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

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Select epochs/events

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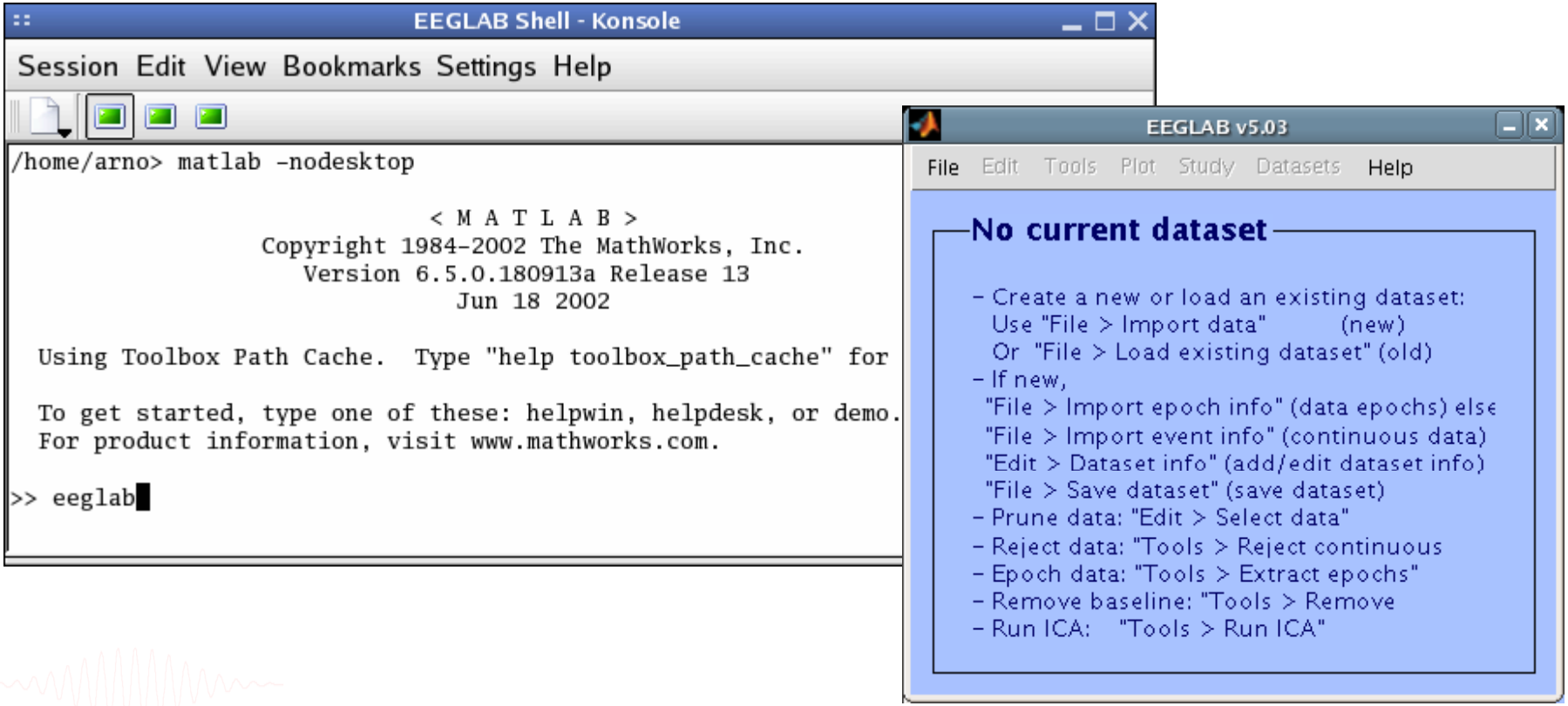
Channel analysis

Exercise...

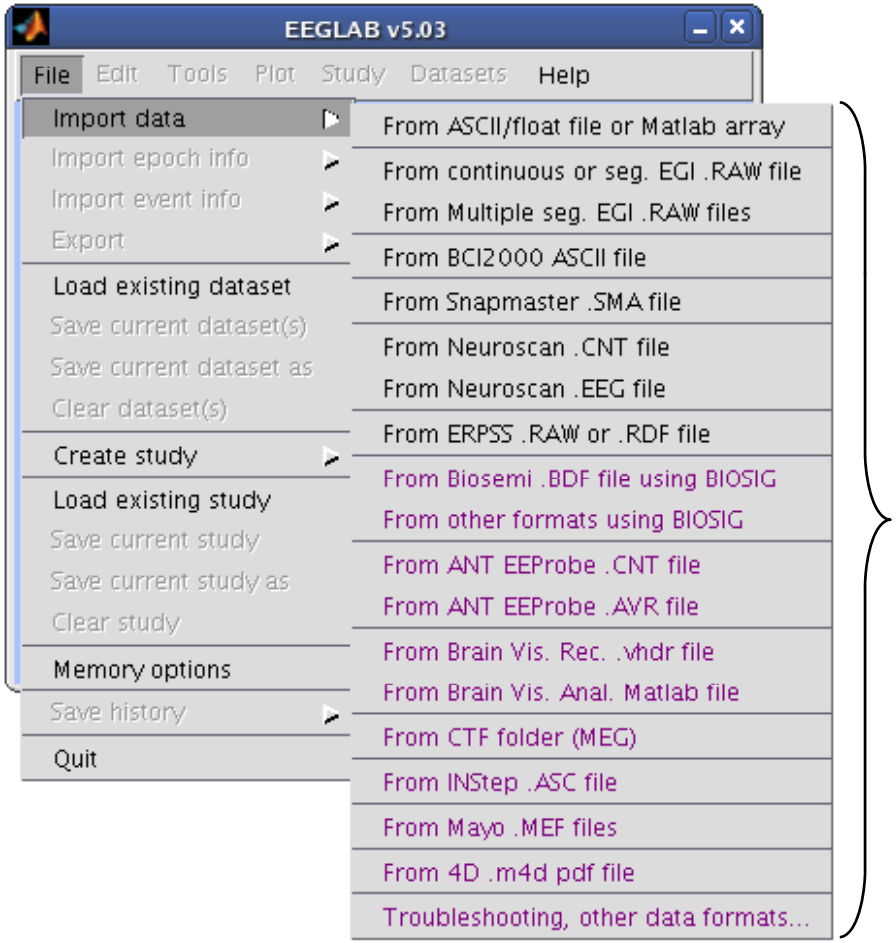
The EEGLAB Matlab software

main graphic interface



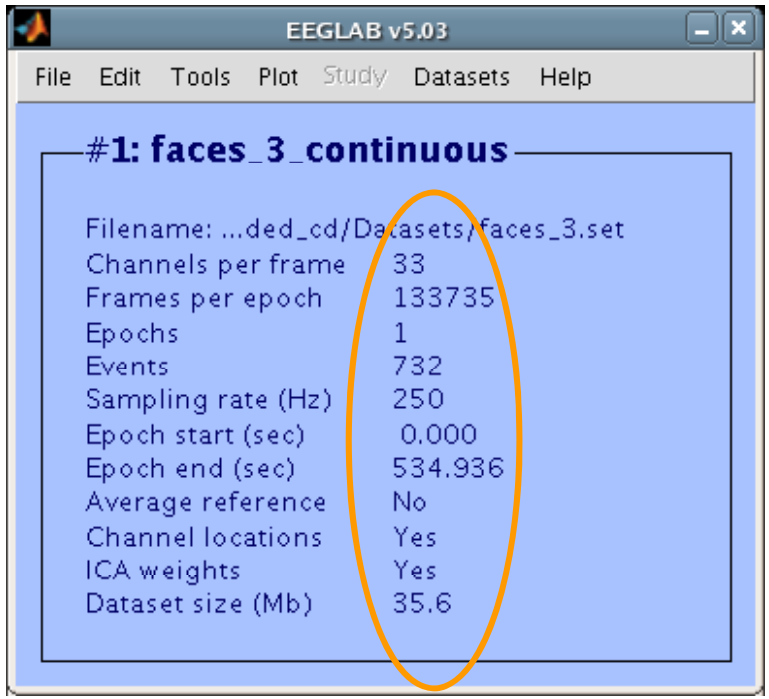
60 menus, more than 300 Matlab functions and more than 50,000 lines of code

Importing a dataset



EEGLAB supports many different raw data formats

Imported EEG data



The example data: faces vs. objects

File

../data/faces_3.set

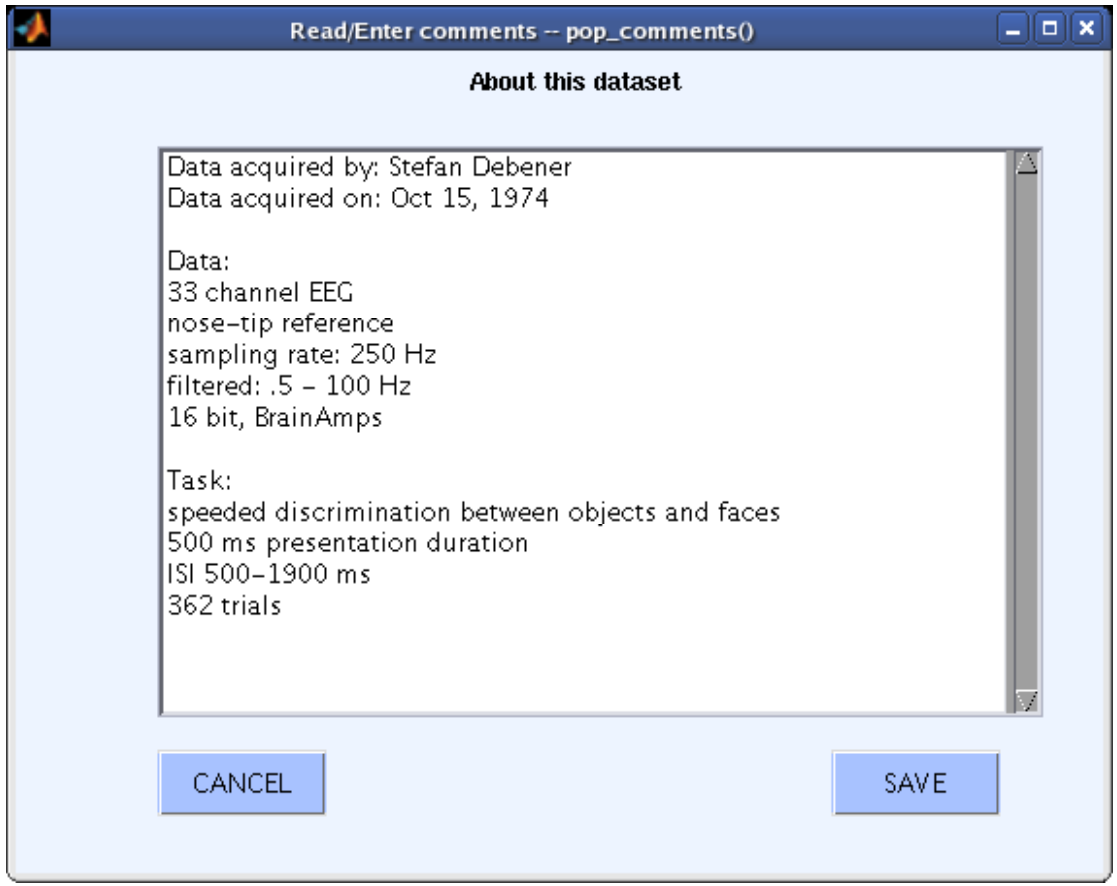
Data

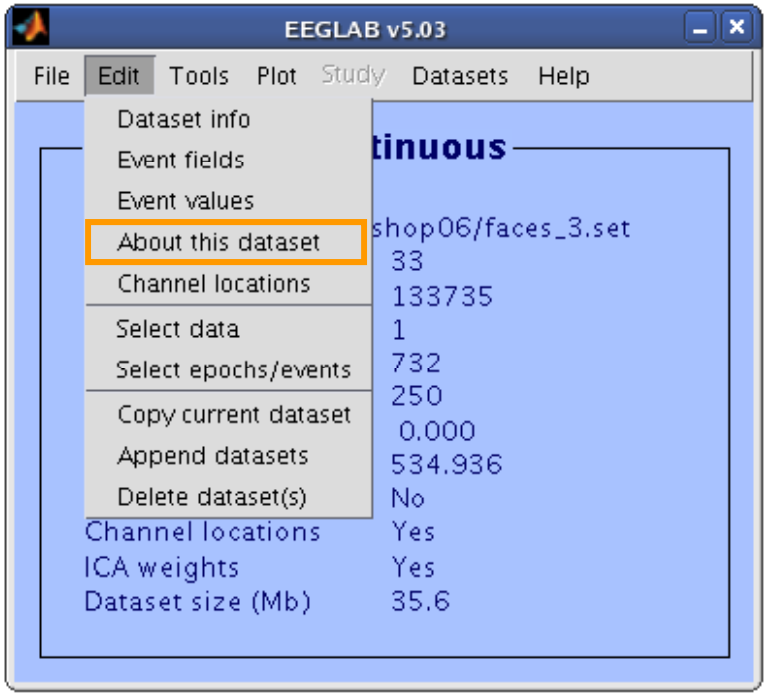
33 channel EEG, nose-tip reference, 250 Hz sampling rate, 0.5-100 Hz, 16 bit, BrainAmps

Task

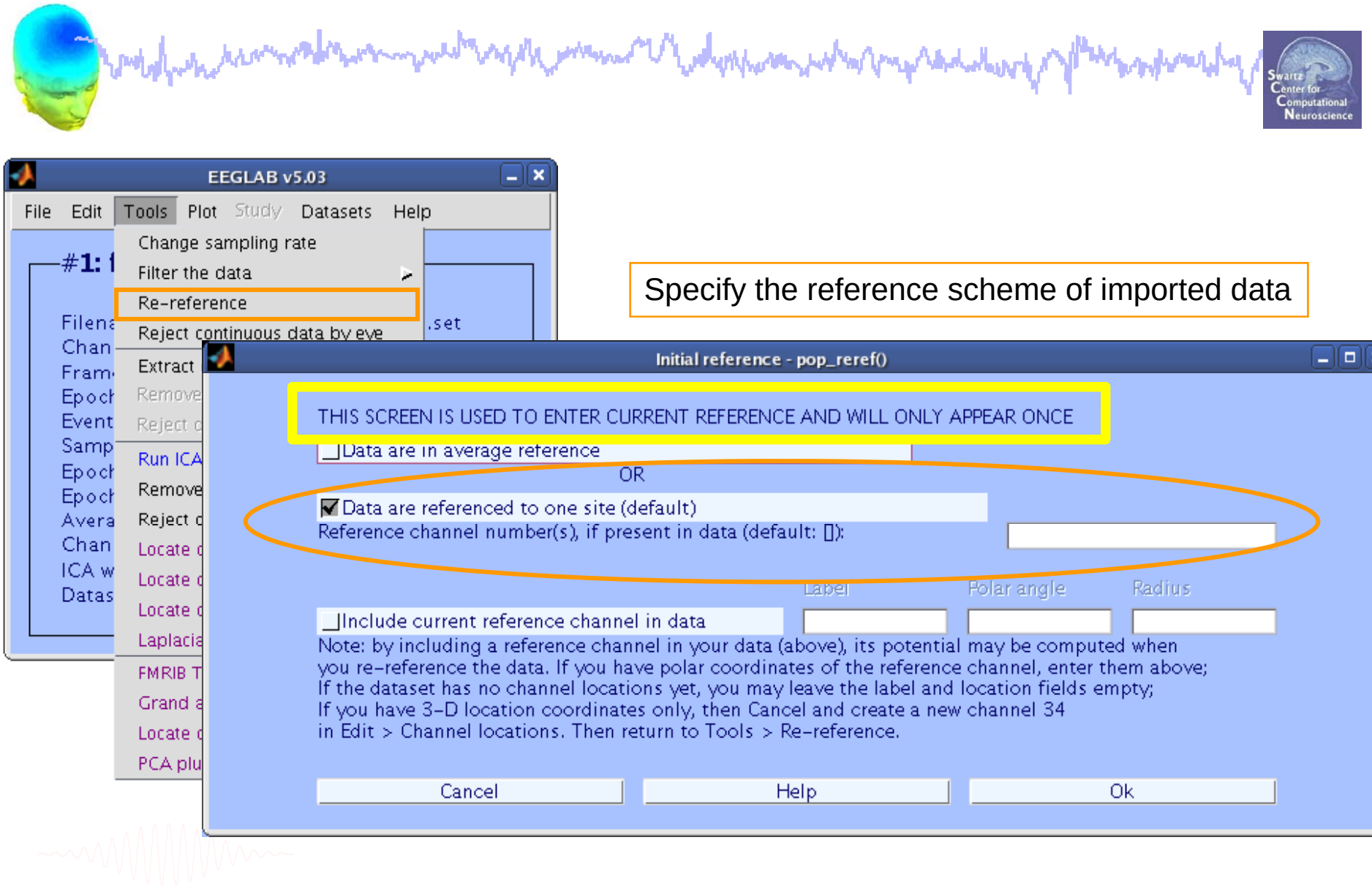
speeded discrimination between objects and faces, 500 ms presentation duration, ISI 500-1900 ms, 362 trials

Comments


Read/Enter comments -- pop_comments()
About this dataset
Data acquired by: Stefan Debener
Data acquired on: Oct 15, 1974
Data:
33 channel EEG
nose-tip reference
sampling rate: 250 Hz
filtered: .5 - 100 Hz
16 bit, BrainAmps
Task:
speeded discrimination between objects and faces
500 ms presentation duration
ISI 500-1900 ms
362 trials
CANCEL
SAVE

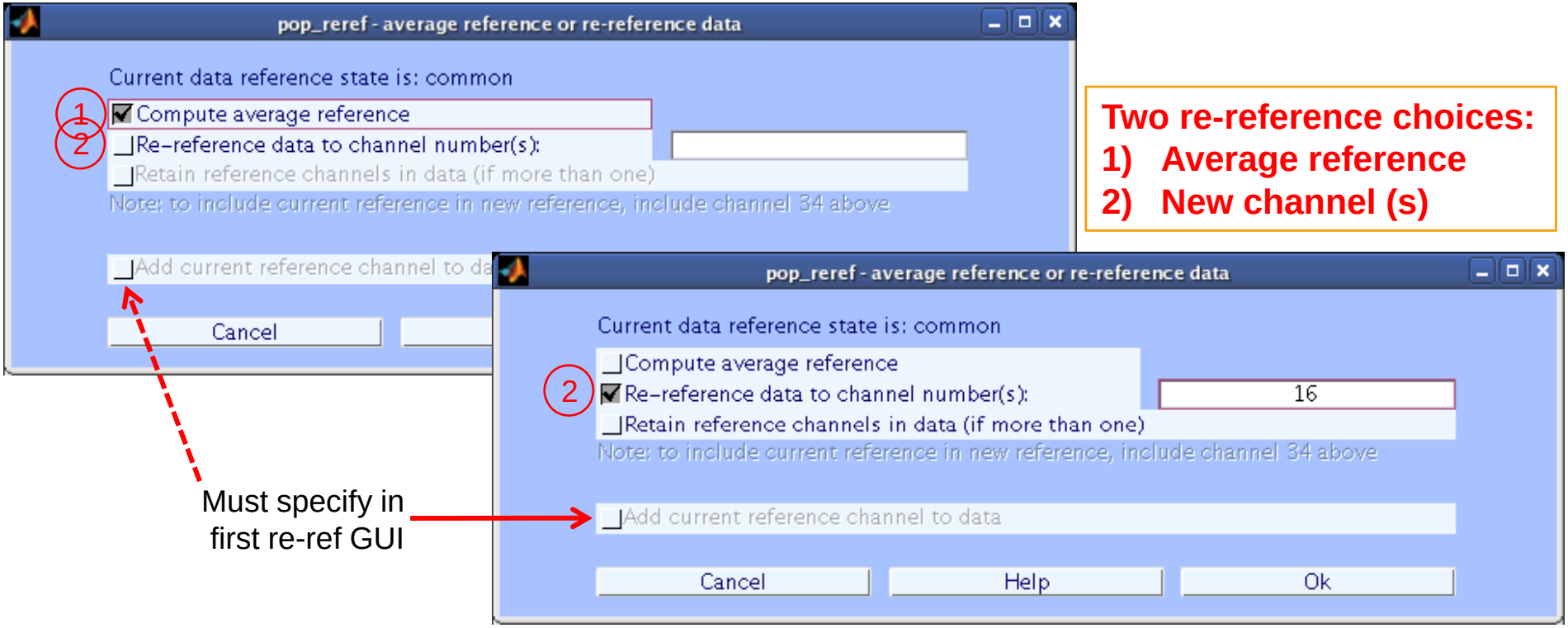

EEGLAB v5.03
File
Edit
Tools
Plot
Study
Datasets
Help
Dataset info
Event fields
Event values
About this dataset
Channel locations
Select data
Select epochs/events
Copy current dataset
Append datasets
Delete dataset(s)
tinuous
shop06/faces_3.set
33
133735
1
732
250
0.000
534.936
No
Channel locations
Yes
ICA weights
Yes
Dataset size (Mb)
35.6

