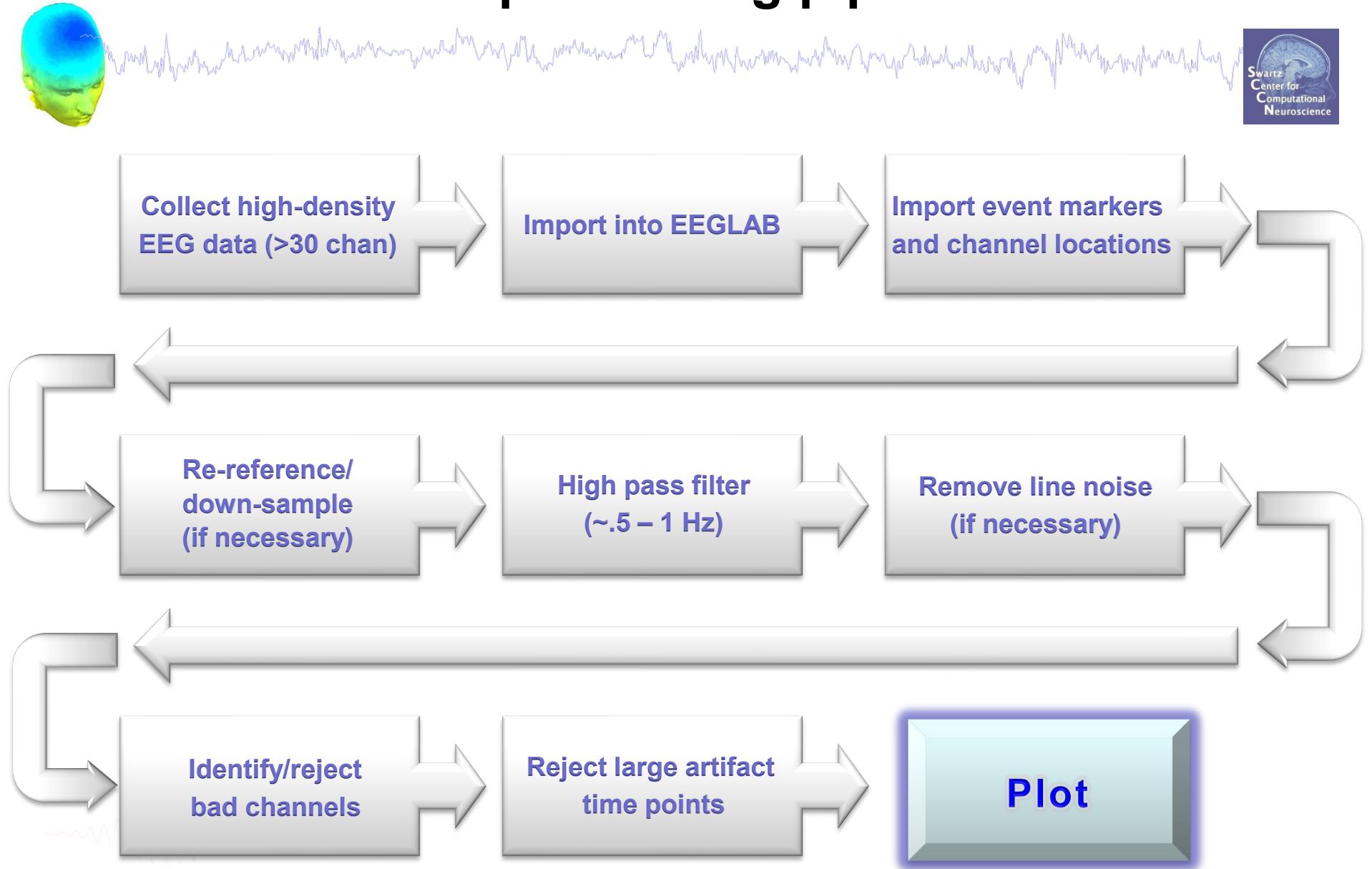
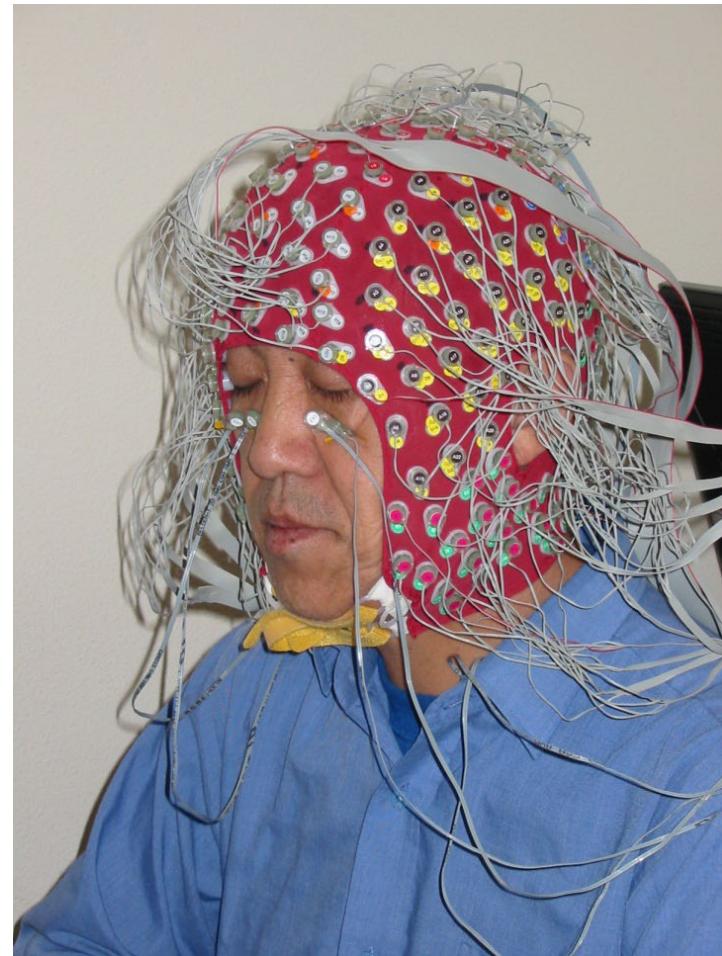
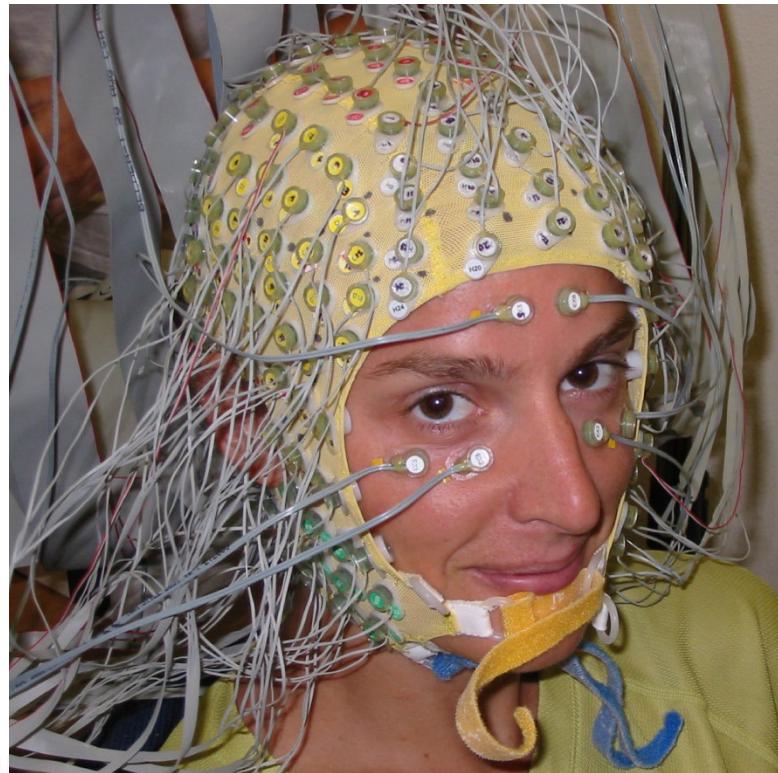


