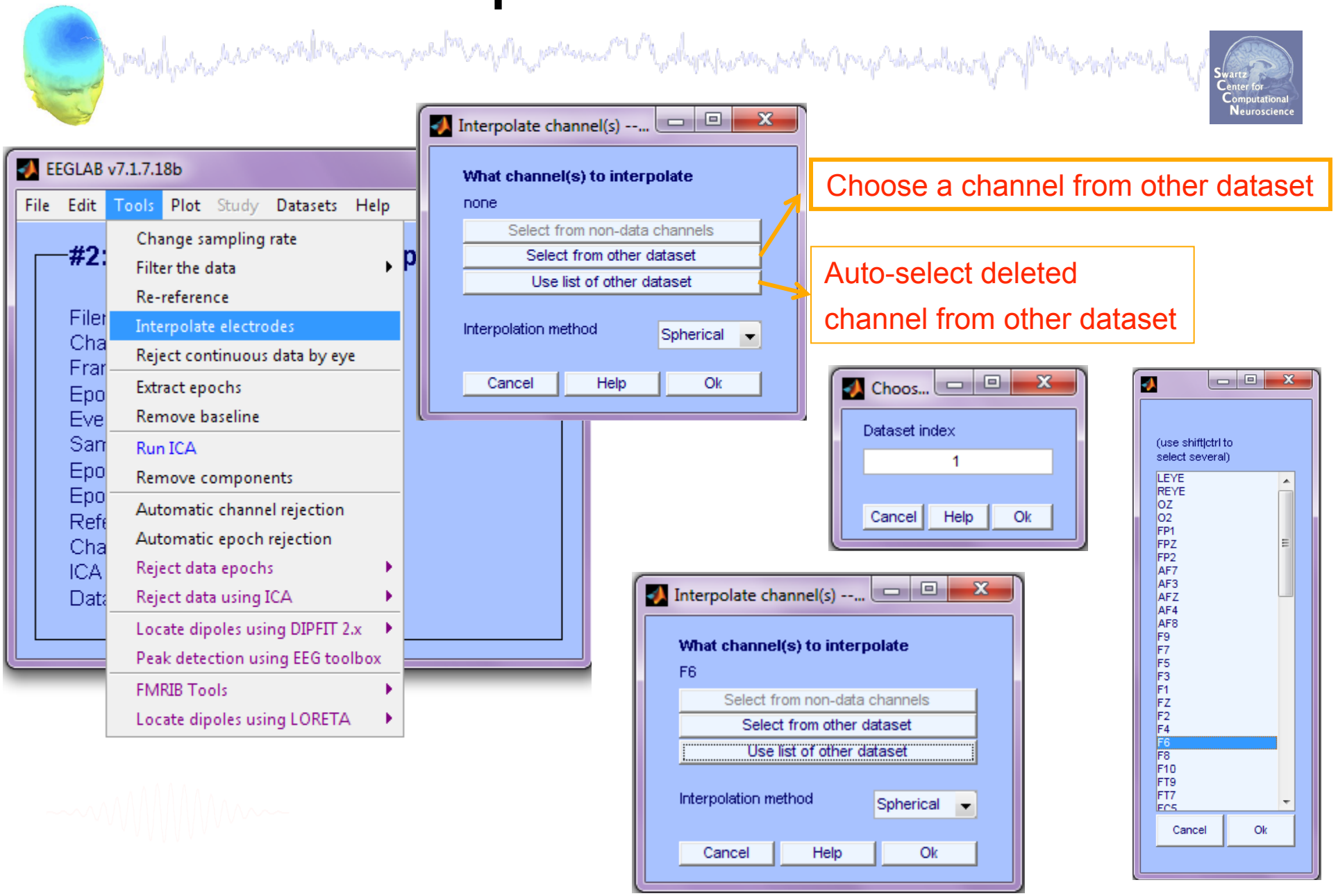




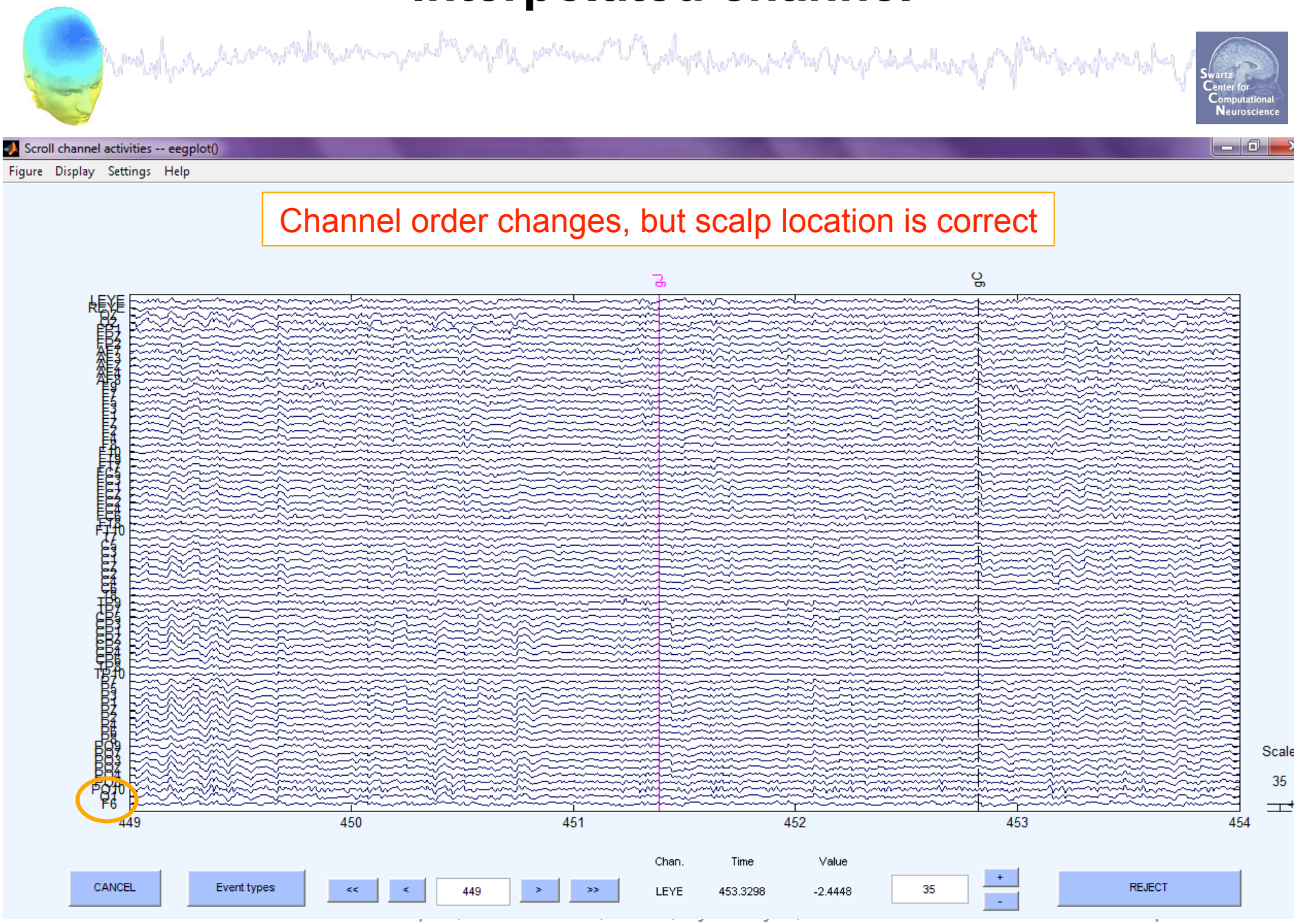
Channel removed



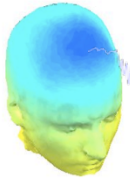
Interpolate bad channel



Interpolated channel



Exercise



- **ALL**
  -Load stern.set
  -Do not save your changes under the same filename!

- **Novice**
  -Re-reference the data to Cz.
  -Scroll data and explore plotting options under 'Settings'.

- **Intermediate**
  -Review events in Edit->Event values, rename an event in Select epochs/events.
  -Remove a channel and then replace it by interpolation.

- **Advanced**
  -Epoch the data on Memorize and Ignore letters separately, then use pop_comperp to compare ERPs between conditions.
  -Explore other menu options.