Re-reference data



Specify the reference scheme of imported data

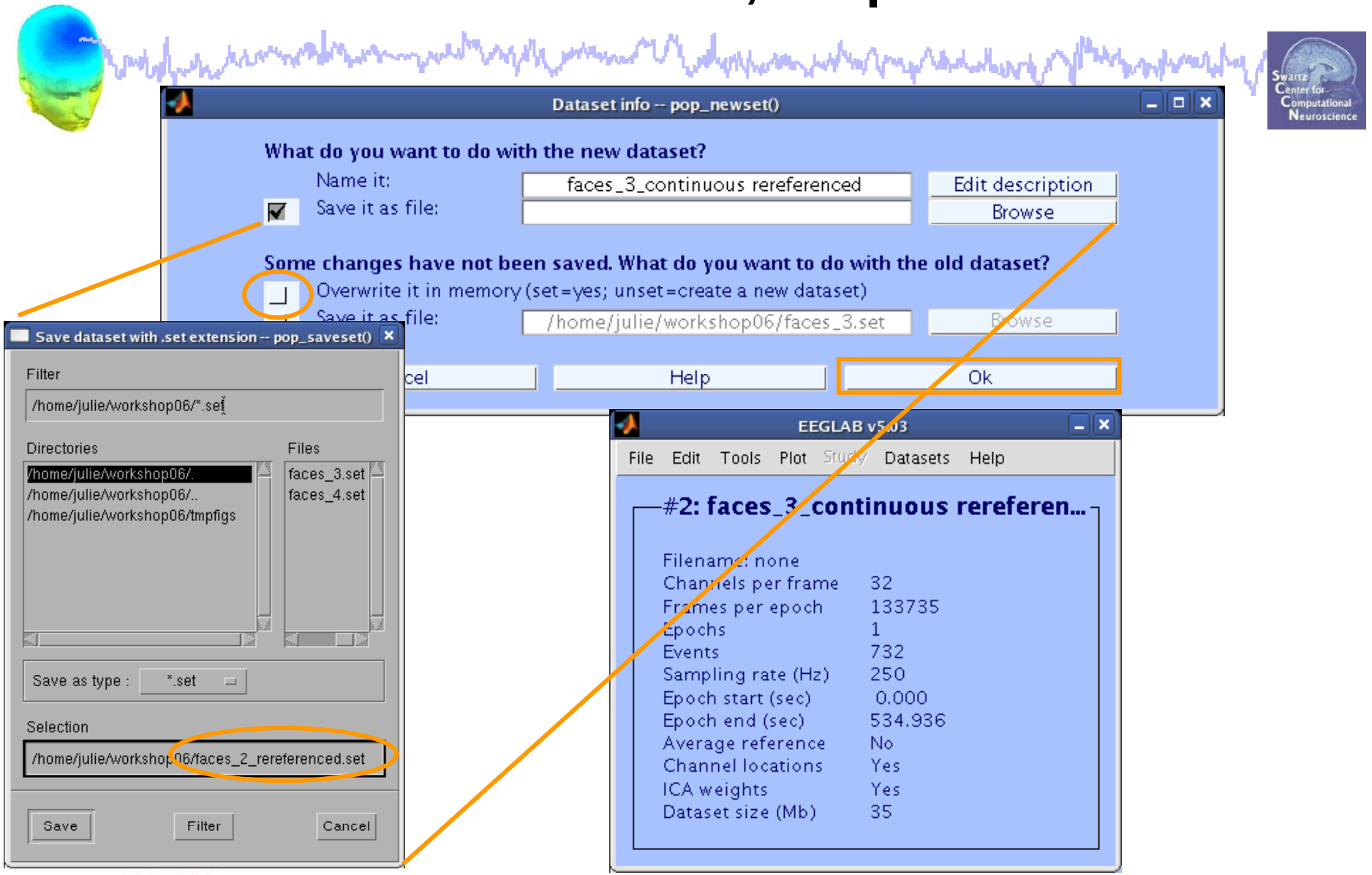
Rereferencing, cont'd



Two re-reference choices:
1) **Average reference**
2) **New channel (s)**

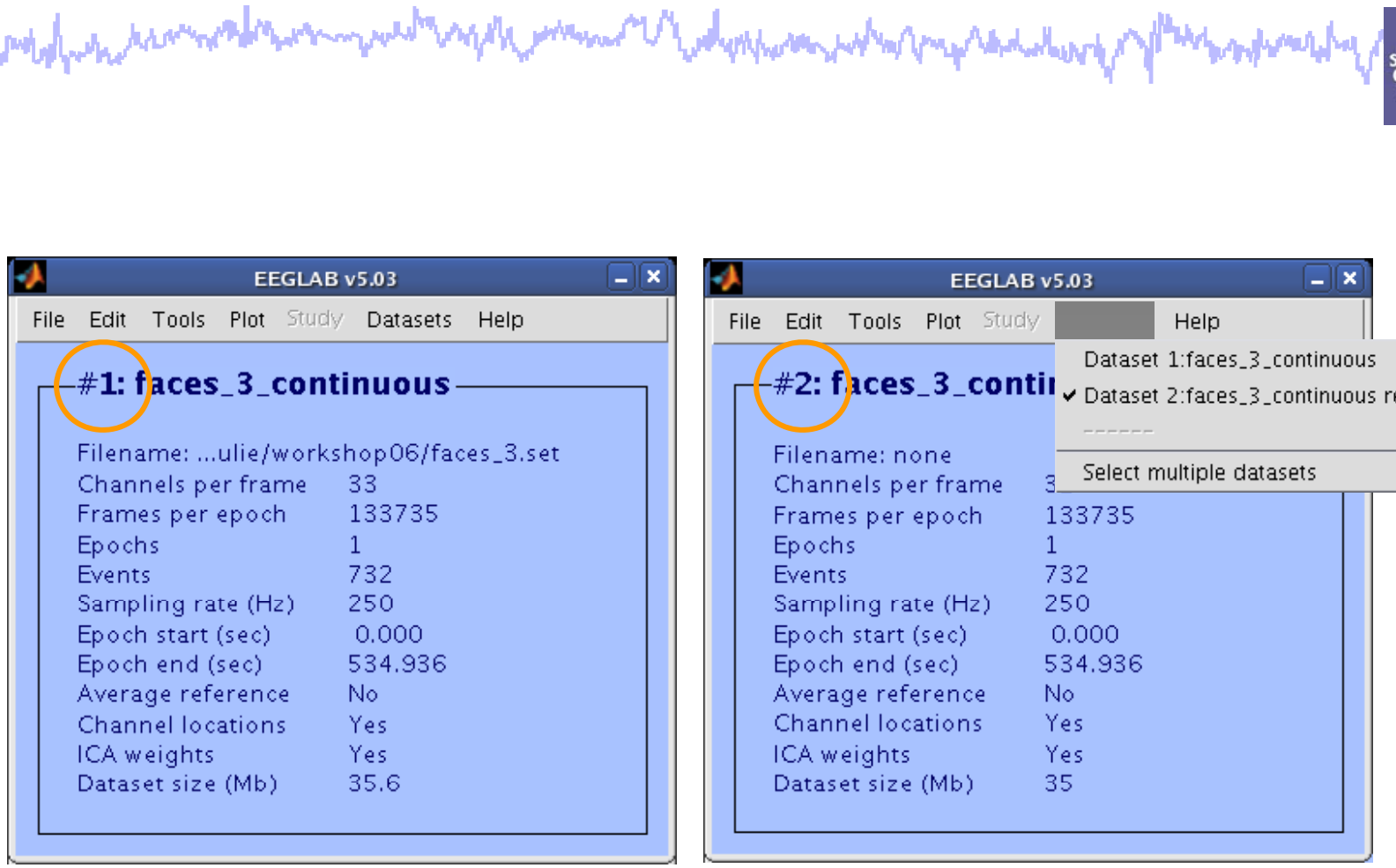
```
EEG = pop_reref( EEG, 16, 'refstate',0);
```

Save new dataset, keep old one

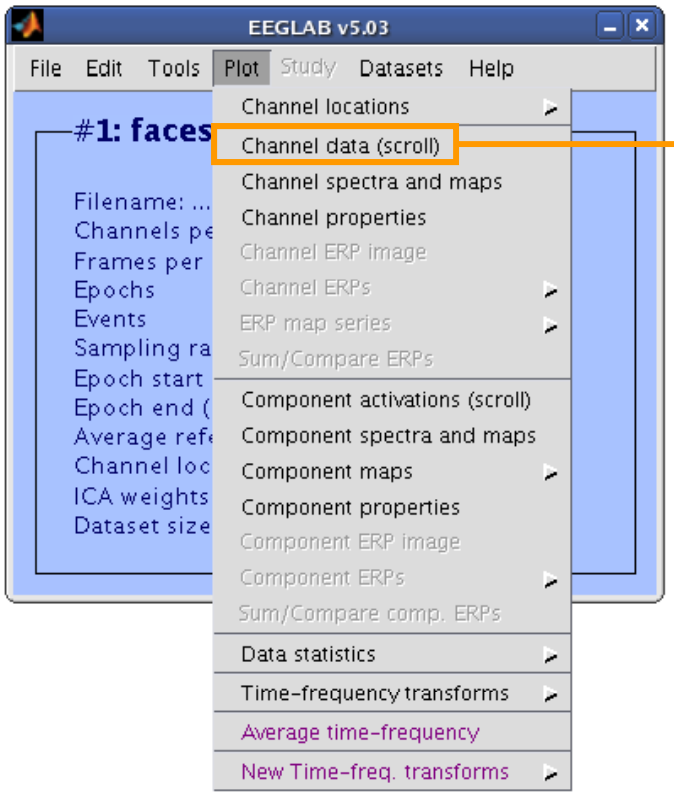


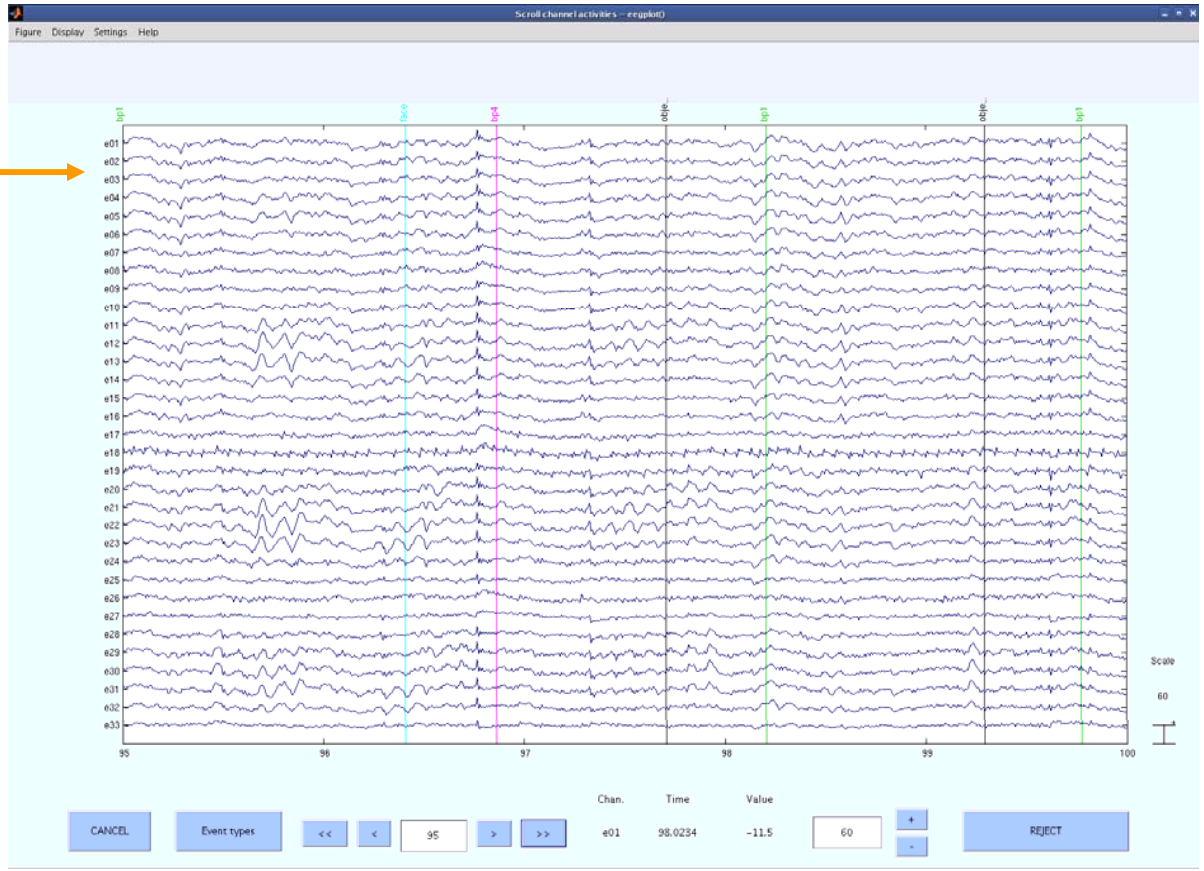

```
[ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG,…
    EEG, 1, 'setname', 'rereferenced data');
```

Multiple active datasets (ALLEEG)