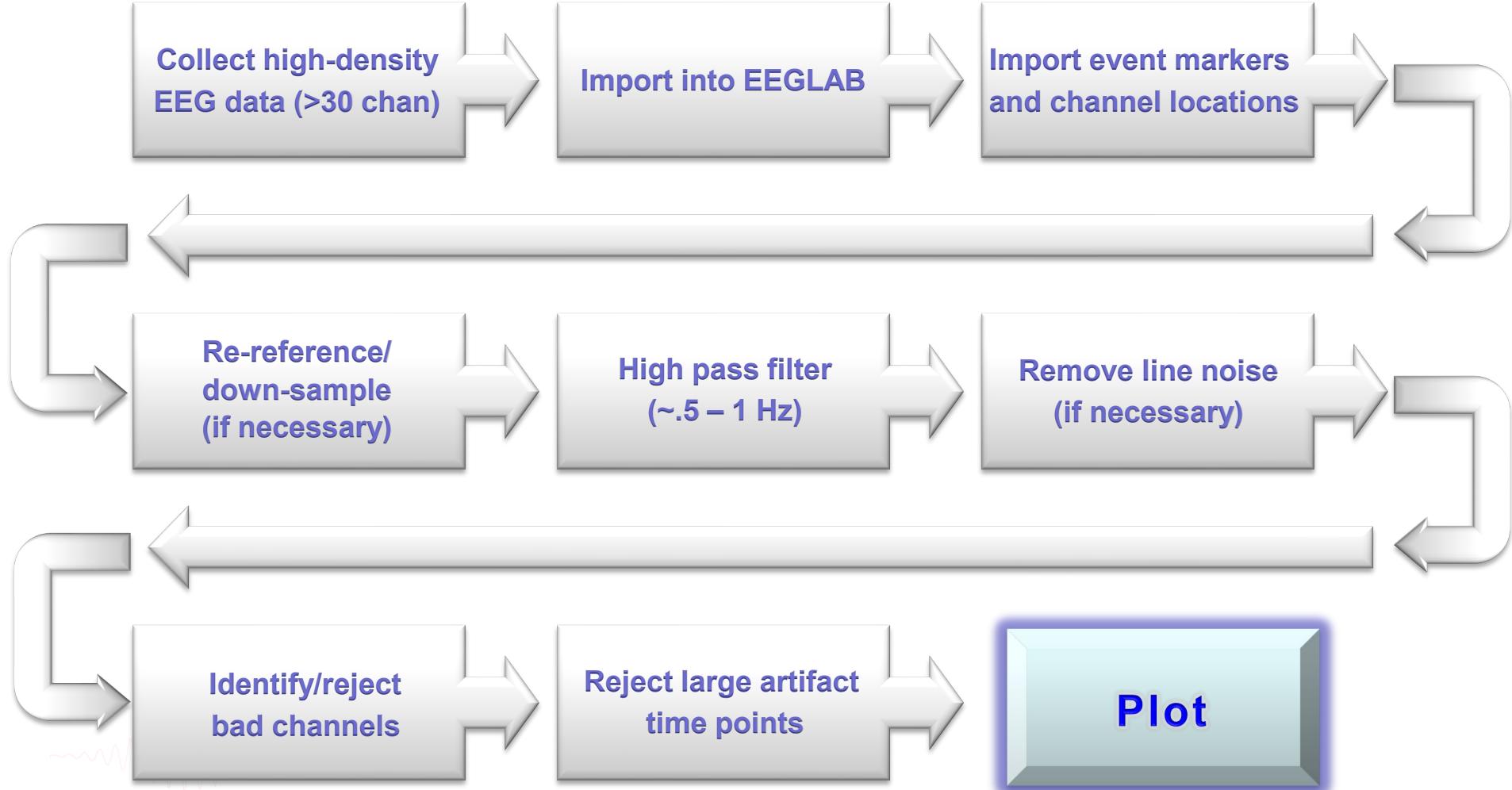
Pre-processing pipeline



Dense-array EEG



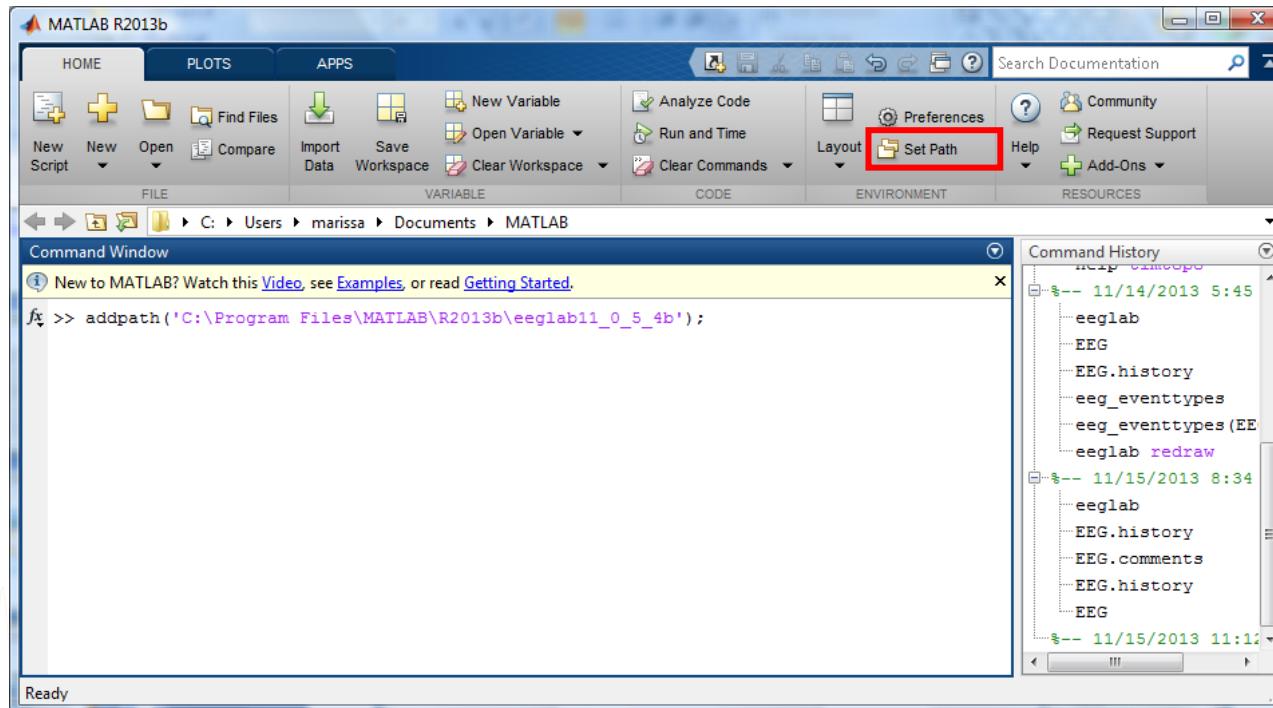
Pre-processing pipeline



Installing EEGLAB and data folder



- Download and install Matlab (2018 or later)
- Download EEGLAB (<http://www.sccn.ucsd.edu/eeglab>)
- Unzip EEGLAB
- Add the EEGLAB folder to your Matlab path:



EEGLAB Matlab toolbox



Type 'eeglab' in main graphic interface

MATLAB R2021a - academic use

HOME PLOTS APPS

New New Variable Find Files Import Data New Variable Open Workspace Open Variable Clear Workspace

FILE VARIABLE CODE ENVIRONMENT

Favorites Analyze Code Run and Time Preferences Set Path Add-Ons RESOURCES

Search Documentation Sign In

Current Folder C: > Users > julie > Documents > MATLAB > eeglab2021.1 >

```
>> eeglab
Some menus items hidden. Use Preference menu to show them all.
eeglab: options file is C:\Users\julie\eeg_options.m
Retrieving plugin versions from server...
Retrieving download statistics...
EEGLAB: adding "ICLabel" v1.3 (see >> help eegplugin_iclabel)
WARNING: for plugin "IMAT" version in the folder name "0.2" and in the eegplugin_file "0.1" differ
EEGLAB: adding "IMAT" v0.2 (see >> help eegplugin_imat)
Initializing SIFT...
Start SIFTing!
EEGLAB: adding "SIFT" v1.52 (see >> help eegplugin_sift)
EEGLAB: adding "clean_rawdata" v2.4 (see >> help eegplugin_clean_rawdata) - new version 2.5 available
EEGLAB: adding "dipfit" v4.2 (see >> help eegplugin_dipfit) - new version 4.3 available
EEGLAB: adding "firfilt" v2.4 (see >> help eegplugin_firfilt)
You are using the latest version of EEGLAB.
```

>>

The folder with eeglab.m must be in your Matlab "paths"