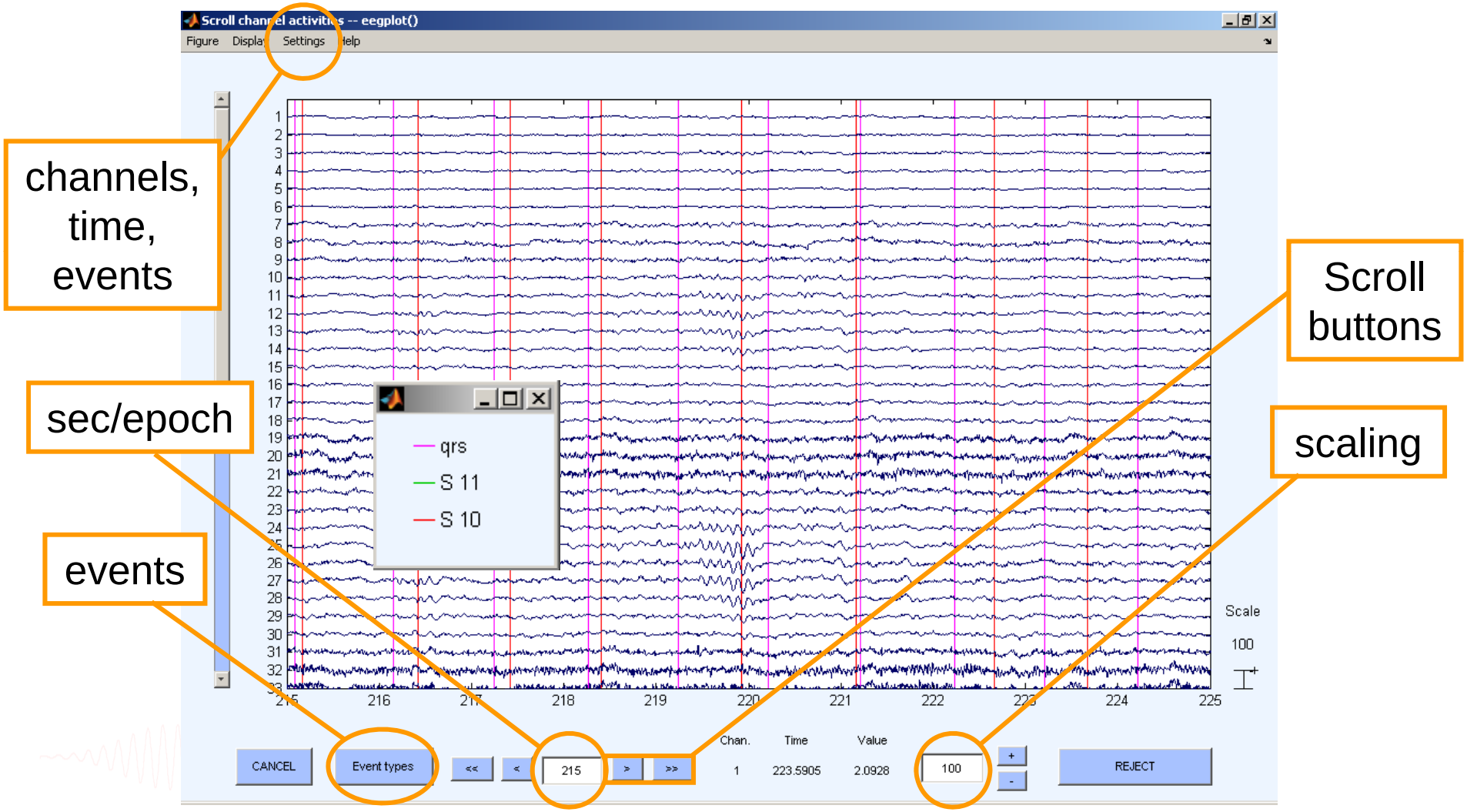
Scroll data






```
>> 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

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Import channel location file

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Import data events

Task 4

Extract data epochs

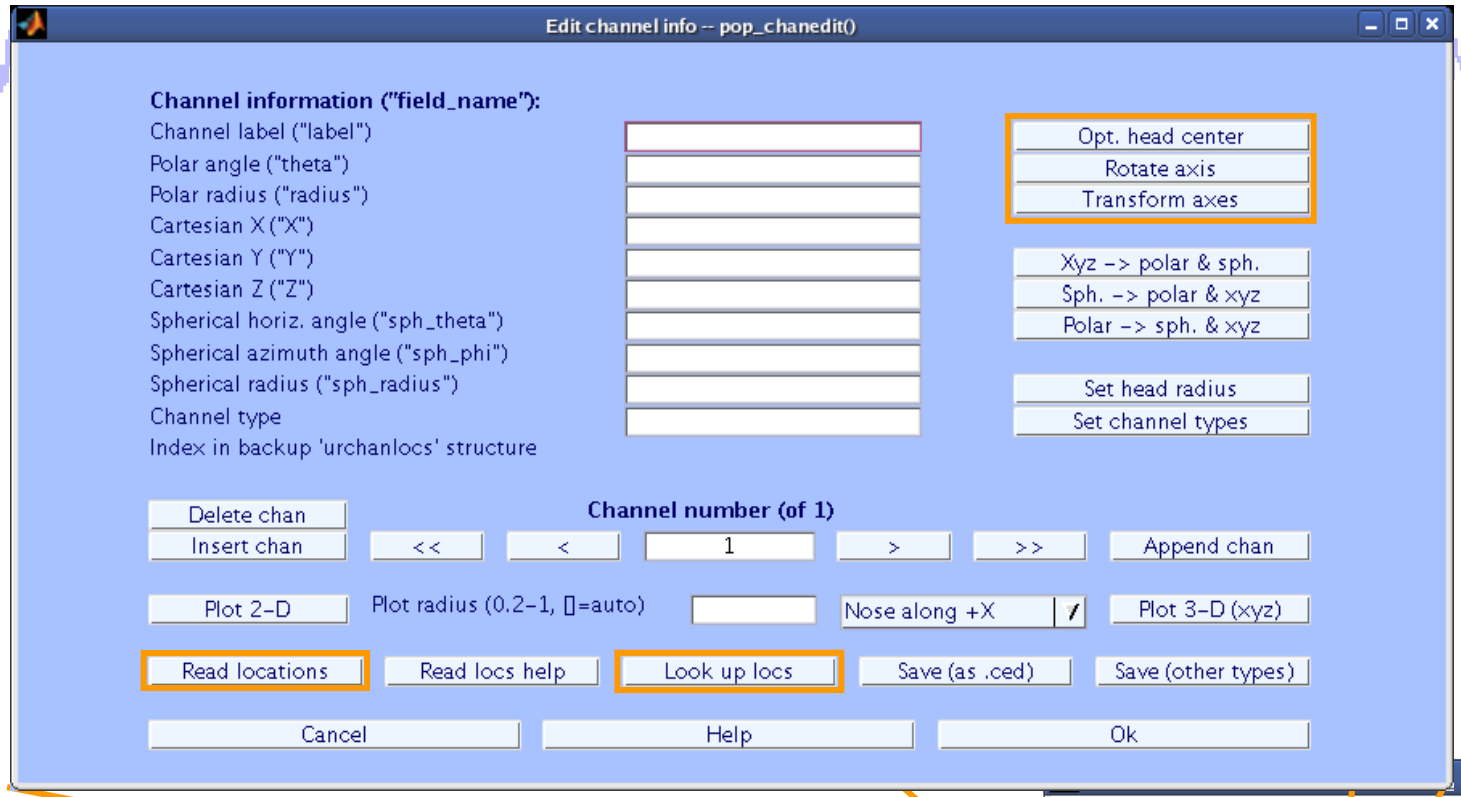
Select epochs/events

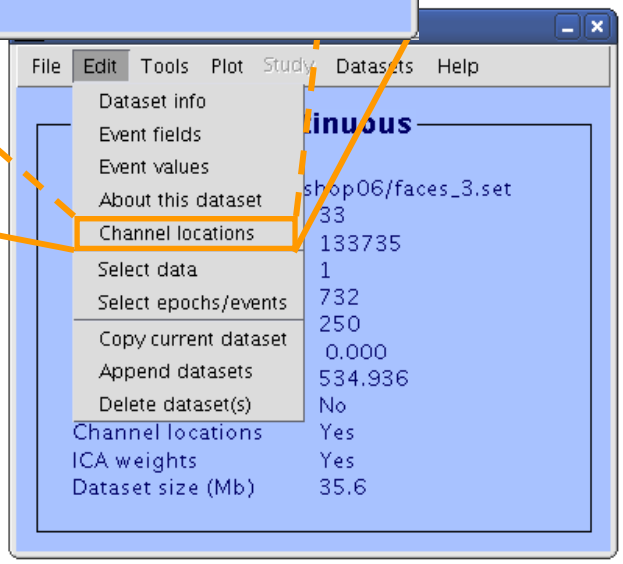
Task 4

Channel analysis

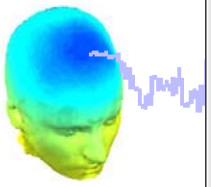
Exercise...

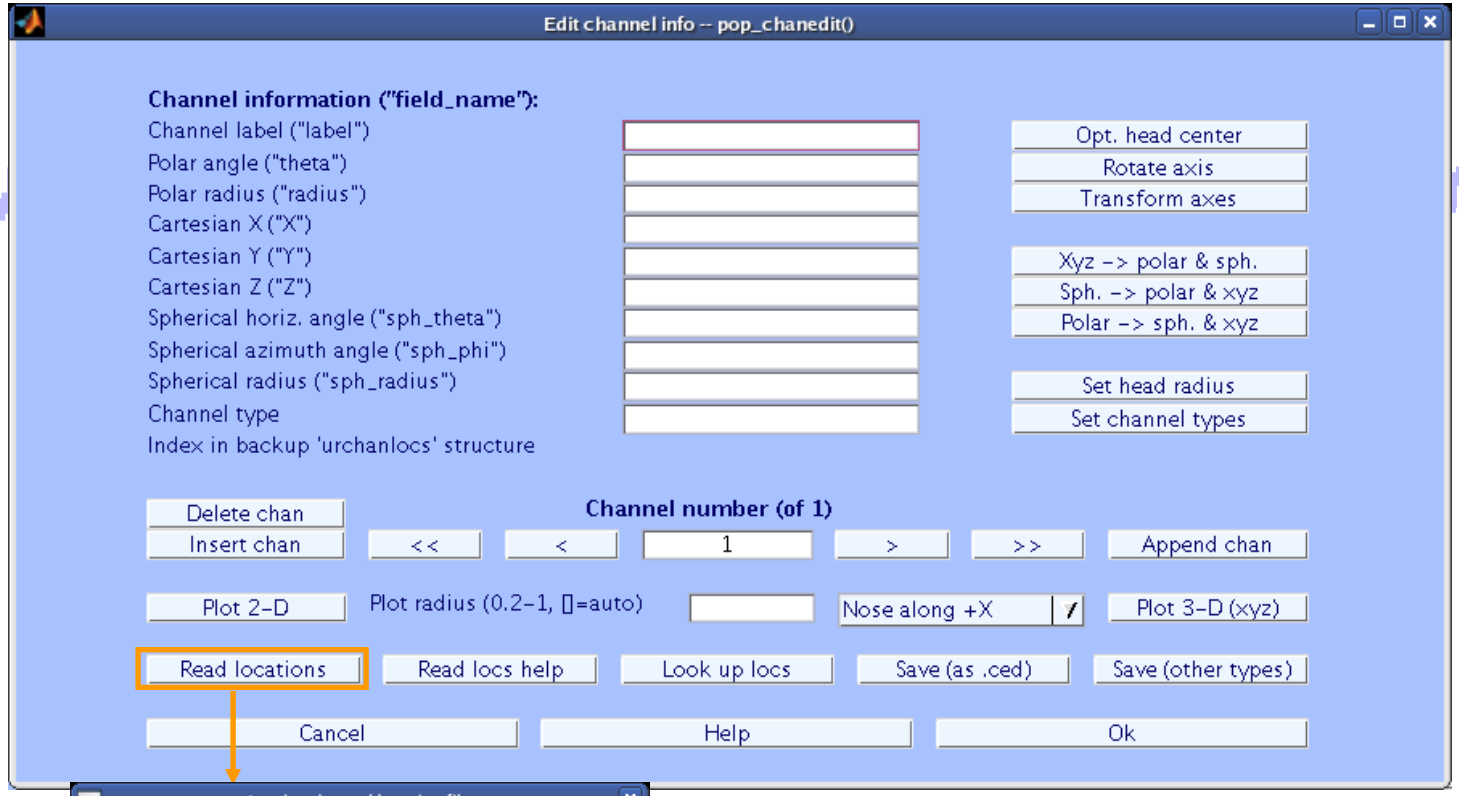
Import channel locations

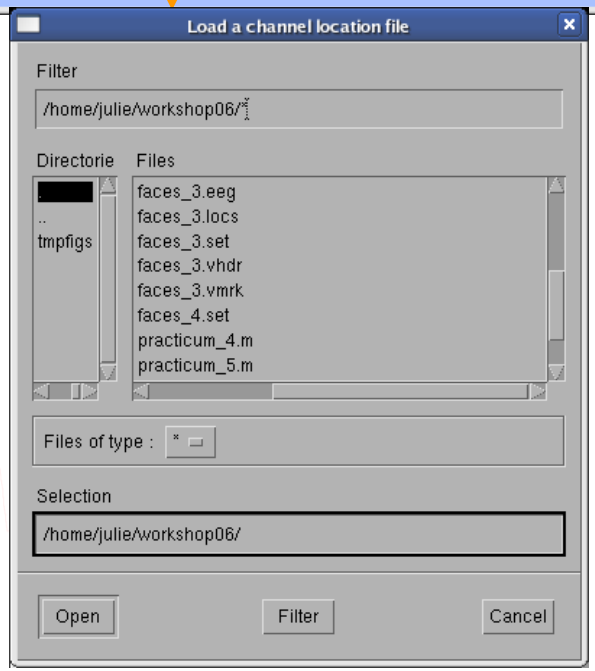


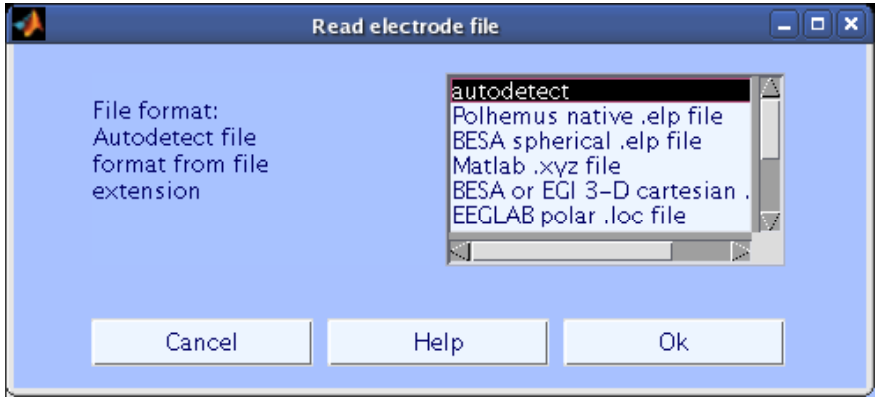


- Use channel names and automatically assign channel location
- Import channel location file
- Modify/stretch/rotate channel locations

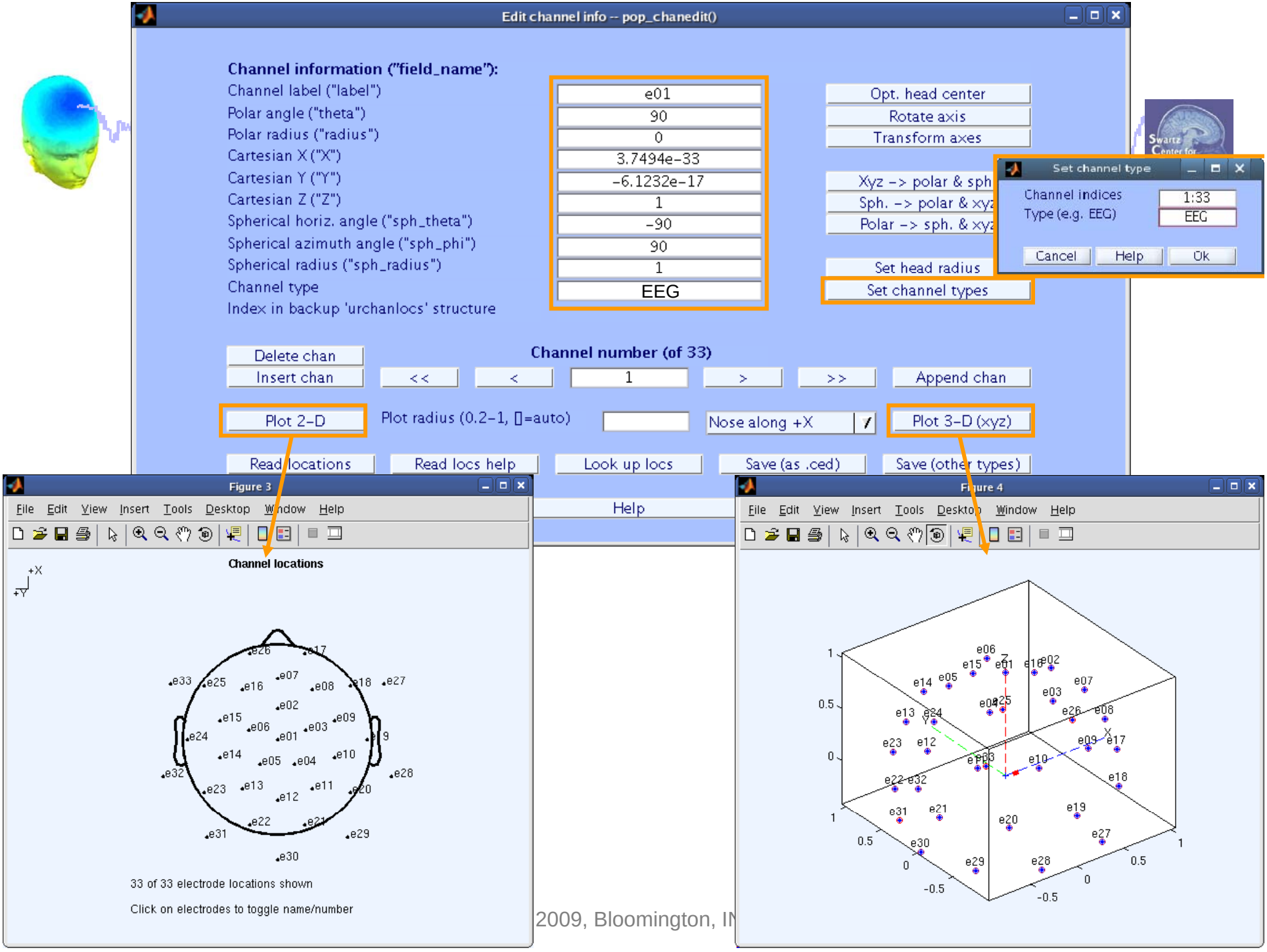






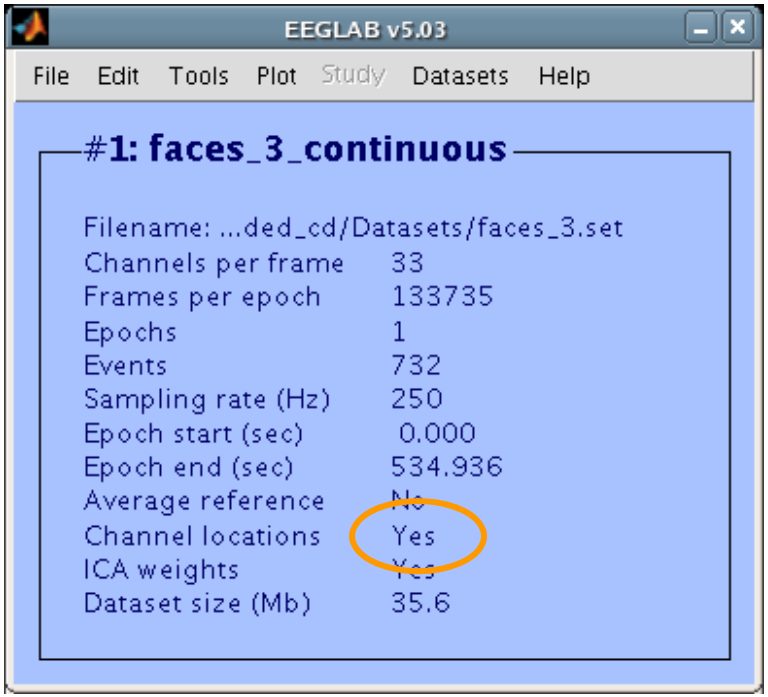


7 file formats supported (Polhemus, BESA, …)



2009, Bloomington, IN

Import channel locations



Data importing and channel analysis

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Import raw data

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Import channel location file

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Import data events

Task 4

Extract data epochs

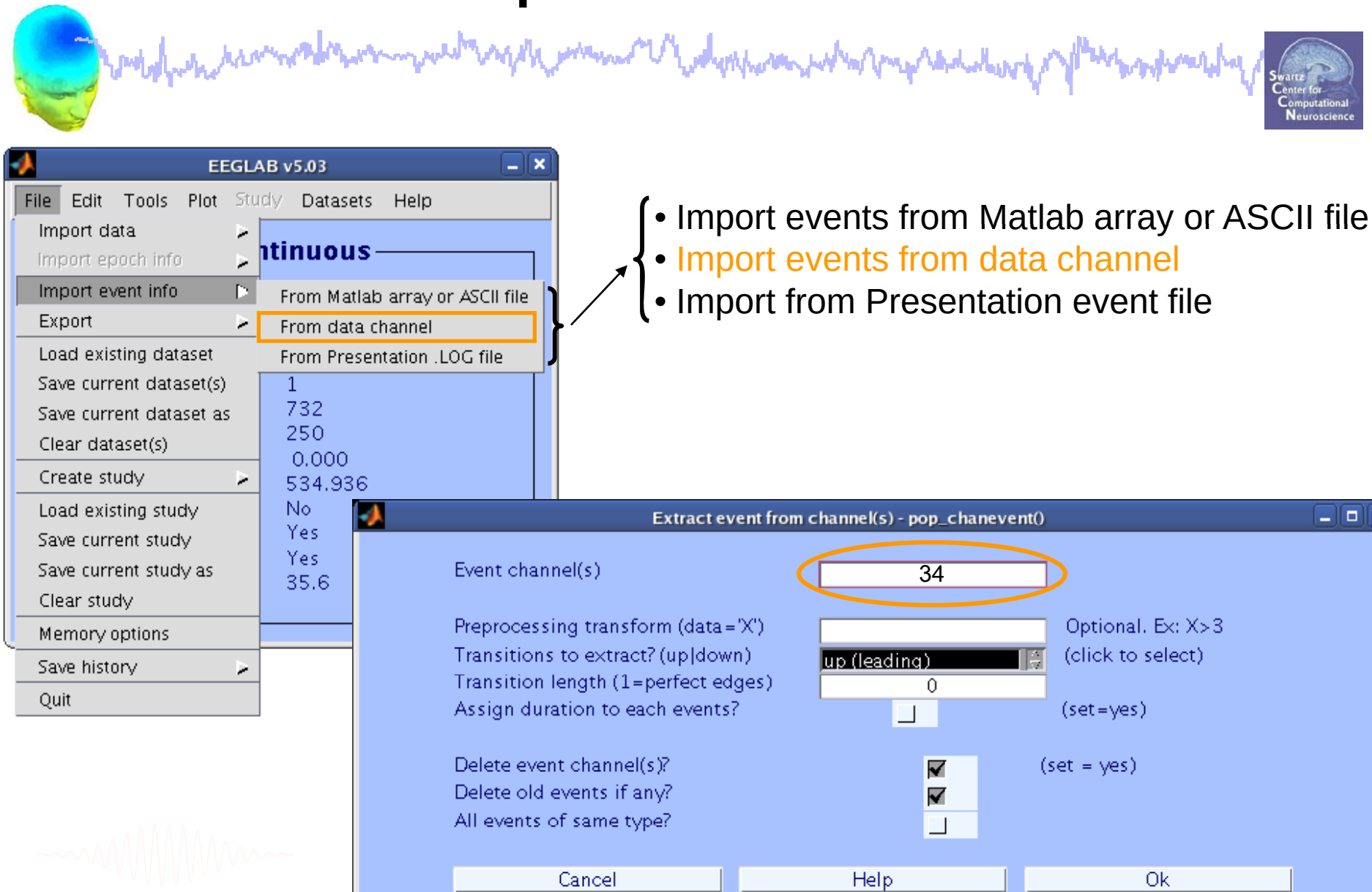
Select epochs/events

Task 4

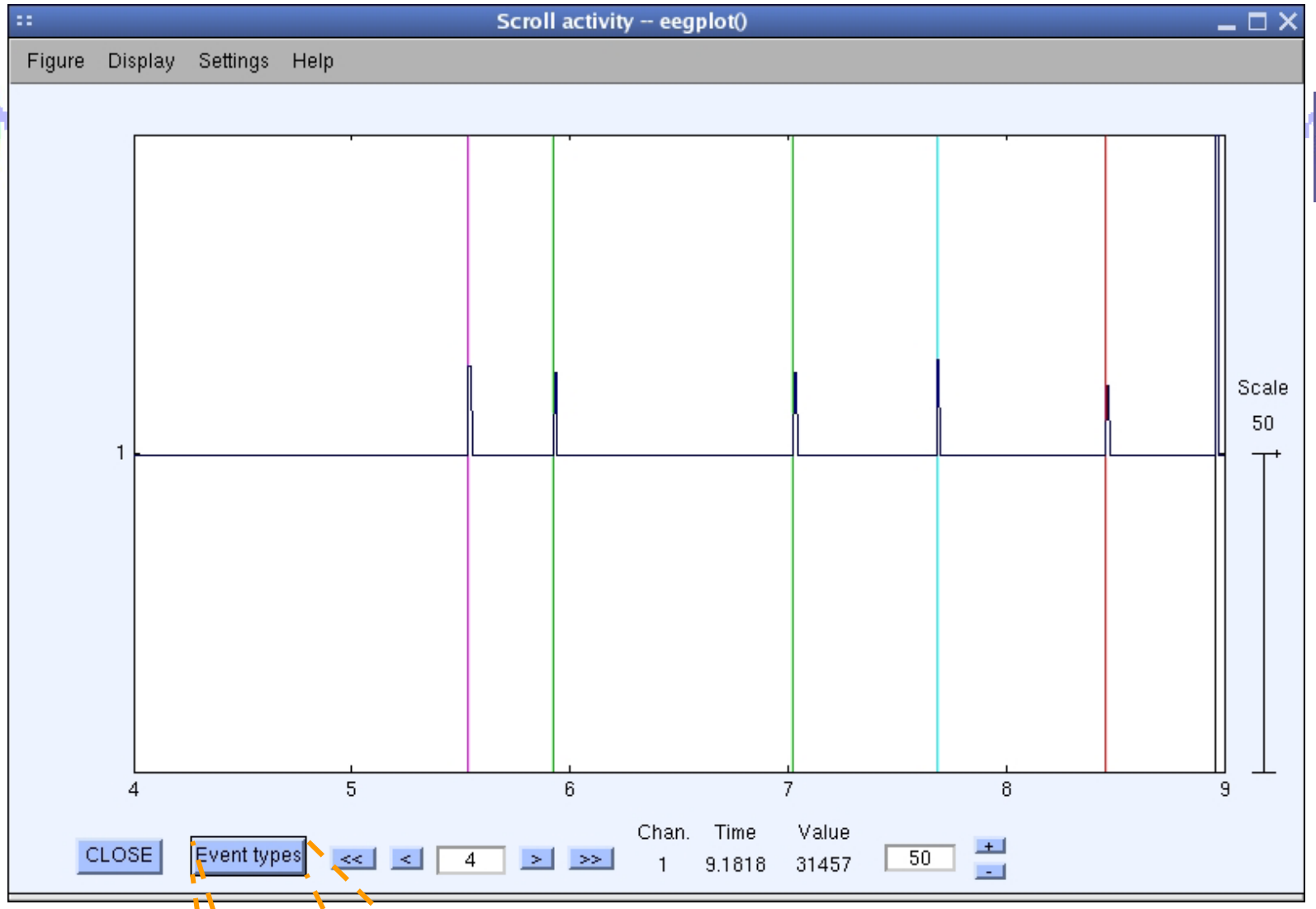
Channel analysis

Exercise...

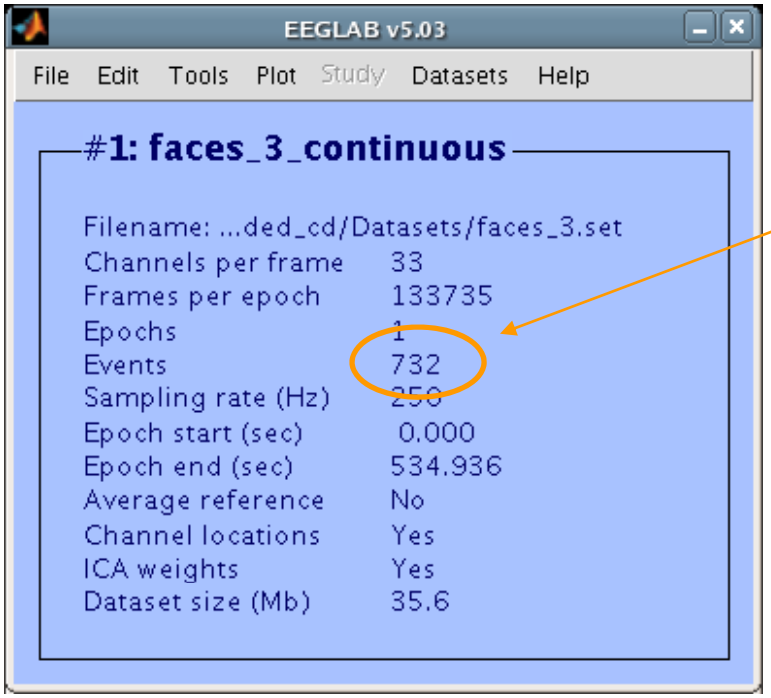
Import data events



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

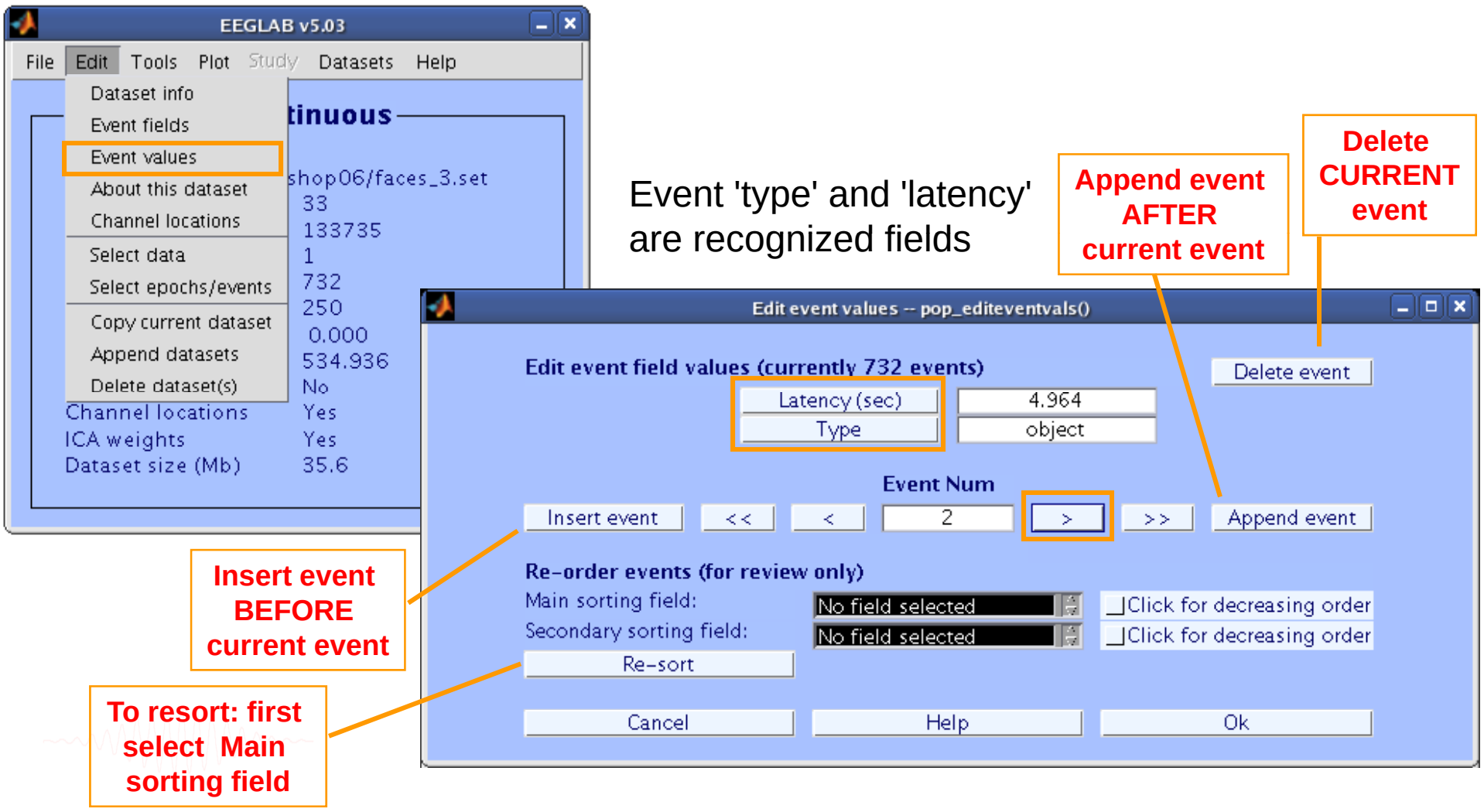

Scroll activity -- eegplot()
Figure
Display
Settings
Help
Scale
50
1
4
5
6
7
8
9
CLOSE
Event types
<<
<
4
>
>>
Chan.
Time
Value
1
9.1818
31457
50
+
-
3145929
3145743
3145742
3145741
3145739

Import data events

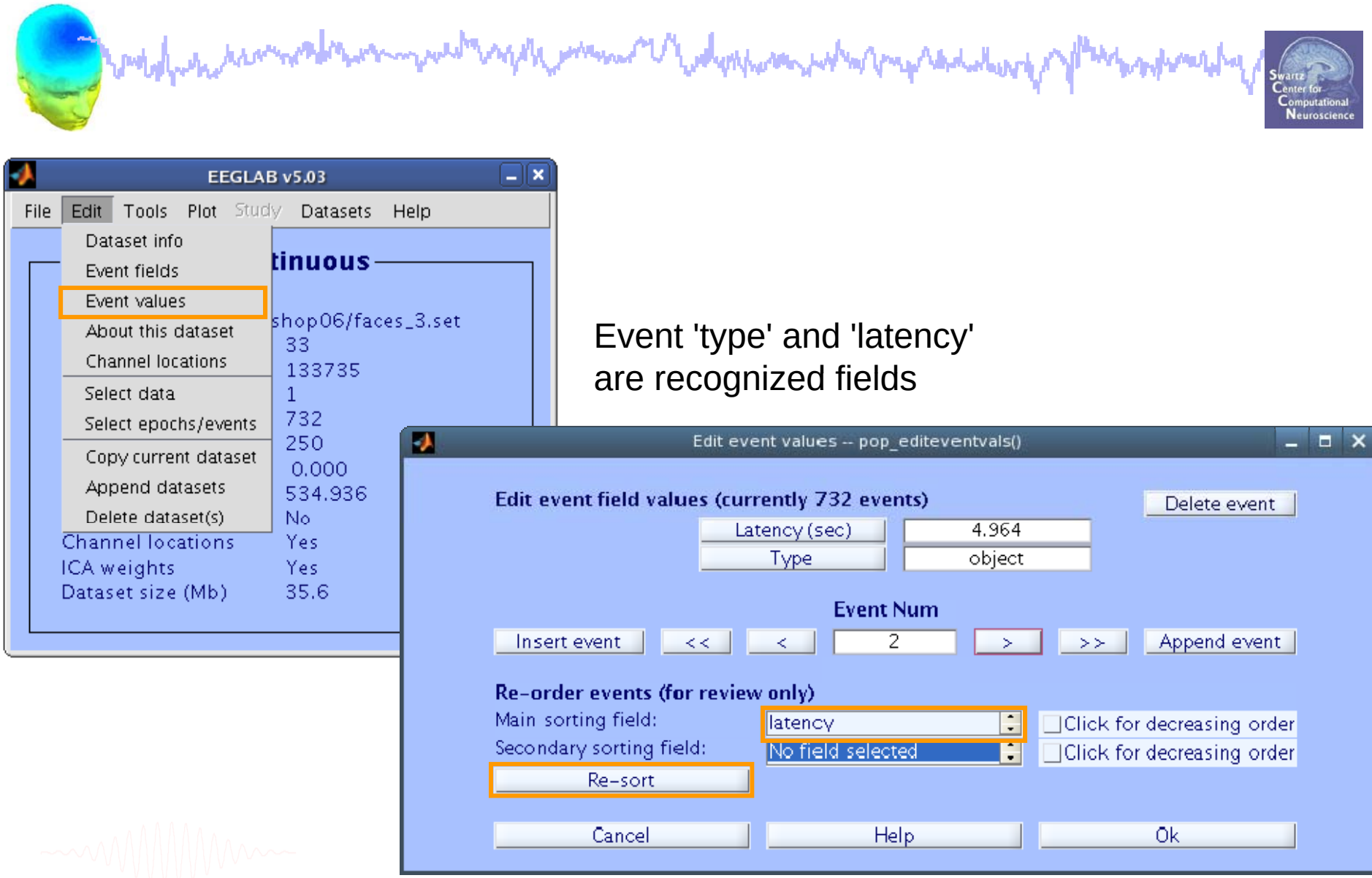


If event import was successful, you will see an appropriate number here

Review event values

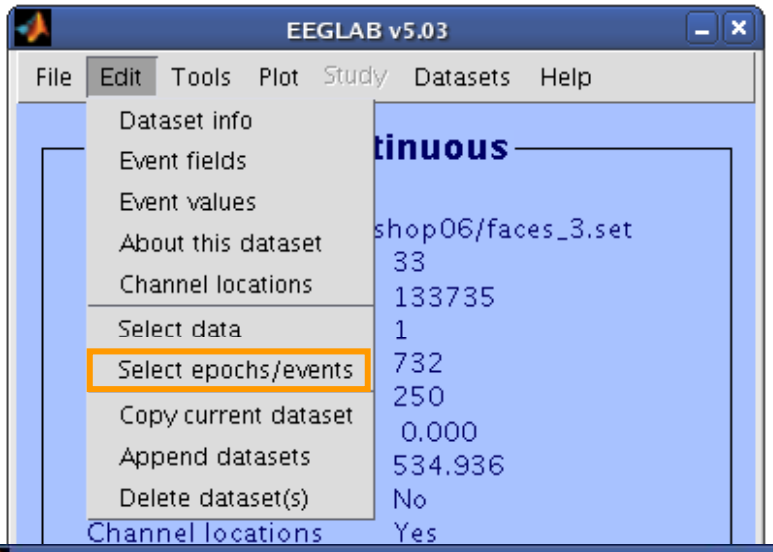


Review event values



Event 'type' and 'latency' are recognized fields

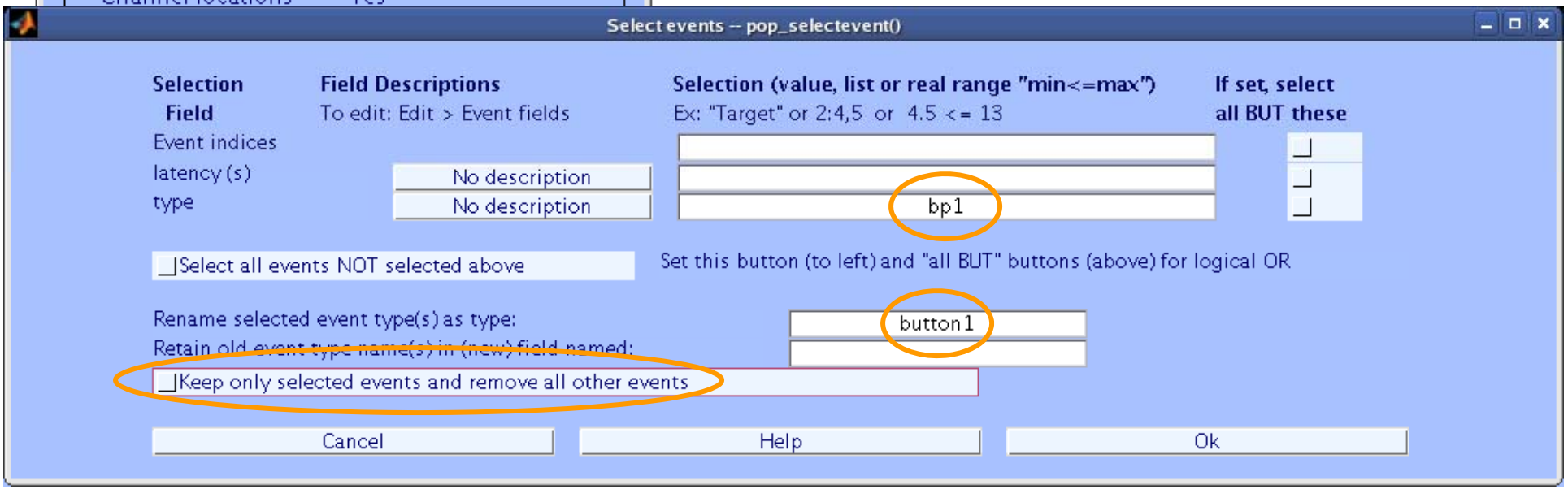
Renaming events



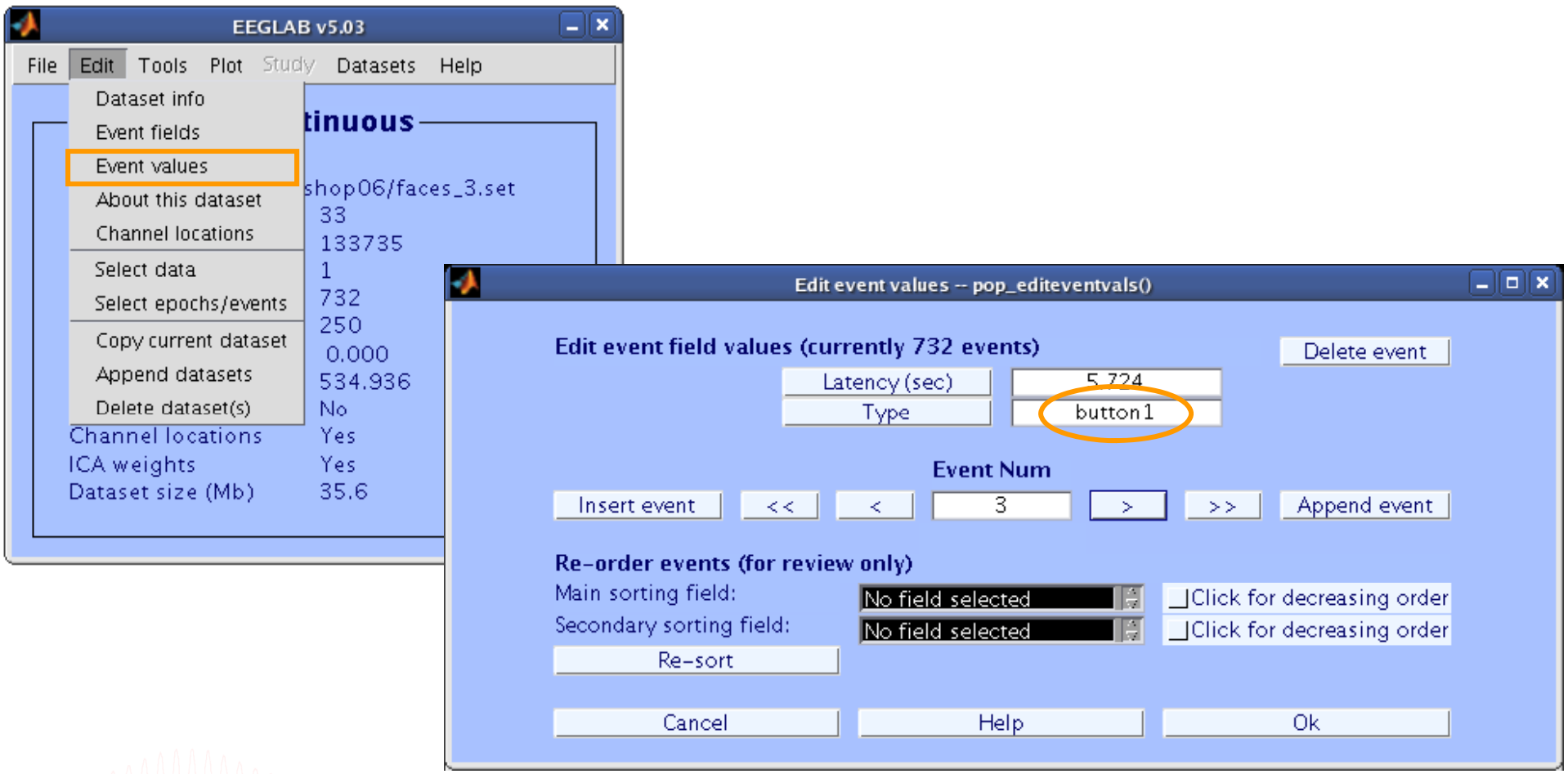
1) input original 'type' code

2) input new 'type' code

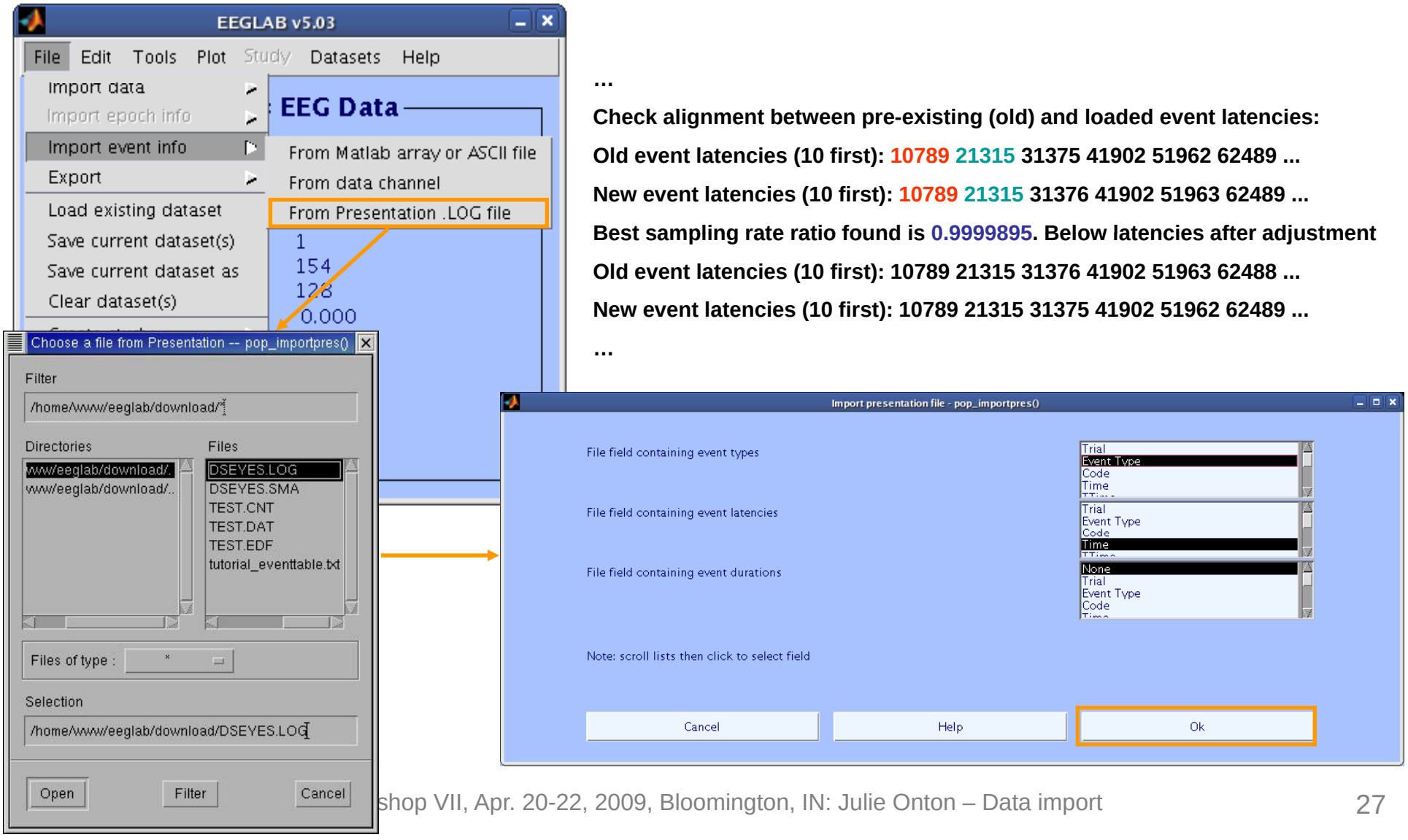
3) Keep/delete all other events



Renaming events



Alternative method for importing events: Import events from event file



...

Check alignment between pre-existing (old) and loaded event latencies:

Old event latencies (10 first): 10789 21315 31375 41902 51962 62489 ...

New event latencies (10 first): 10789 21315 31376 41902 51963 62489 ...

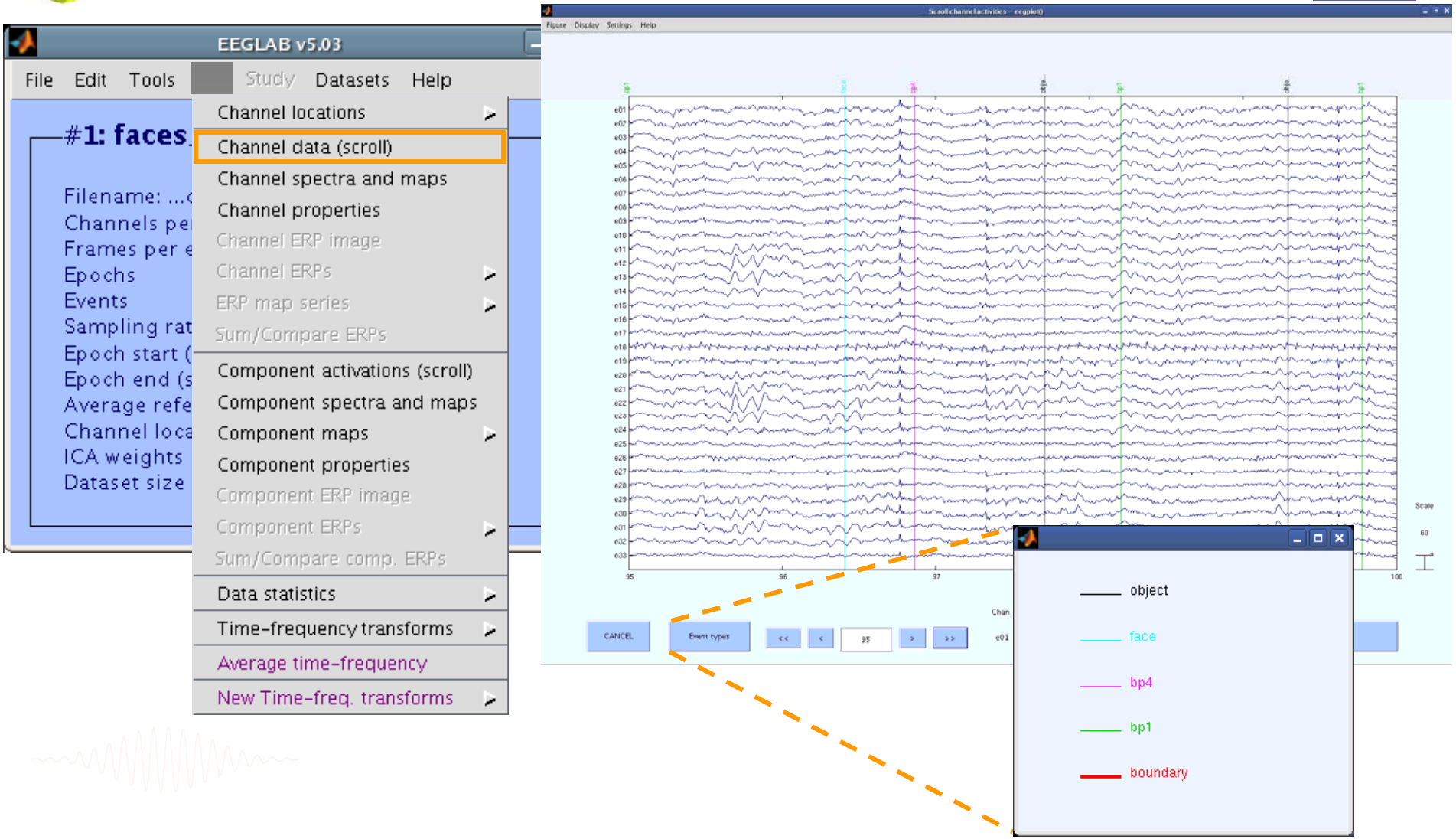
Best sampling rate ratio found is 0.9999895. Below latencies after adjustment

Old event latencies (10 first): 10789 21315 31376 41902 51963 62488 ...

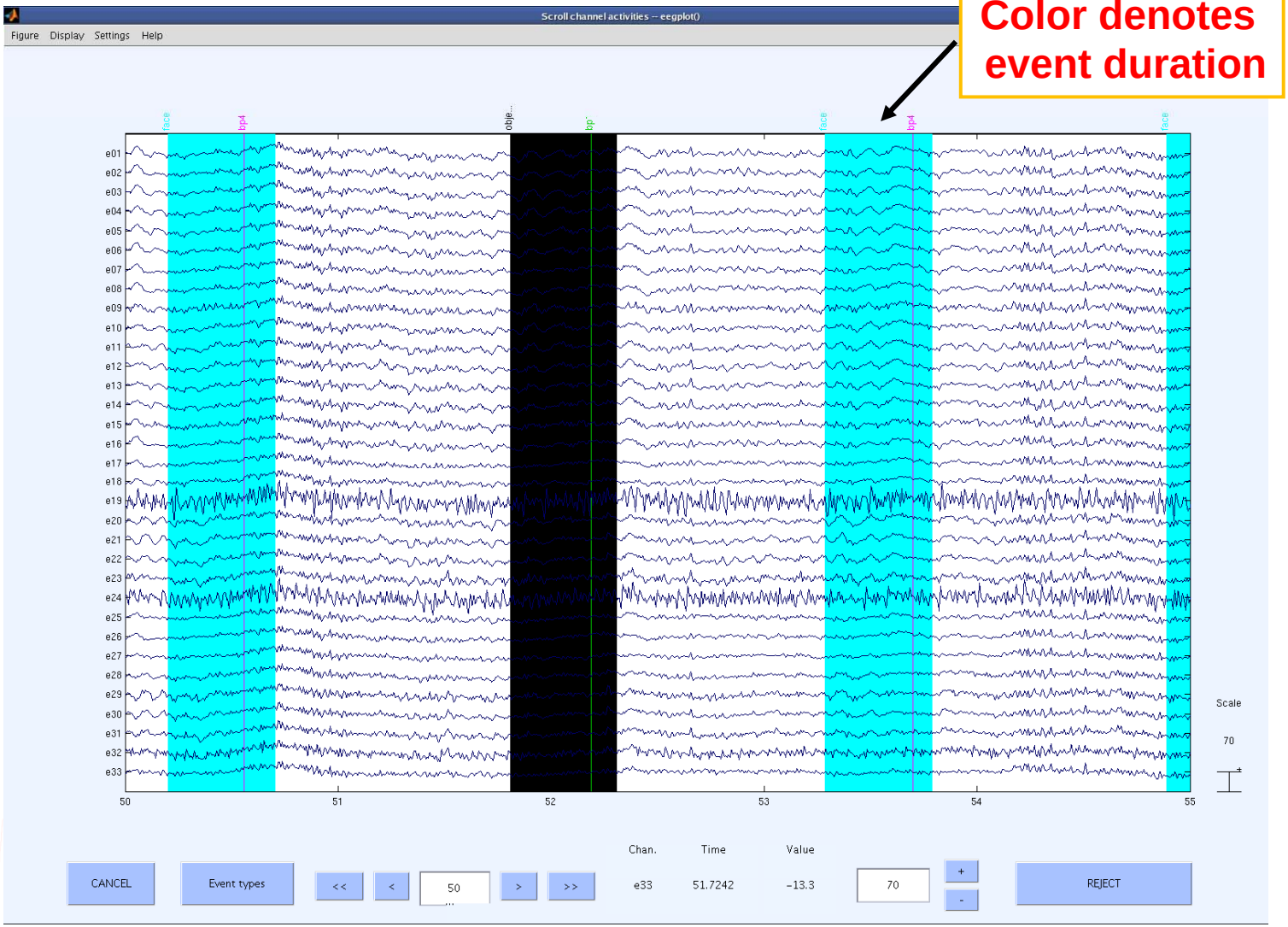
New event latencies (10 first): 10789 21315 31375 41902 51962 62489 ...

...

Scroll data with 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

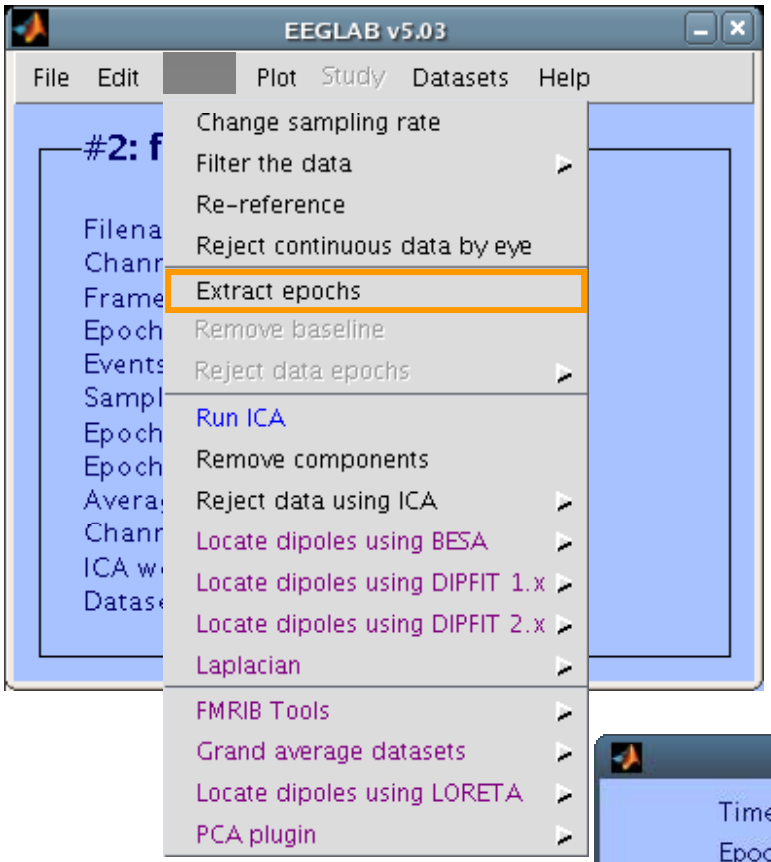
Select epochs/events

Task 4

Channel analysis

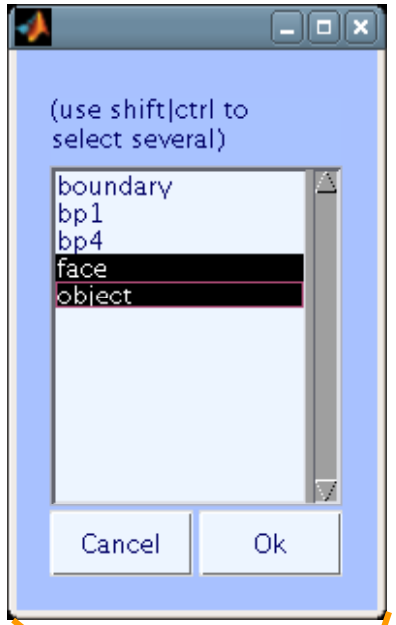
Exercise...

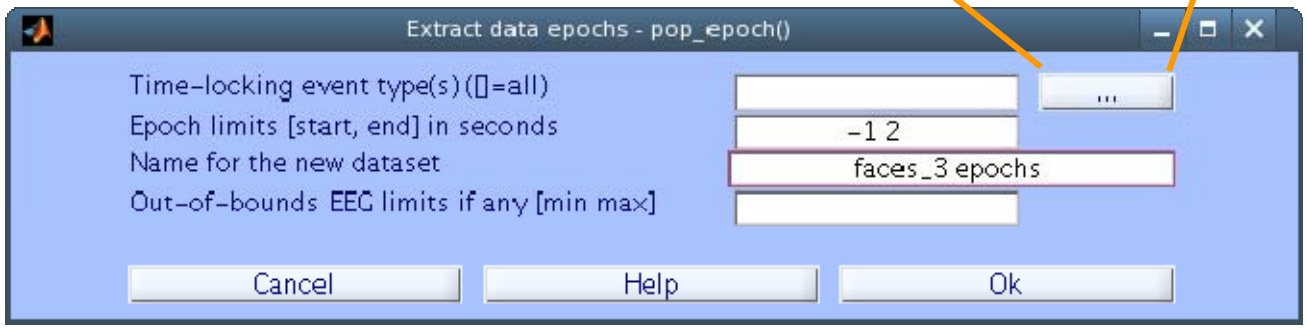
Extract epochs



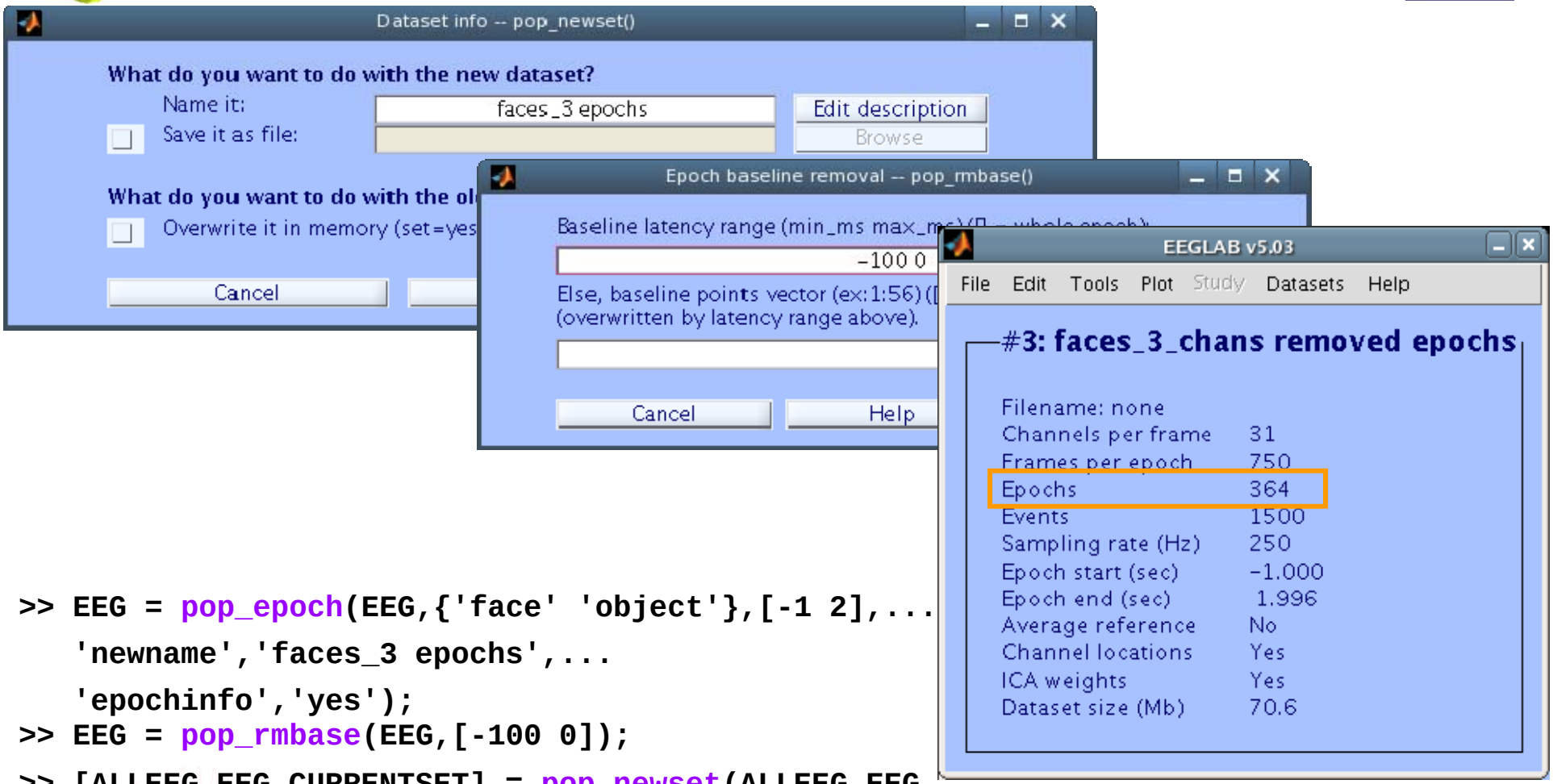