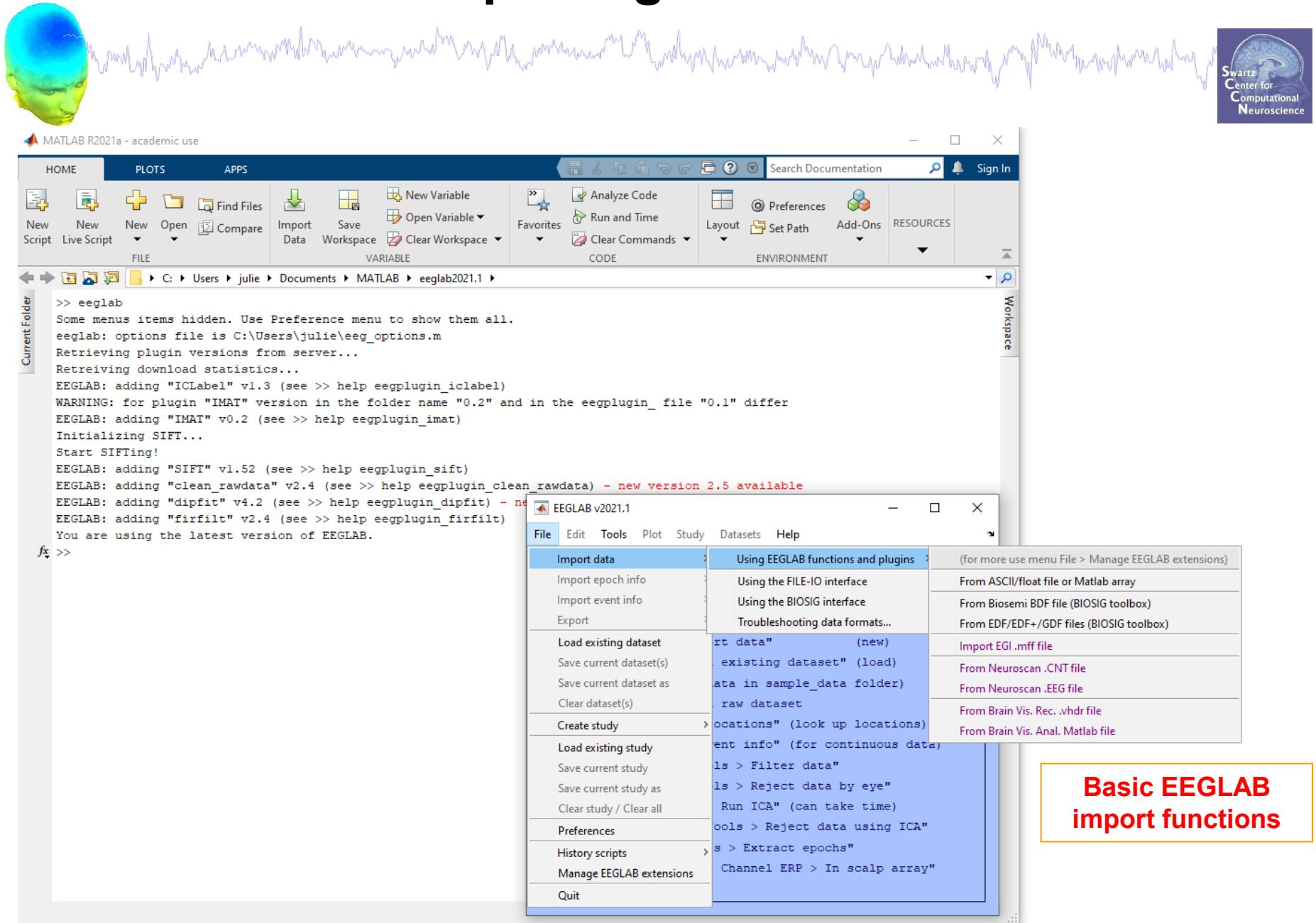
EEGLAB v2021.1

No current dataset

Suggested steps to get started

- Create a new or load an existing dataset:
Use "File > Import data" (new)
Or "File > Load existing dataset" (load)
(find tutorial data in sample_data folder)
- If newly imported raw dataset
"Edit > Channel locations" (look up locations)
"File > Import event info" (for continuous data)
- Filter data: "Tools > Filter data"
- Reject data: "Tools > Reject data by eye"
- Run ICA: "Tools > Run ICA" (can take time)
- Reject by ICA: "Tools > Reject data using ICA"
- Epoch data: "Tools > Extract epochs"
- Plot ERP: "Plot > Channel ERP > In scalp array"

Importing a dataset



The image shows the MATLAB R2021a interface. At the top, there is a decorative header featuring a brain scan and an EEG signal. On the right, there is a logo for the Swartz Center for Computational Neuroscience.

The MATLAB interface includes:

- HOME, PLOTS, APPS** tabs in the ribbon.
- FILE** menu with options: New Script, New Live Script, New, Open, Find Files, Import Data, Save Workspace, New Variable, Open Variable, Favorites, Run and Time, Preferences, Set Path, Add-Ons, RESOURCES.
- VARIABLE**, **CODE**, and **ENVIRONMENT** sections in the ribbon.
- A command window showing the following text:

```
>> eeglab
Some menus items hidden. Use Preference menu to show them all.
eeglab: options file is C:\Users\julie\eeeg_options.m
Retrieving plugin versions from server...
Retrieving download statistics...
EEGLAB: adding "ICLabel" v1.3 (see >> help eegplugin_iclabel)
WARNING: for plugin "IMAT" version in the folder name "0.2" and in the eegplugin_file "0.1" differ
EEGLAB: adding "IMAT" v0.2 (see >> help eegplugin_imat)
Initializing SIFT...
Start SIFTing!
EEGLAB: adding "SIFT" v1.52 (see >> help eegplugin_sift)
EEGLAB: adding "clean_rawdata" v2.4 (see >> help eegplugin_clean_rawdata) - new version 2.5 available
EEGLAB: adding "dipfit" v4.2 (see >> help eegplugin_dipfit) - ne
EEGLAB: adding "firfilt" v2.4 (see >> help eegplugin_firfilt)
You are using the latest version of EEGLAB.
```
- A workspace browser showing the current folder path: C:\Users\julie\Documents\MATLAB\eeglab2021.1.
- An EEGLAB v2021.1 application window with its own ribbon and a context menu open over the "Import data" option. The menu is titled "Using EEGLAB functions and plugins" and lists various import functions with their descriptions.
- A red box highlights the text "Basic EEGLAB import functions" at the bottom right.

**Basic EEGLAB
import functions**

Download other import functions



MATLAB R2021a - academic use

HOME PLOTS APPS

New New Script New Live Script Open Import Data Save Workspace Clear Work

FILE VARIABLE

<> Current Folder >> eeglab

Some menus items hidden. Use Preference menu to show them...
eeglab: options file is C:\Users\julie\Documents\MATLAB\eeeglabc...\
Retrieving plugin versions from server...
EEGLAB: adding "ICLabel" v1.3 (see >> help eegplugin_iclabel)
WARNING: for plugin "IMAT" version in the folder name 'IMAT' is not correct.
EEGLAB: adding "IMAT" v0.2 (see >> help eegplugin_imat)
Initializing SIFT...
Start SIFT!
EEGLAB: adding "SIFT" v1.52 (see >> help eegplugin_sift)
EEGLAB: adding "clean_rawdata" v2.4 (see >> help eegplugin_clean)
EEGLAB: adding "dipfit" v4.2 (see >> help eegplugin_dipfit)
EEGLAB: adding "firfilt" v2.4 (see >> help eegplugin_firfilt)
You are using the latest version of EEGLAB.
Retrieving download statistics...

File Edit Tools Plot Study Datasets Help

Import data > iet
> get started
> load an existing dataset:
> raw data" (new)
> existing dataset" (load)
> data in sample_data folder)
> raw dataset
> locations" (look up locations)
> info" (for continuous data)
ls > Filter data"
ls > Reject data by eye"
Run ICA" (can take time)
ools > Reject data using ICA"
s > Extract epochs"
Channel ERP > In scalp array"

List of plugins (bolded means installed)

No install status filter Filter by import Search

***** - Biosig v3.7.9 (52915 downloads; 19 rating)
***** - Fileio v20210601 (21860 downloads; 4 rating)
***** - bva-io v1.7 (17268 downloads; 8 rating)
***** - neuroscancio v1.5 (11362 downloads; 6 rating)
***** - BDFimport v1.2 (3938 downloads; 4 rating)
***** - MFFMatlabIO v4.0 (3509 downloads; 5 rating)
***** - ANTeepimport v1.13 (3318 downloads; 4 rating)
***** - xdfimport v1.18 (2983 downloads; 4 rating)
***** - loadcurry v3.2.3 (2791 downloads; 16 rating)
***** - MFFimport v2.3 (2321 downloads; 2 rating)
***** - BCI2000import v0.36 (1789 downloads; 2 rating)
***** - biopac v1.00 (1554 downloads; 1 rating)
***** - loadhdf5 v1.1 (1341 downloads; 3 rating)