```
>> eeg_eventtypes(EEG)

boundary    1
bp1         183
bp4         184
face        182
object      182
```



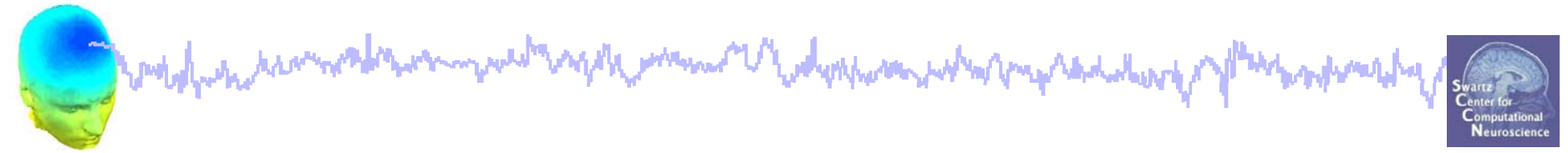


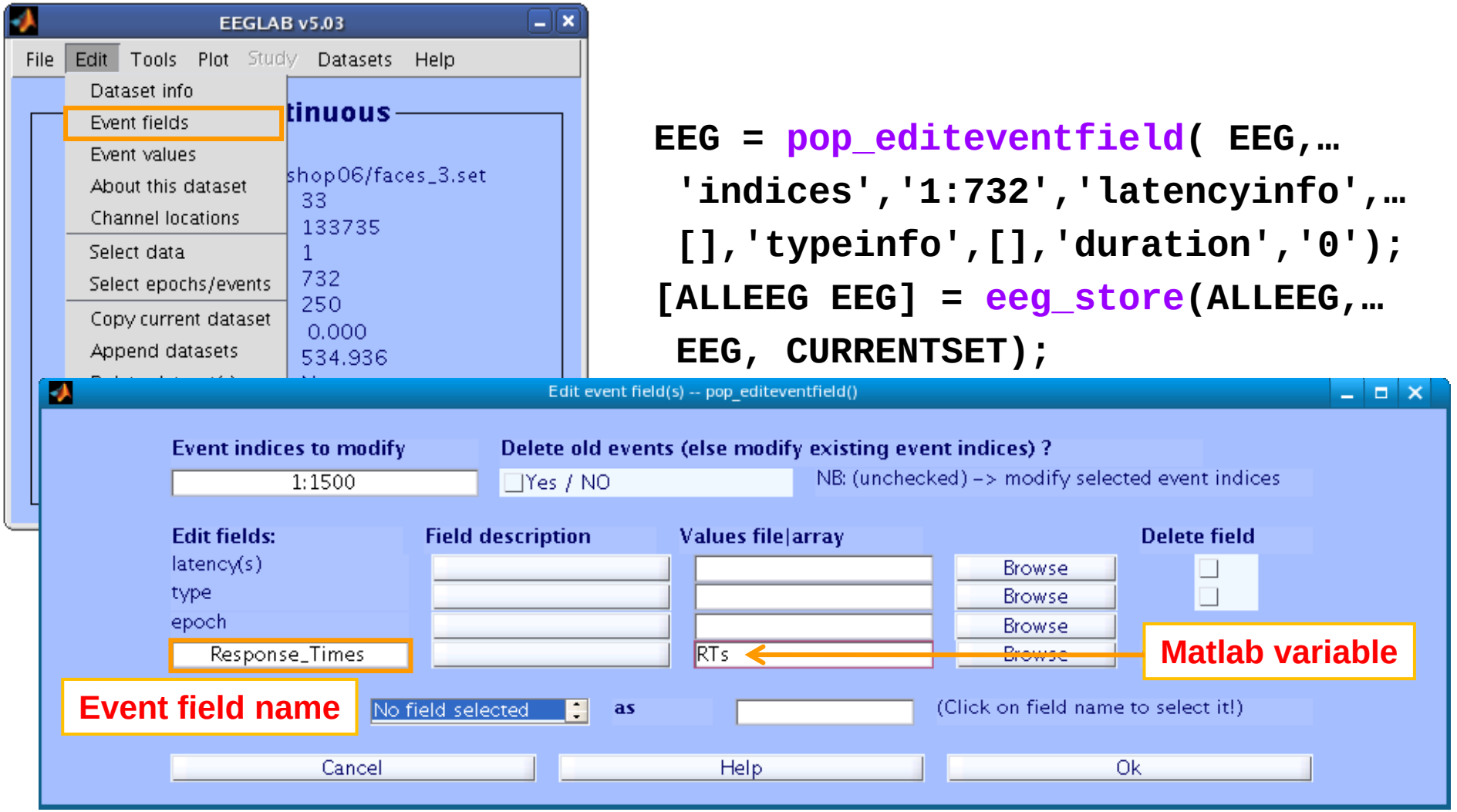
Extract epochs