Web documentation Upload new plugin

Cancel Remove Install/Update

Sample data: basic P300 paradigm



File

SimpleOddball.set

Data

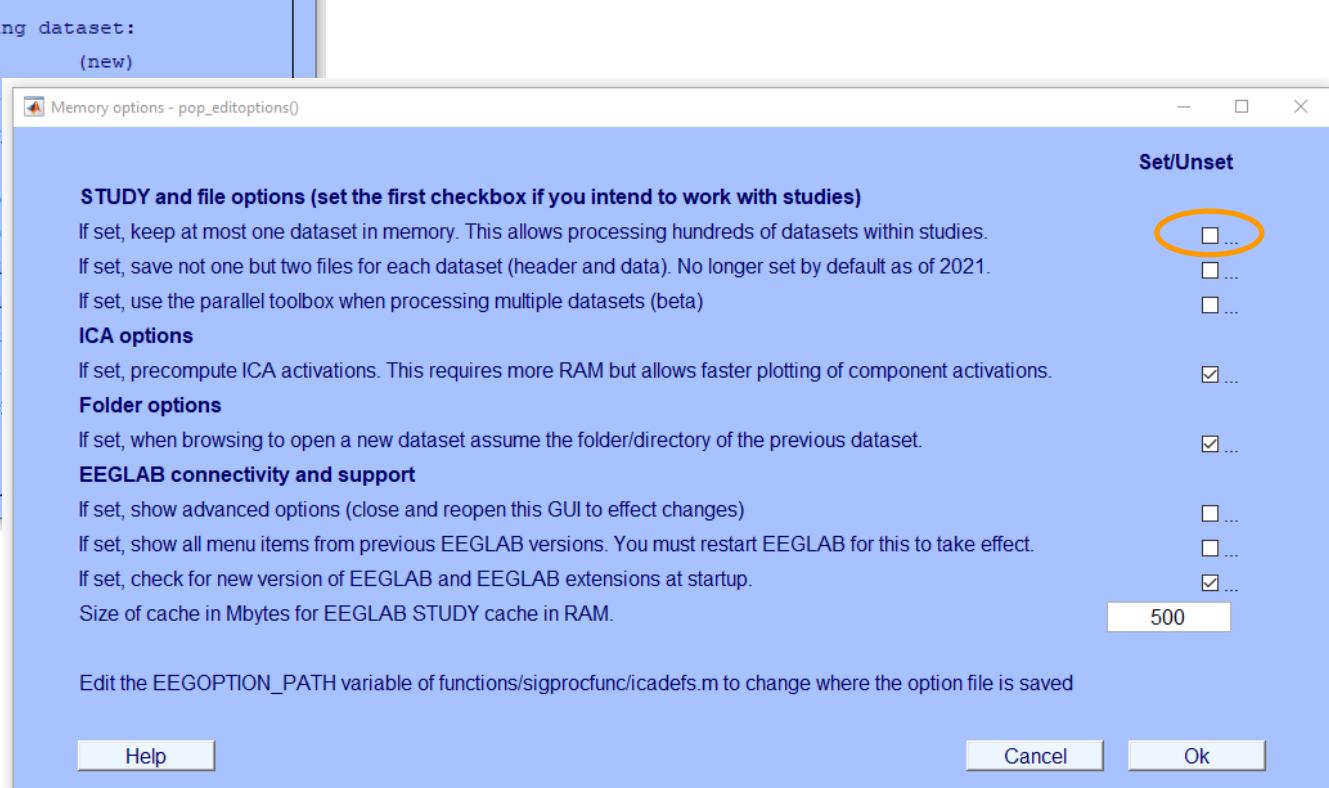
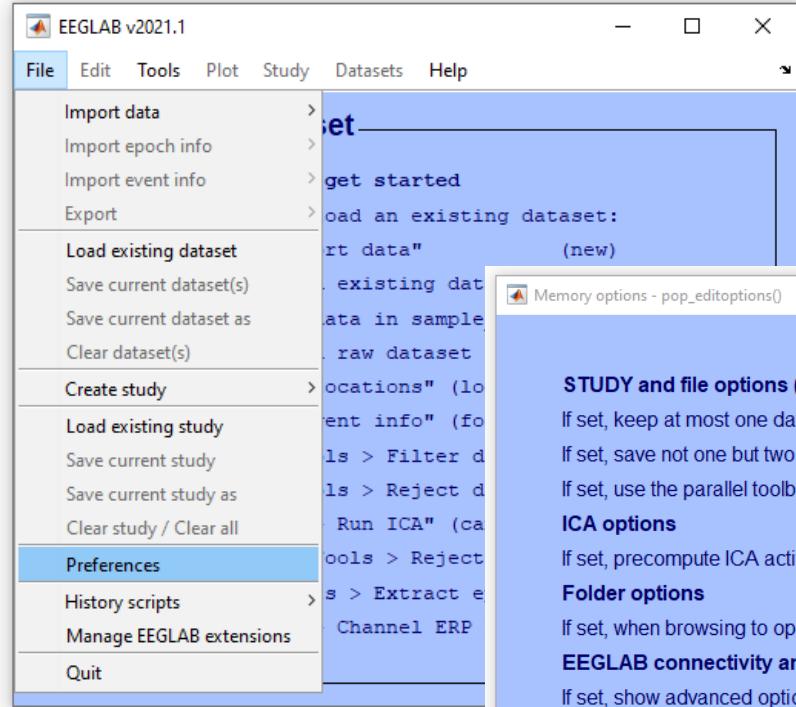
66 channel EEG, 256 Hz sampling rate, Biosemi system, re-referenced during import to averaged left and right mastoid electrodes

Task

speeded button press response to star shape (no response to circle shape), 100 ms presentation duration, 200 trials



Adjust preferences



Load a dataset

The image shows the MATLAB R2021a interface. At the top, there is a 3D head model with colored regions (blue, green, yellow) overlaid by a blue wavy line representing EEG signal amplitude. The MATLAB toolbar is visible at the top, featuring icons for Home, Plots, Apps, File, Variable, Code, and Environment. The workspace browser shows the current directory as C:\Users\julie\Documents\MATLAB\eeglab2021.1. The command window displays the following text:

```
>> eeglab
Some menus items hidden. Use Preference menu to show them all.
eeglab: options file is C:\Users\julie\eeg_options.m
Retrieving plugin versions from server...
Retreiving download statistics...
EEGLAB: adding "ICLabel" v1.3 (see >> help eegplugin_iclabel)
WARNING: for plugin "IMAT" version in the folder name "0.2" and in the eegplugin_ file "0.1" differ
EEGLAB: adding "IMAT" v0.2 (see >> help eegplugin_imat)
Initializing SIFT...
Start SIFTing!
EEGLAB: adding "SIFT" v1.52 (see >> help eegplugin_sift)
EEGLAB: adding "clean_rawdata" v2.4 (see >> help eegplugin_clean_rawdata) - new version 2.5 available
EEGLAB: adding "dipfit" v4.2 (see >> help eegplugin_dipfit) - new version 4.3 available
EEGLAB: adding "firfilt" v2.4 (see >> help eegplugin_firfilt)
You are using the latest version of EEGLAB
Retreiving download statistics...
fx >>
```

A modal dialog box titled "EEGLAB v2021" is open over the command window, showing the "File" menu. The "Load existing dataset" option is highlighted. The menu also includes "Import data", "Import epoch info", "Import event info", "Export", "Create study", "Load existing study", "Preferences", and "History scripts". The right side of the dialog box shows a list of dataset loading commands:

- get started
- load an existing dataset:
 - "rt data" (new)
 - "existing dataset" (load)
 - "ata in sample_data folder"
 - "raw dataset
 - "locations" (look up locations)
 - "ent info" (for continuous data)
 - "ls > Filter data"
 - "ls > Reject data by eye"
 - "Run ICA" (can take time)
 - "ools > Reject data using ICA"
 - "s > Extract epochs"
 - "Channel ERP > In scalp array"

Load a dataset



MATLAB R2021a - academic use

HOME PLOTS APPS

New Script New Live Script New Open Find Files Import Data Save Workspace New Variable Open Variable Clear Workspace Favorites Analyze Code Run and Time Clear Commands Layout Preferences Set Path Add-Ons RESOURCES

FILE VARIABLE CODE ENVIRONMENT

C: > Users > julie > Documents > MATLAB > eeglab2021.1

```
>> eeglab
Some menus items hidden. Use Preference...
eeglab: options file is C:\Users\julie\...
Retrieving plugin versions from server...
Retrieving download statistics...
EEGLAB: adding "ICLabel" v1.3 (see >> help)
WARNING: for plugin "IMAT" version in the...
EEGLAB: adding "IMAT" v0.2 (see >> help)
Initializing SIFT...
Start SIFTing!
EEGLAB: adding "SIFT" v1.52 (see >> help)
EEGLAB: adding "clean_rawdata" v2.4 (see >> help)
EEGLAB: adding "dipfit" v4.2 (see >> help)
EEGLAB: adding "firfilt" v2.4 (see >> help)
You are using the latest version of EEGLAB
Retreiving download statistics...
>>
```

Current Folder

Load dataset(s) -- pop_loadset()

This PC > Documents > EEG > WorkshopData

Organize New folder

Name	Date modified	Type	Size
faces_3.set	6/16/2021 11:23 AM	SET File	17,468 KB
faces_4.set	6/16/2021 11:23 AM	SET File	17,410 KB
RestEC_S03.set	6/23/2021 12:33 PM	SET File	75,750 KB
RestEO_S03.set	6/17/2021 10:10 AM	SET File	22,156 KB
SimpleOddball.set	6/16/2021 11:23 AM	SET File	803 KB

Pictures iCloud Drive CogSleepStudy ML03 Scans SubjDataMelator OneDrive - Person This PC 3D Objects Desktop Documents Downloads Music Pictures Videos OS (C:)

File name: (*.SET*, *.set) Open Cancel

- Epoch data: "Tools > Extract epochs"
- Plot ERP: "Plot > Channel ERP > In scalp array"

Load "SimpleOddball.set"

Imported EEG data



MATLAB R2021a - academic use

HOME PLOTS APPS

FILE VARIABLE CODE ENVIRONMENT

Current Folder C: > Users > julie > Documents > MATLAB > eeglab2021.1 >

```
>> eeglab
Some menus items hidden. Use Preference menu to show them all.
eeglab: options file is C:\Users\julie\eeg_options.m
Retrieving plugin versions from server...
Retreiving download statistics...
EEGLAB: adding "ICLabel" v1.3 (see >> help eegplugin_iclabel)
WARNING: for plugin "IMAT" version in the folder name "0.2" and in the eegplugin_ file "0.1" differ
EEGLAB: adding "IMAT" v0.2 (see >> help eegplugin_imat)
Initializing SIFT...
Start SIFTing!
EEGLAB: adding "SIFT" v1.52 (see >> help eegplugin_sift)
EEGLAB: adding "clean_rawdata" v2.4 (see >> help eegplugin_clean)
EEGLAB: adding "dipfit" v4.2 (see >> help eegplugin_dipfit) - r
EEGLAB: adding "firfilt" v2.4 (see >> help eegplugin_firfilt)
You are using the latest version of EEGLAB.
Retreiving download statistics...
pop_loadset(): loading file C:\Users\julie\Documents\EEG\WorkshopData\SimpleOddball.set
Reading float file 'C:\Users\julie\Documents\EEG\WorkshopData\SimpleOddball.set'
Creating a new ALLEEG dataset 1
Done.
```