```
>> EEG = pop_epoch(EEG,{'face' 'object'},[-1 2],...
   'newname','faces_3 epochs',...
   'epochinfo','yes');
>> EEG = pop_rmbase(EEG,[-100 0]);
>> [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG,EEG,...
   CURRENTSET,'setname','faces_3 epochs');
```

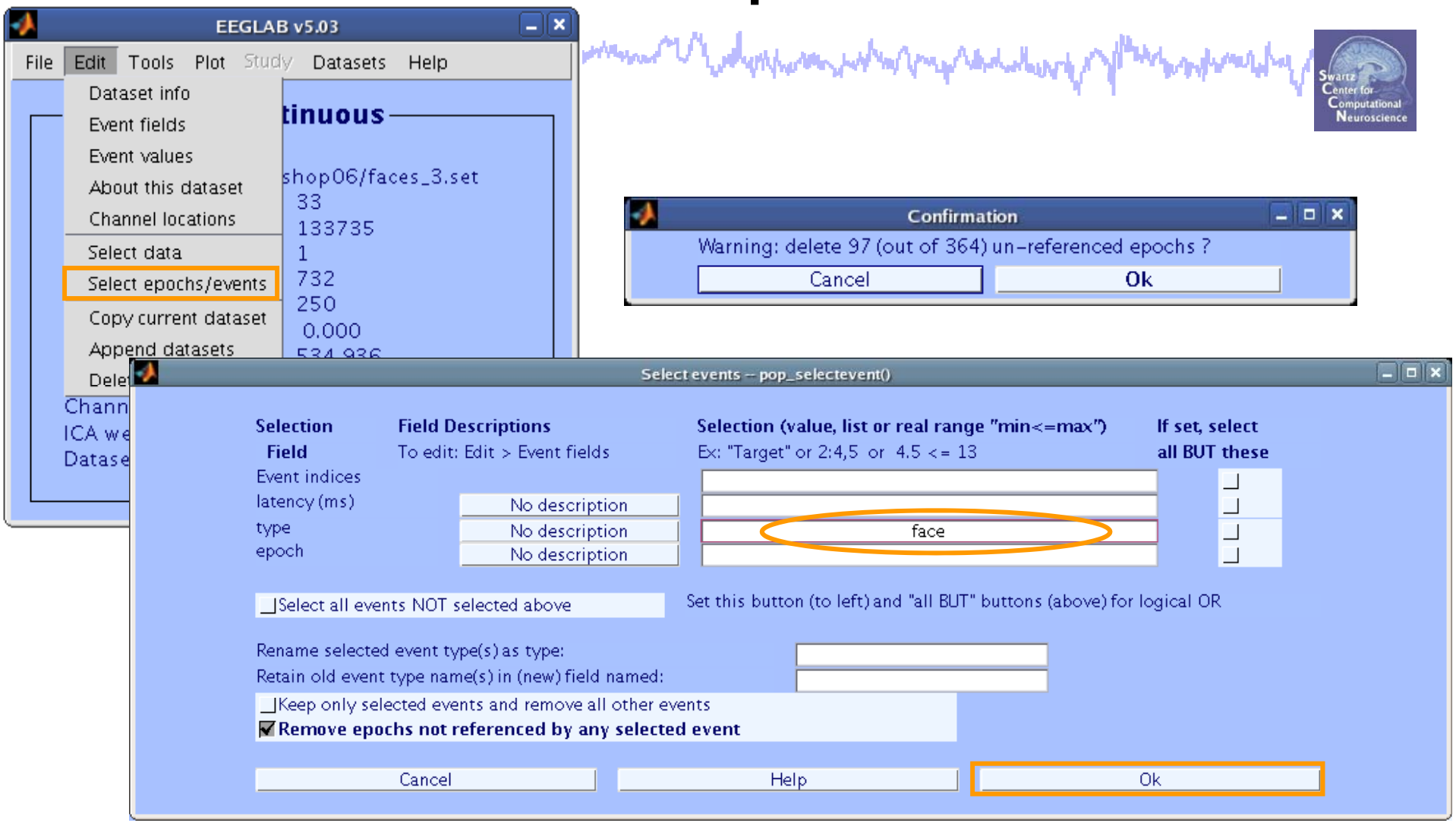
Create new event field



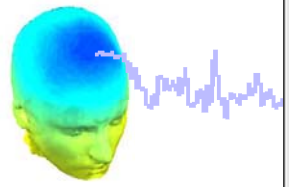


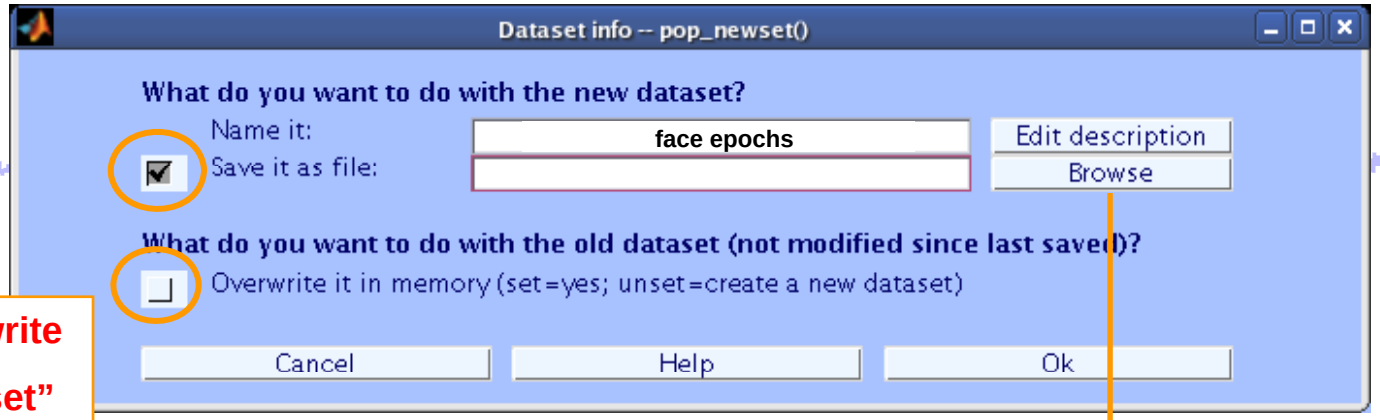

```
EEG = pop_editeventfield( EEG,…
 'indices','1:732','latencyinfo',…
 [],'typeinfo',[],'duration','0');
[ALLEEG EEG] = eeg_store(ALLEEG,…
 EEG, CURRENTSET);
```

Select epochs



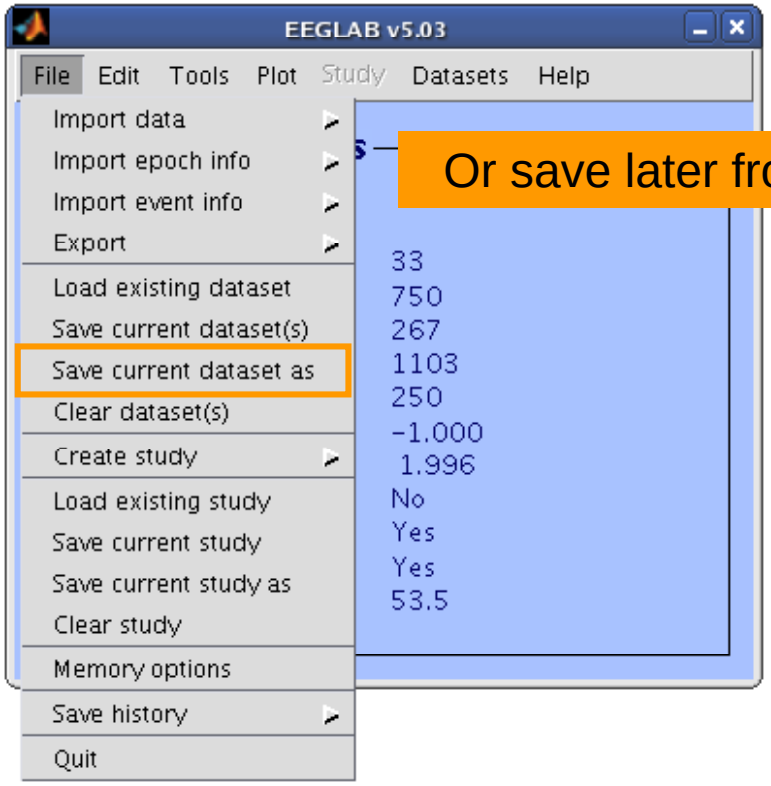

```
>> EEG = pop_selectevent(EEG,'type',{'face'},...
   'deleteevents', 'off','deleteepochs','on');
>> [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG,EEG,4,...
  'setname','faces only epochs');
```



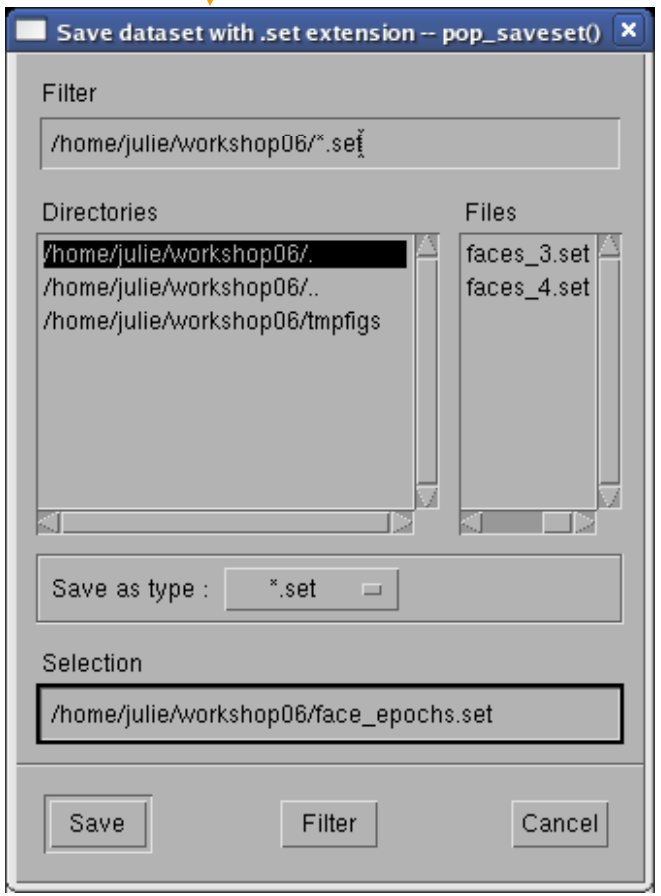


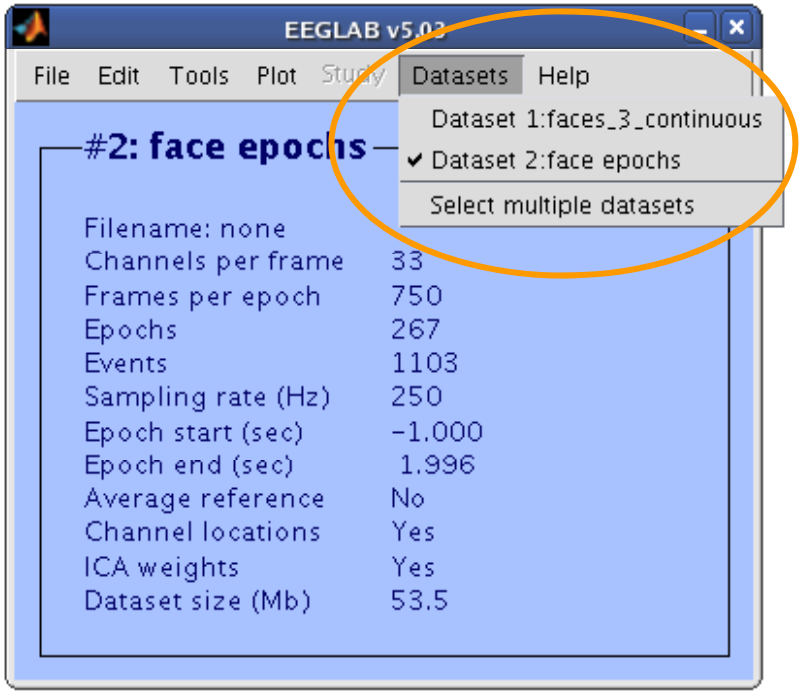
"Do not overwrite current dataset"

Save dataset (optional)



Or save later from menu





New dataset created

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

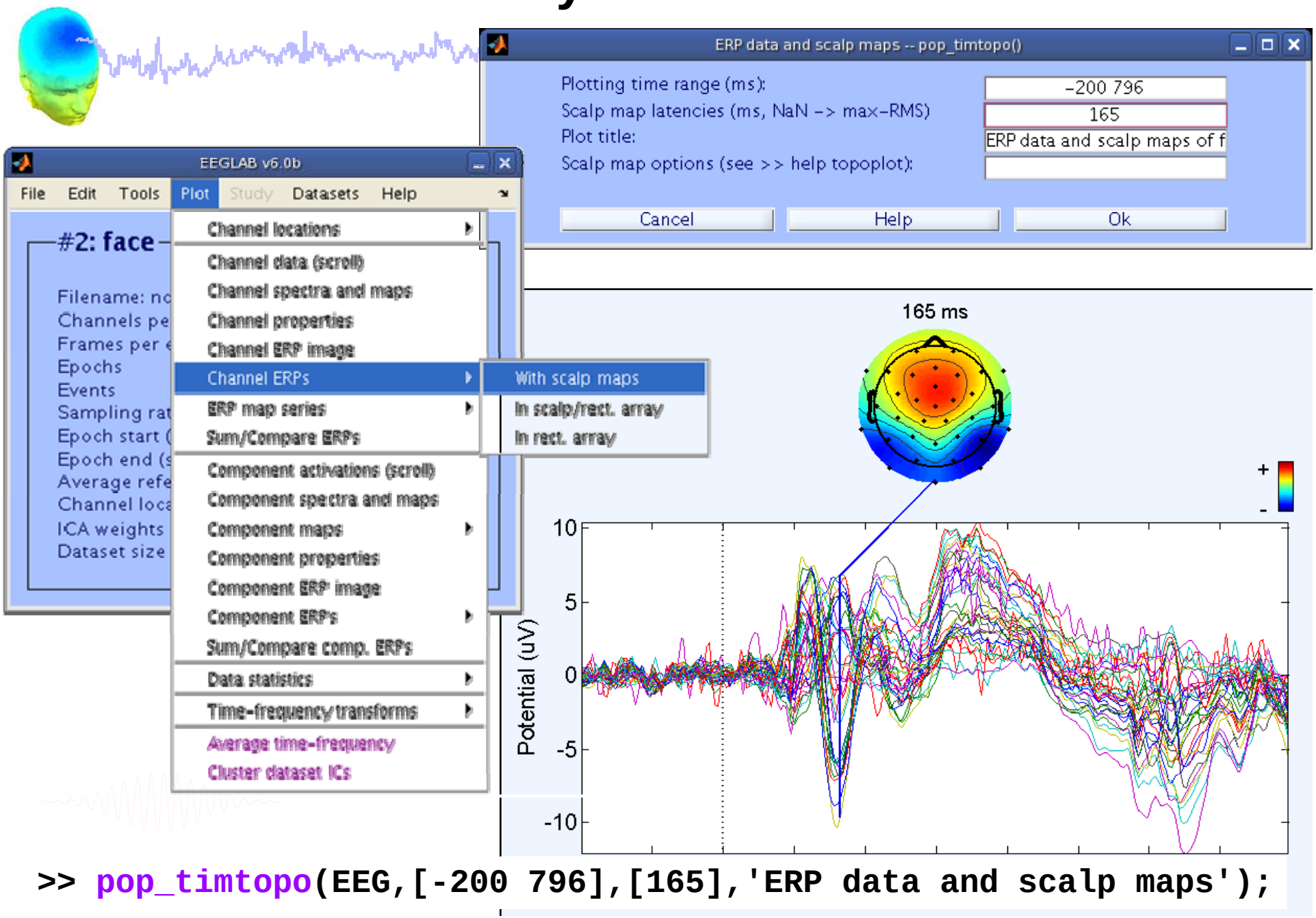
Select epochs/events

Task 4

Channel analysis

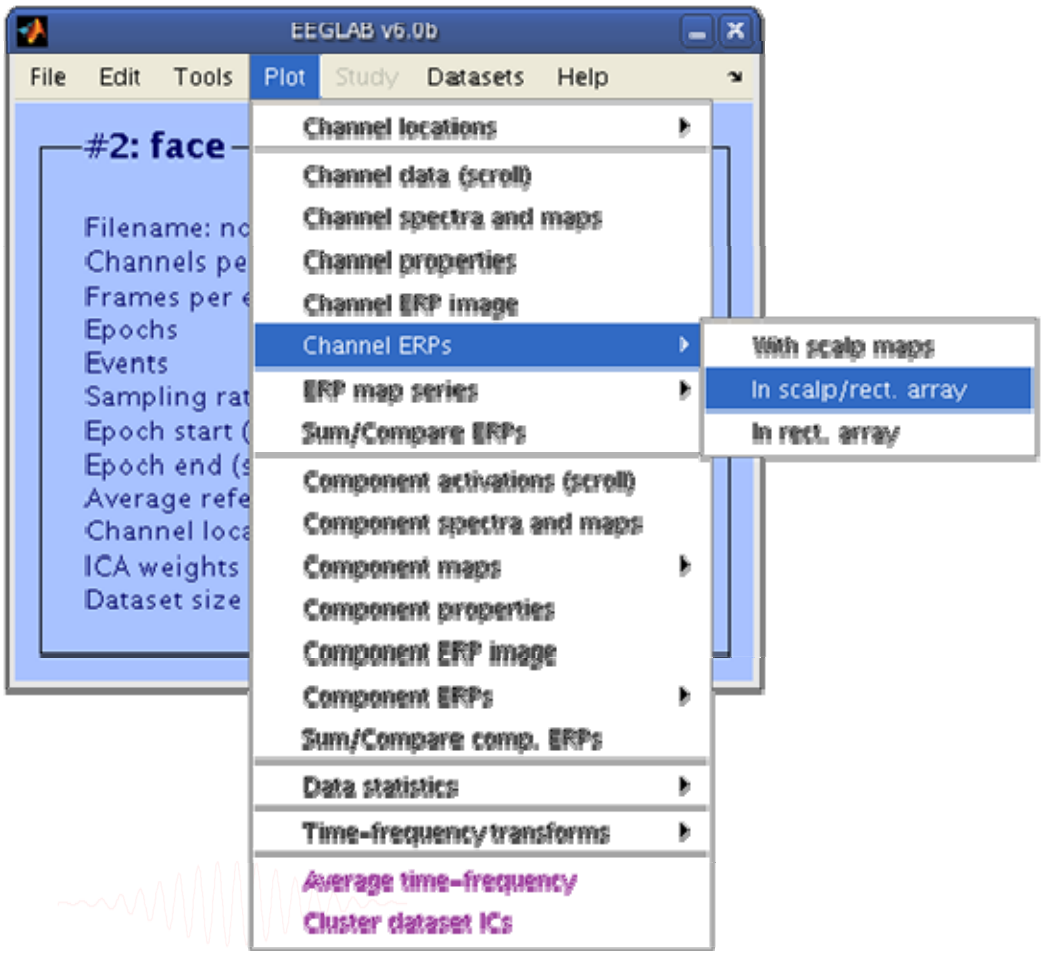
Exercise...

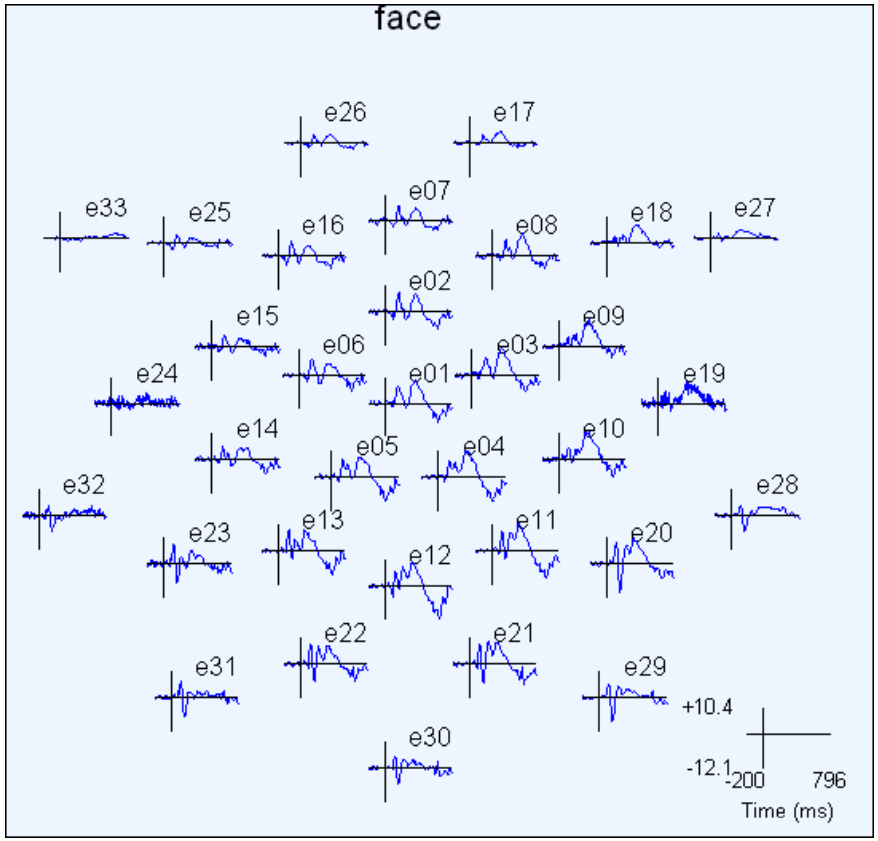
Analysis of ERPs



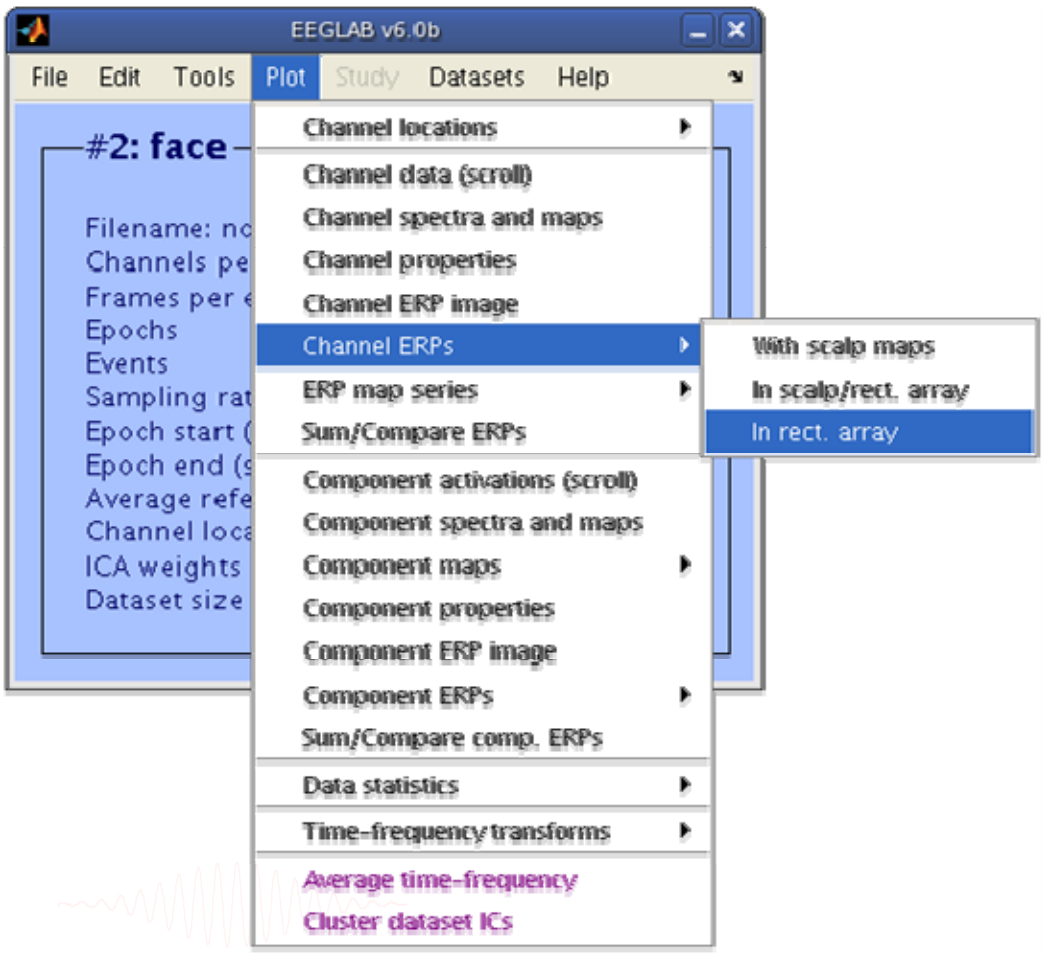