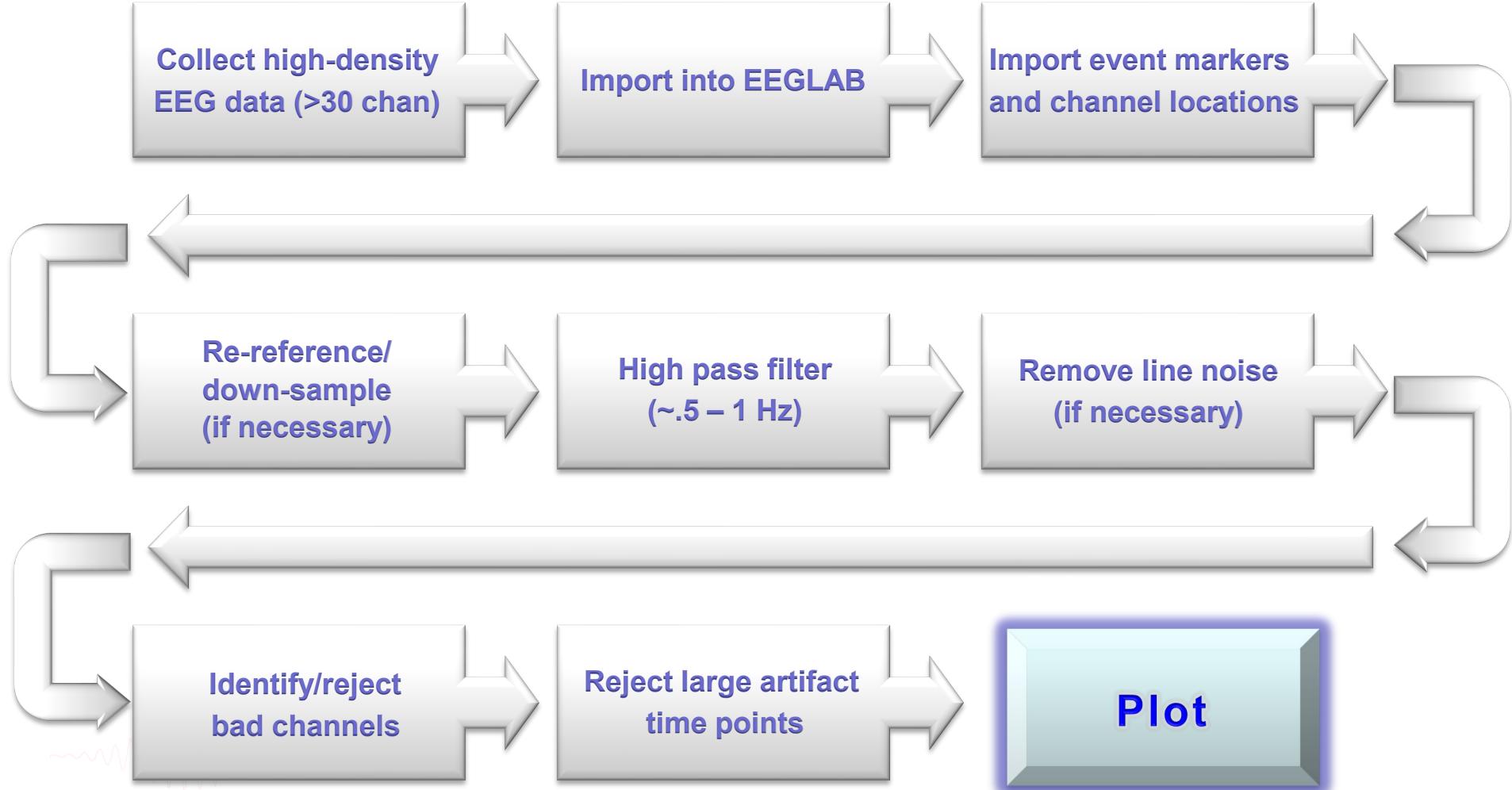
EEGLAB GUI displays dataset basics

EEGLAB v2021.1

#1: Simple Oddball

Filename:	...kshopData\SimpleOddball.set
Channels per frame	66
Frames per epoch	85504
Epochs	1
Events	260
Sampling rate (Hz)	256
Epoch start (sec)	0.000
Epoch end (sec)	333.996
Reference	unknown
Channel locations	Yes
ICA weights	No
Dataset size (Mb)	23.5

Pre-processing pipeline





MATLAB R2021a - academic use

HOME PLOTS APPS

New Variable New Variable

New Live Script New Open Find Files Import Data Save Workspace Clear Workspace Favorites Analyze Code Run and Time Clear Commands

FILE VARIABLE CODE ENVIRONMENT RESOURCES

Current Folder C: > Users > julie > Documents > MATLAB > eeglab2021.1 >

```
>> eeglab
Some menus items hidden. Use Preference menu to show them all.
eeglab: options file is C:\Users\julie\eeg_options.m
Retrieving plugin versions from server...
Retreiving download statistics...
EEGLAB: adding "ICLabel" v1.3 (see >> help eegplugin_iclabel)