```
>> pop_timtopo(EEG,[-200 796],[165],'ERP data and scalp maps');
```

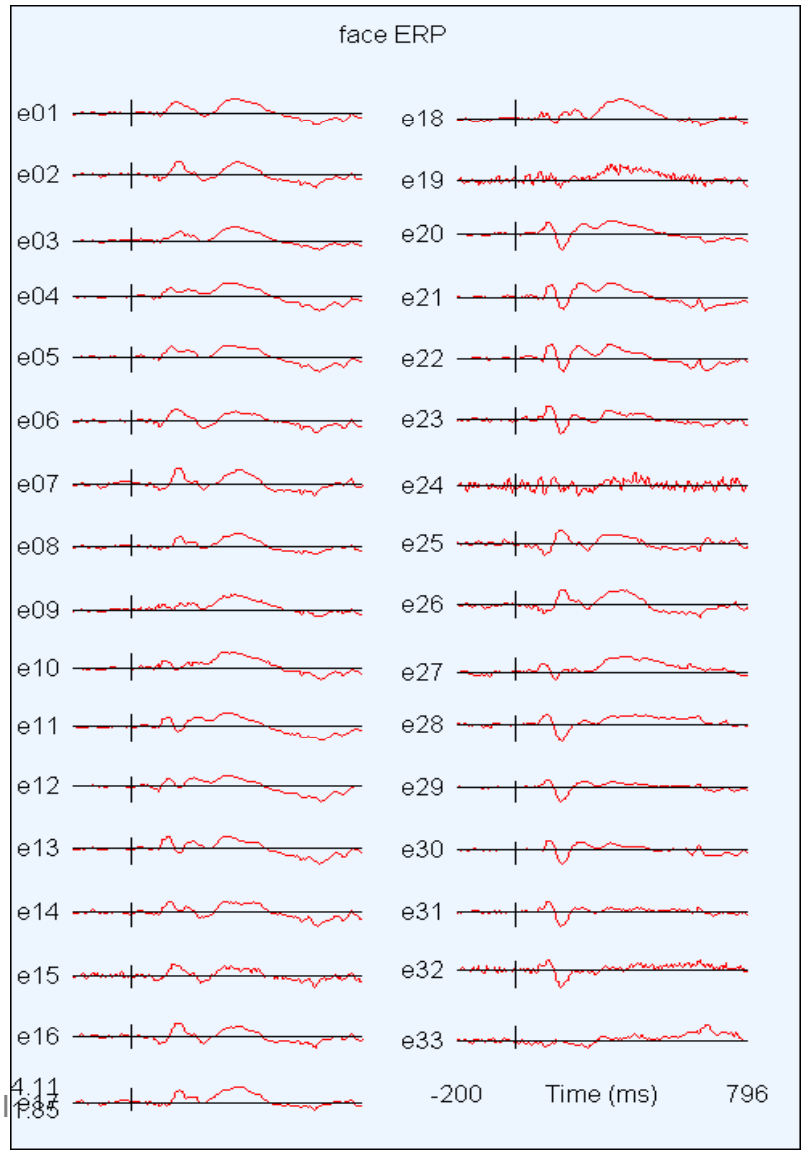
Analysis of ERPs



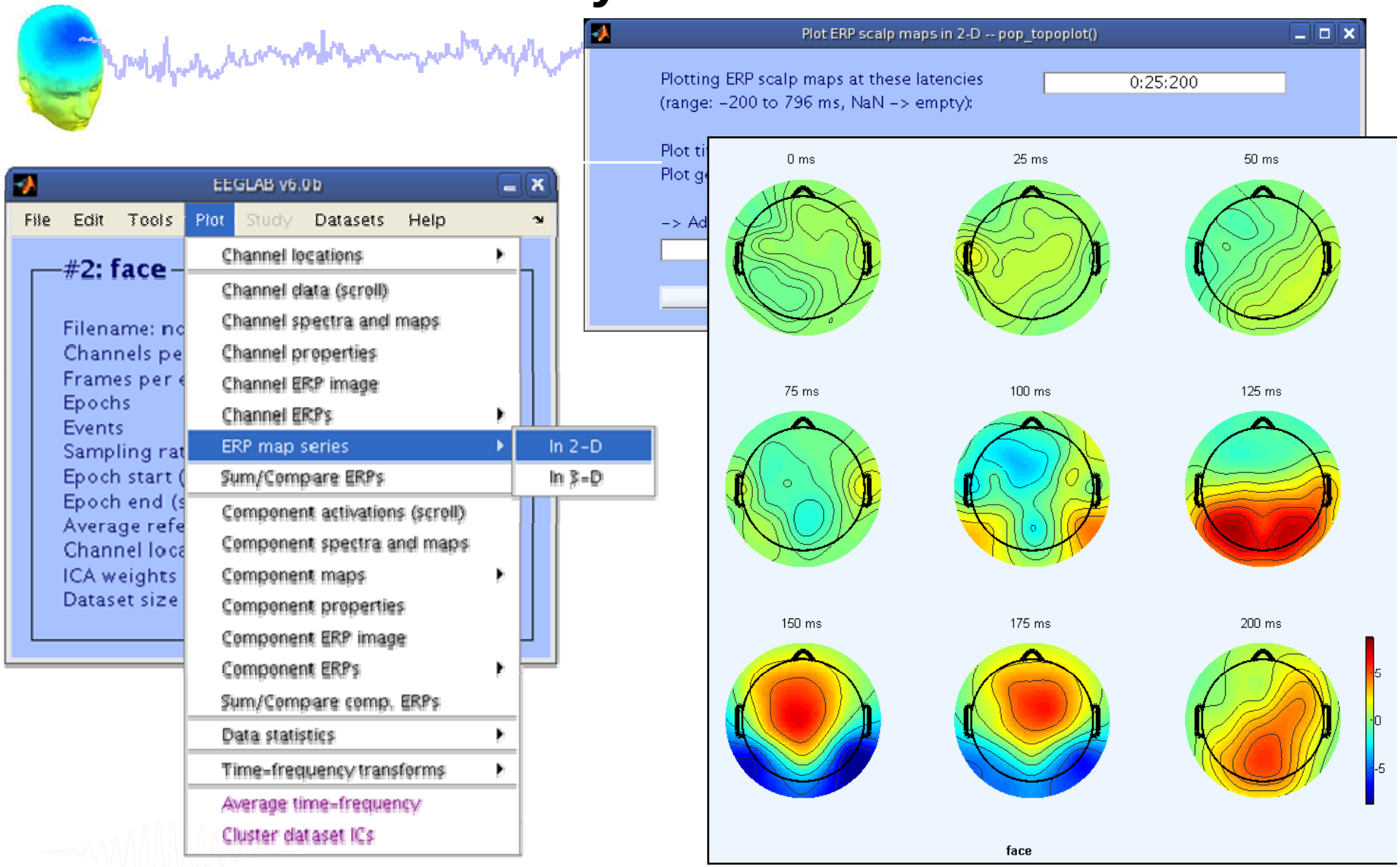


Analysis of ERPs



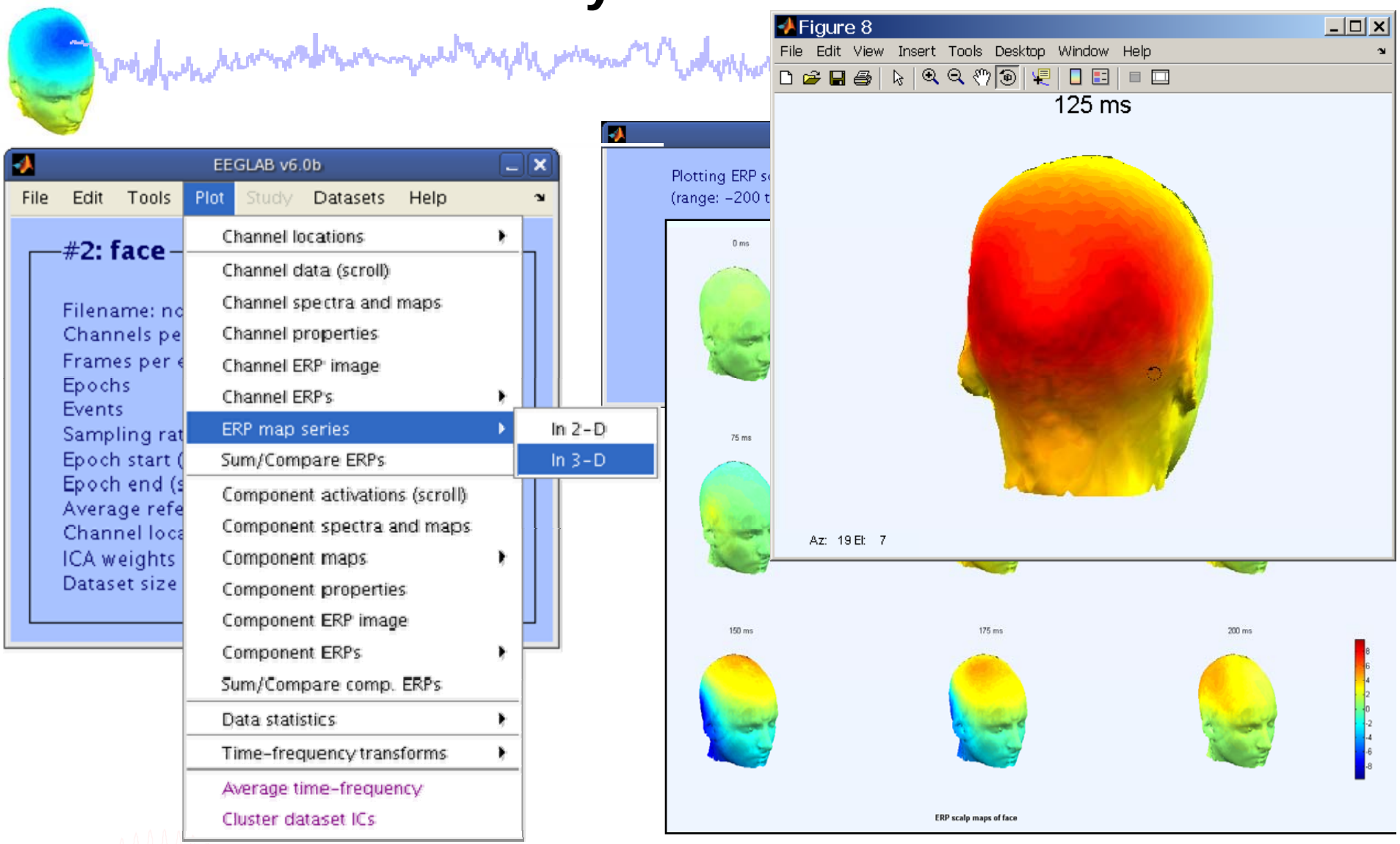


Analysis of ERPs




```
>>pop_topoplot(EEG,1,[0:25:200],'face',[3 3],0,'electrodes','off');
```

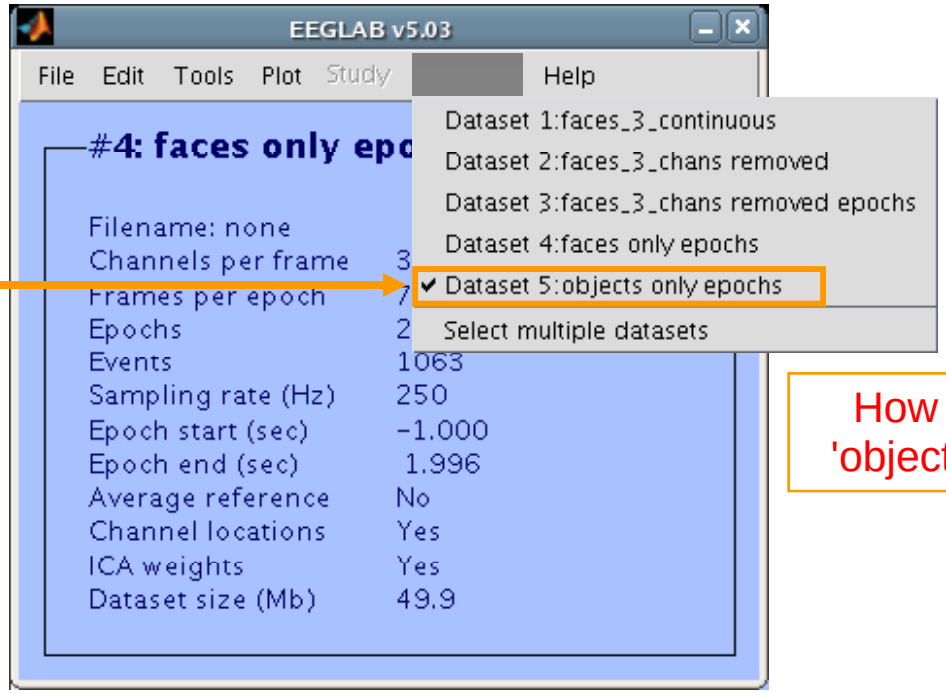
Analysis of ERPs




```
>> pop_headplot(EEG,1,[0:25:200],'ERP scalp maps',[3 3],...
  'electrodes', 'off');
```

Compare ERPs across conditions

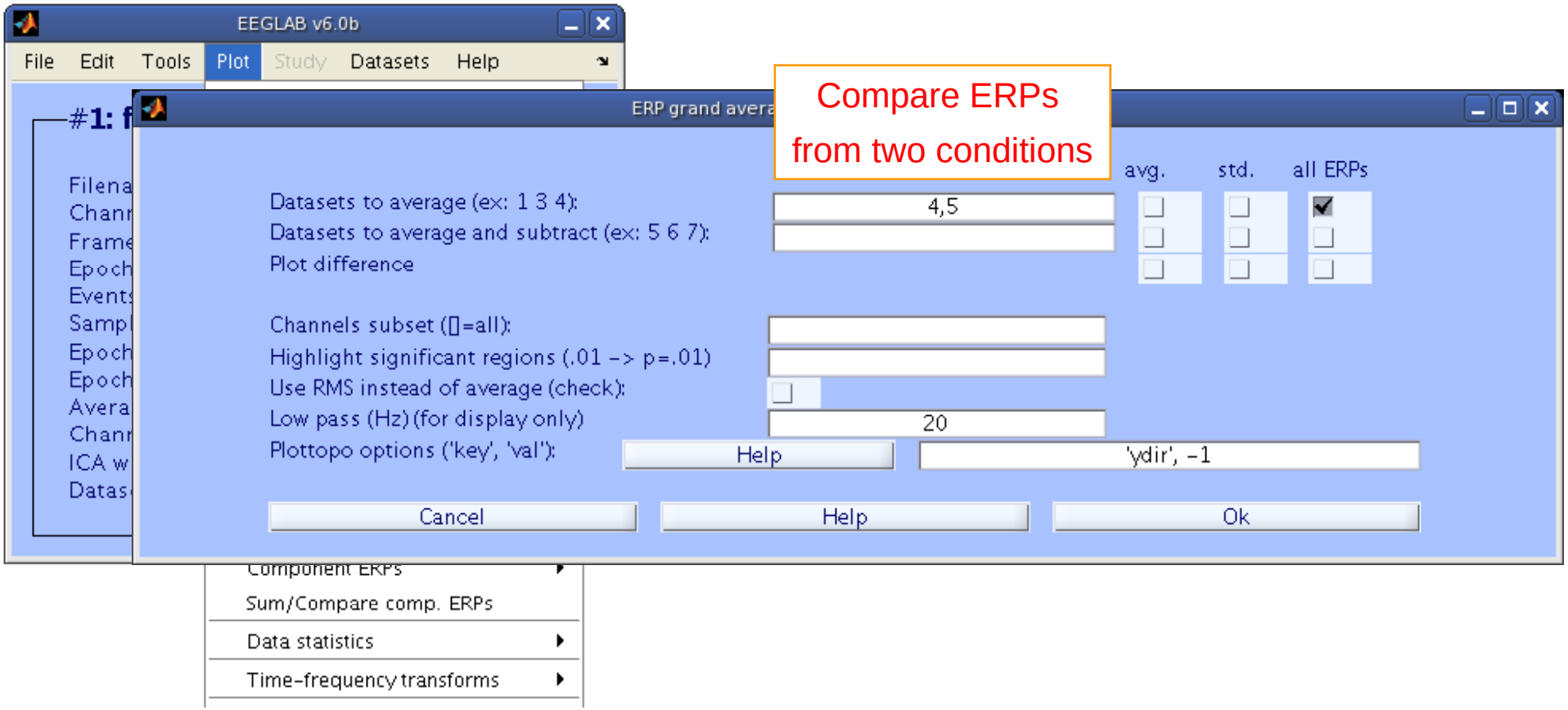
Select 'object' epochs and create new dataset



How do 'face' and 'object' ERPs differ?

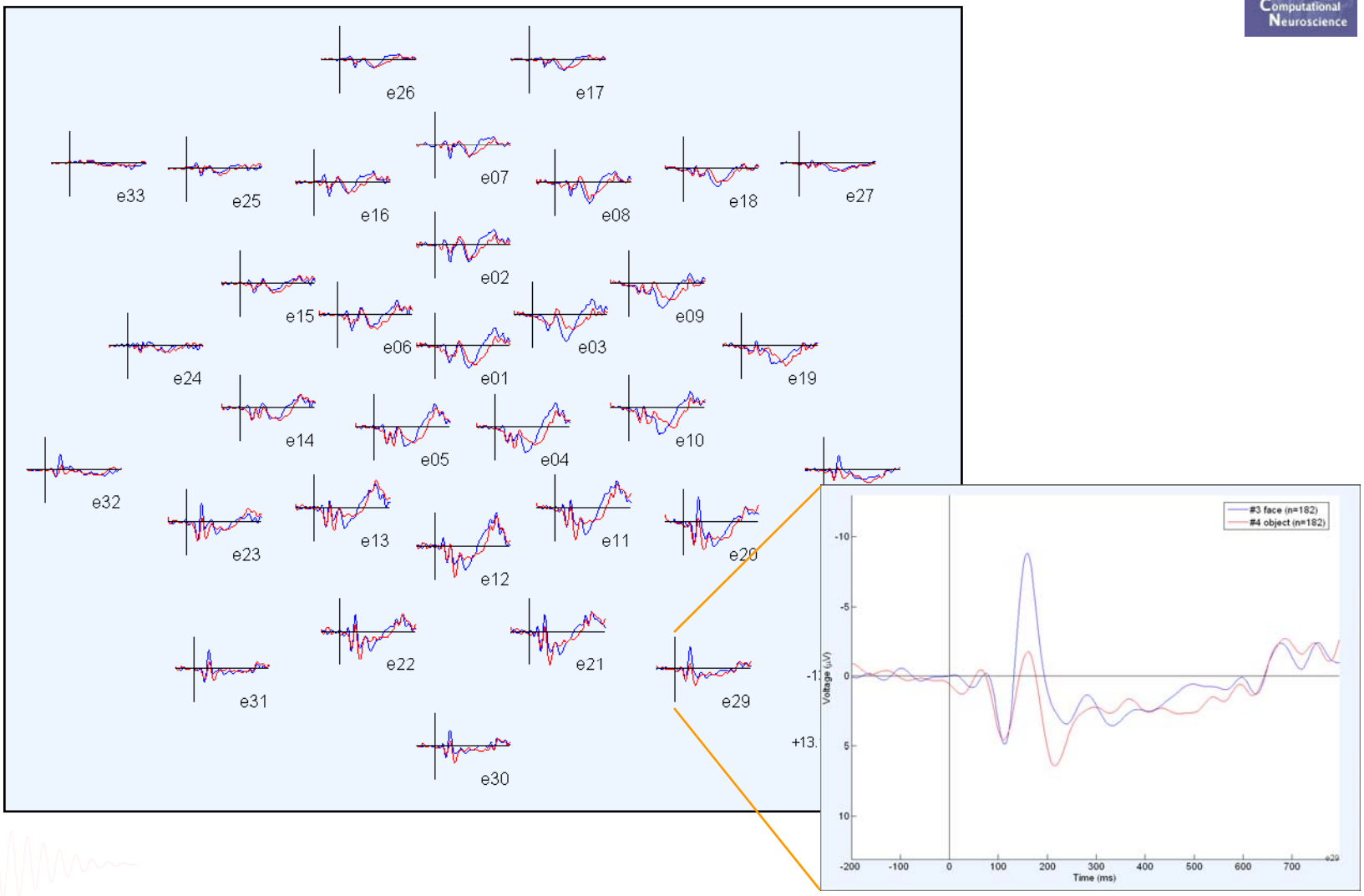
```
>> [EEG,ALLEEG,CURRENTSET] = pop_newset(ALLEEG,EEG,4, ...
   'retrieve',3,'study',0);
>> EEG = pop_selectevent(EEG,'type',{'object'},...
  'deleteevents', 'off','deleteepochs','on');
>> [ALLEEG EEG CURRENTSET] = pop_newset(ALLEEG,EEG,5, ...
   'setname','object only epochs');
```

Compare ERPs across conditions

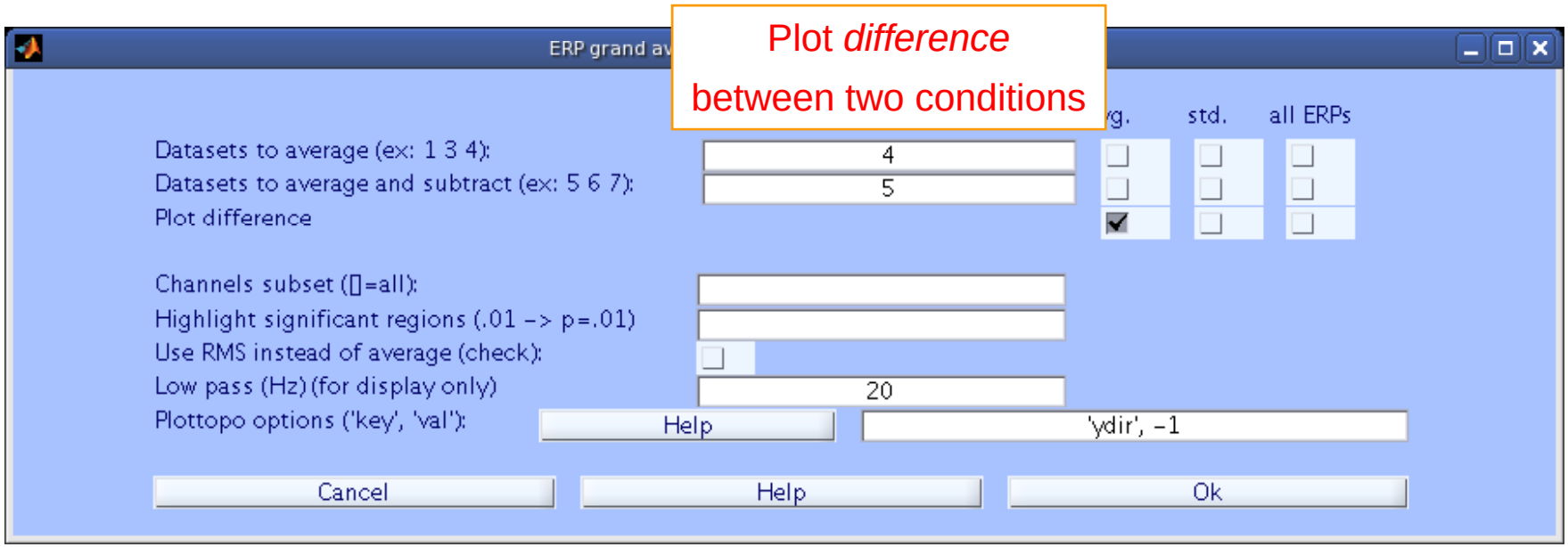



```
>>pop_comperp(ALLEEG,1,[4 5],[],'addavg','off','addstd','off', …
  'addall','on','diffavg','off','diffstd','off','lowpass',20, …
  'tplotopt',{'ydir',-1});
```

Compare ERPs across conditions

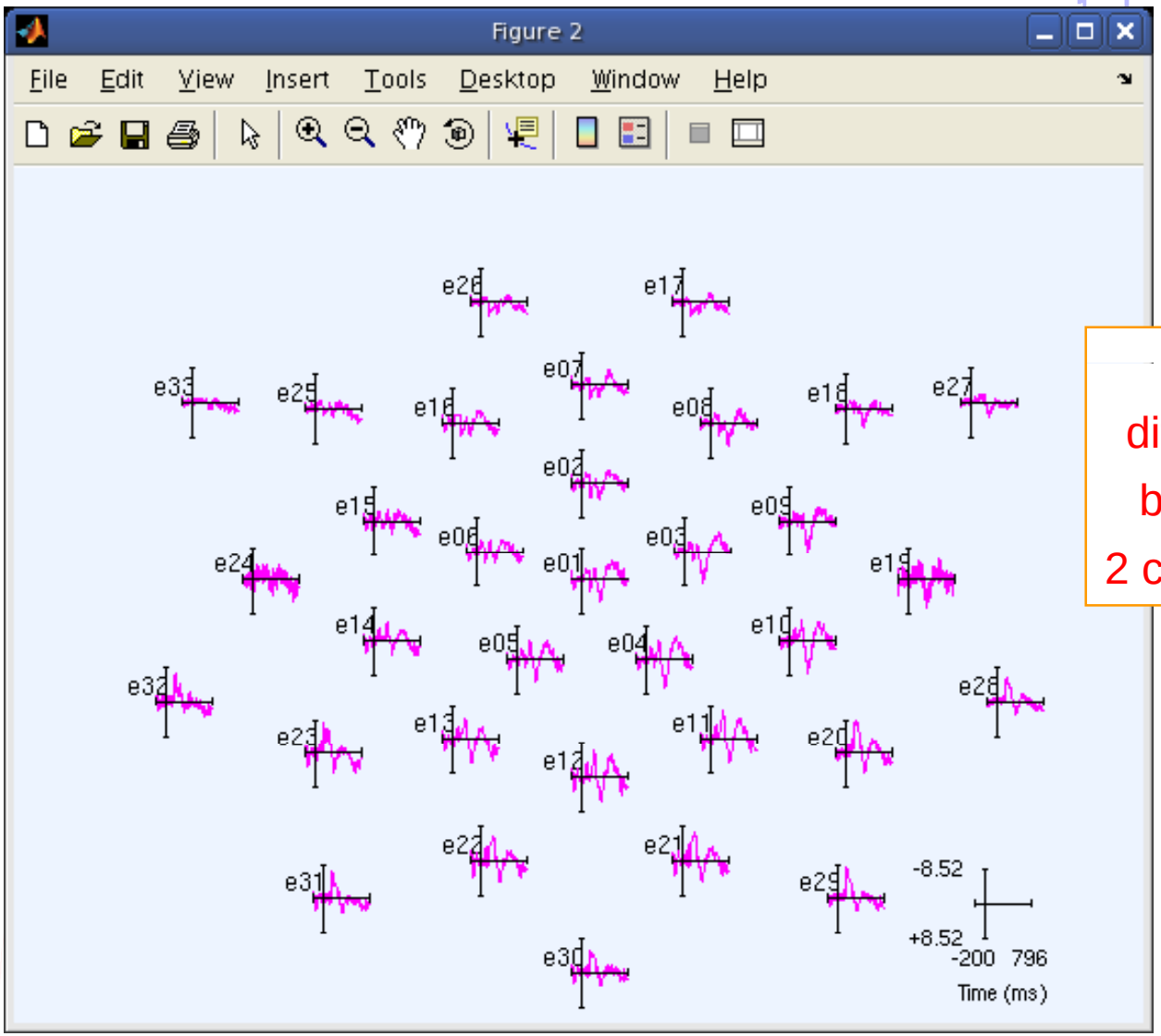


Analysis of ERP *differences*



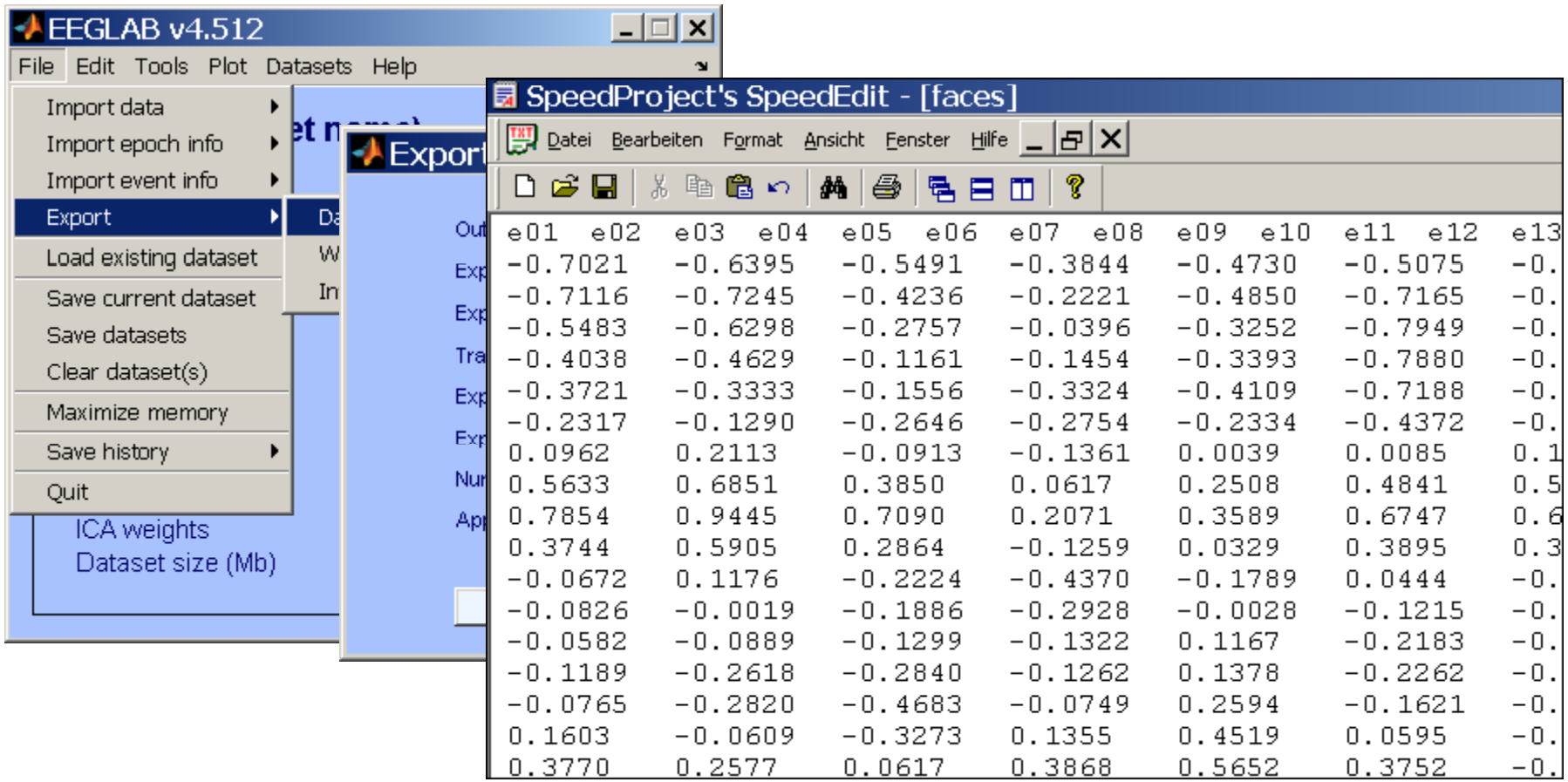

```
>> pop_comperp(ALLEEG,1, 4, 5,'addavg','off',…
'addstd','off', 'diffavg','on','diffstd','off', …
'lowpass',20, 'tplotopt',{'ydir',-1});
```

Analysis of ERP differences



ERP difference between 2 conditions

Export EEG data




```
>> pop_export(EEG,'D:\tmp\faces.dat','erp','on',...
   'transpose','on','time','off');
```

Exercise

- **ALL**
  -Load faces_3.set
  -Do not save your changes under the same filename!

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

- **Intermediate**
  -Load channel locations from .locs file in 'data' folder, explore options to transform axes.
  -Review events in Edit->Event values, rename an event in Select epochs/events.
  -Create a new event field in Edit->Event fields.

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