WARNING: for plugin "IMAT" version in the folder name "0.2" and in the eegplugin_ file "0.1" differ
EEGLAB: adding "IMAT" v0.2 (see >> help eegplugin_imat)
Initializing SIFT...
Start SIFTing!
EEGLAB: adding "SIFT" v1.52 (see >> help eegpl
EEGLAB: adding "clean_rawdata" v2.4 (see >> he
EEGLAB: adding "dipfit" v4.2 (see >> help eeg
EEGLAB: adding "firfilt" v2.4 (see >> help eeg
You are using the latest version of EEGLAB.
pop_loadset(): loading file C:\Users\julie\Doc
Reading float file 'C:\Users\julie\Documents\E
Creating a new ALLEG dataset 1
Done.
fx >>
```

EEGLAB v2021.1

File Edit Tools Plot Study Datasets Help

Import data > all

Import epoch info >

Import event info > From Matlab array or ASCII file

Export > From data channel

Load existing dataset

Save current dataset(s)

Save current dataset as

Clear dataset(s)

Create study > 260

Load existing study

Save current study

Save current study as

Clear study / Clear all 256

Preferences 0.000

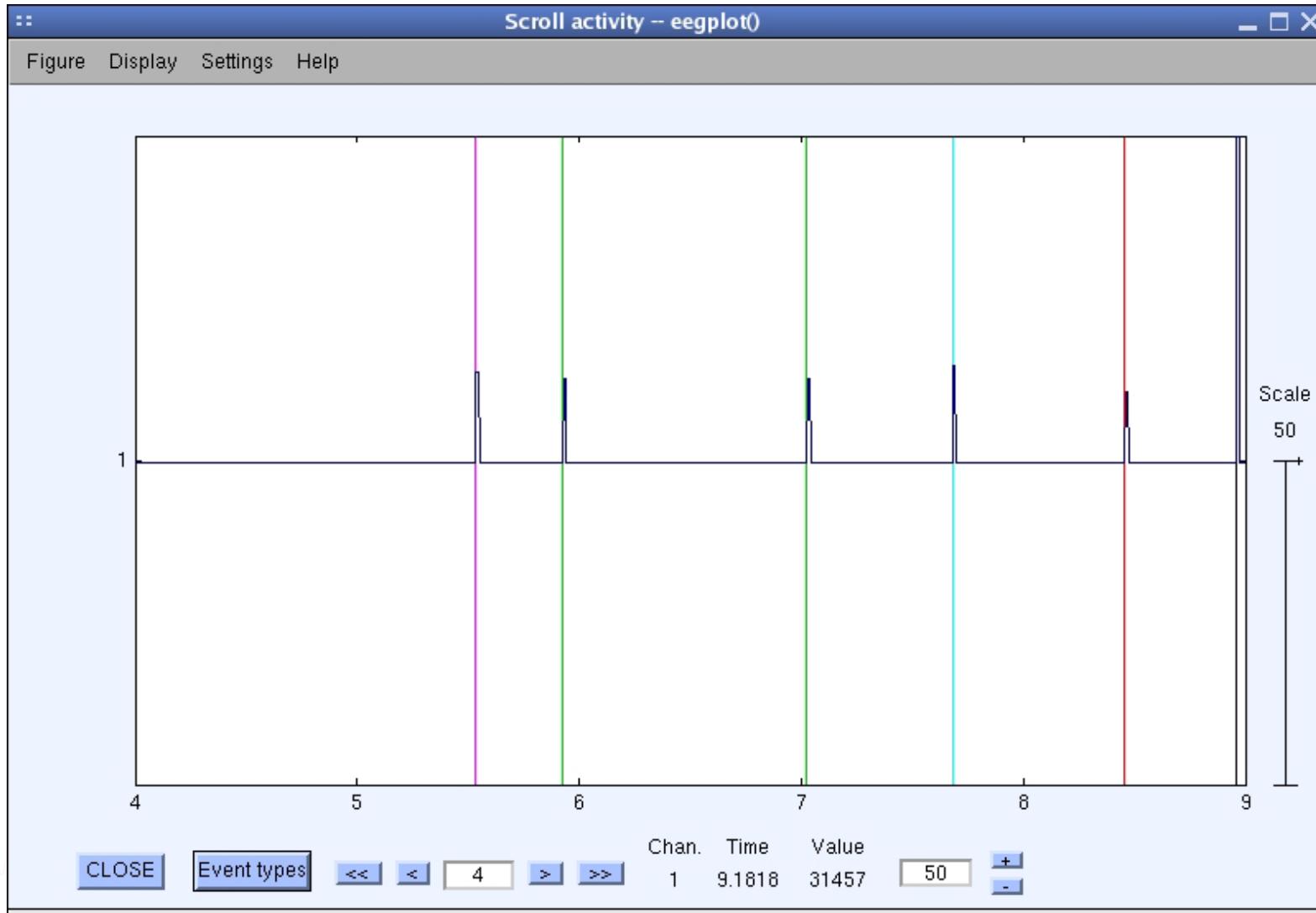
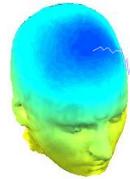
History scripts > 333.996

Manage EEGLAB extensions unknown

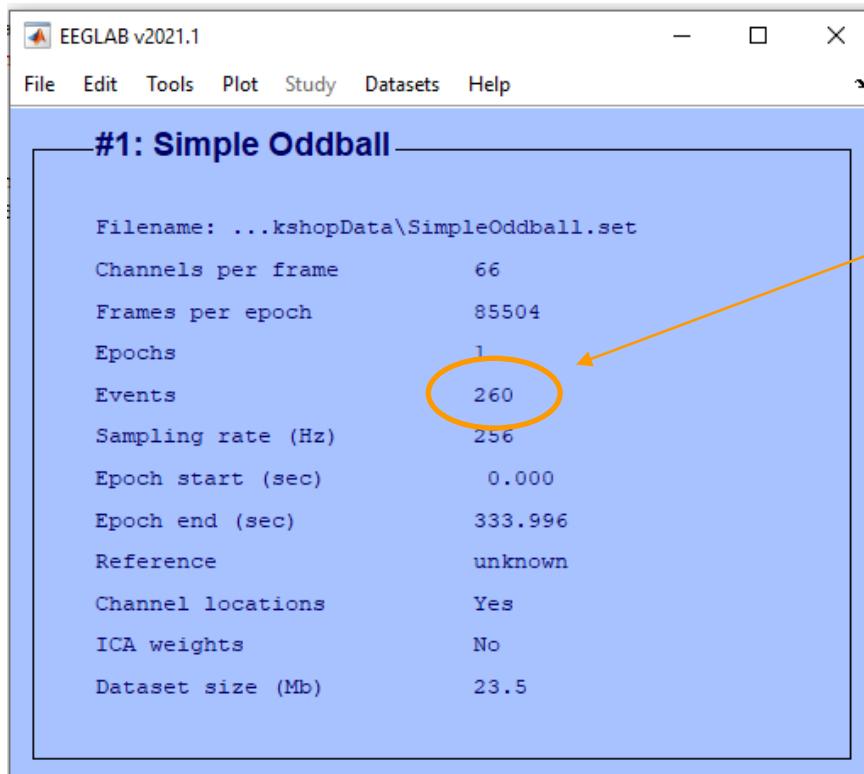
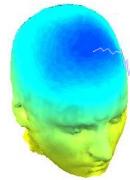
Quit Yes

Many file formats import events automatically.

Appearance of an event channel in raw data



Imported data events



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

Review/edit event values

The image shows the EEGLAB v2021.1 software interface. On the left, a 3D head model is displayed above a blue waveform. The main window has a menu bar with File, Edit, Tools, Plot, Study, Datasets, and Help. The 'Edit' tab is selected. A sidebar on the left lists dataset information, including 'Event values' which is currently selected. The main pane displays a list of event parameters:

	Value
SampleOddball.set	
66	
85504	
1	
260	
256	
0.000	
Epoch end (sec)	333.996
Reference	unknown
Channel locations	Yes
ICA weights	No
Dataset size (Mb)	23.5

An orange box labeled "Insert event BEFORE current event" points to the "Insert event" button in the edit dialog. Another orange box labeled "Delete CURRENT event" points to the "Delete event" button. A third orange box labeled "Append event AFTER current event" points to the "Append event" button.

Edit event values -- pop_editeventvals()

Edit event field values (currently 260 events)

Basic fields

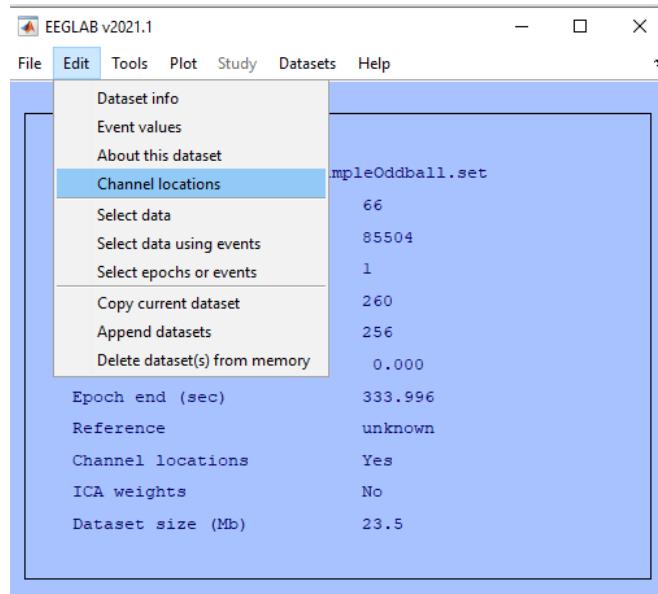
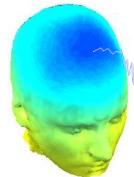
Latency (sec)	87.02
Type	1

Event Num
1 originally 2

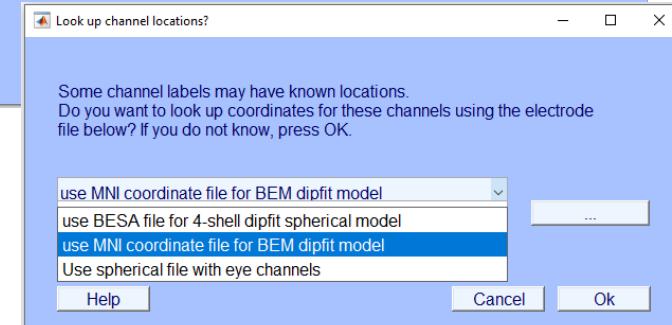
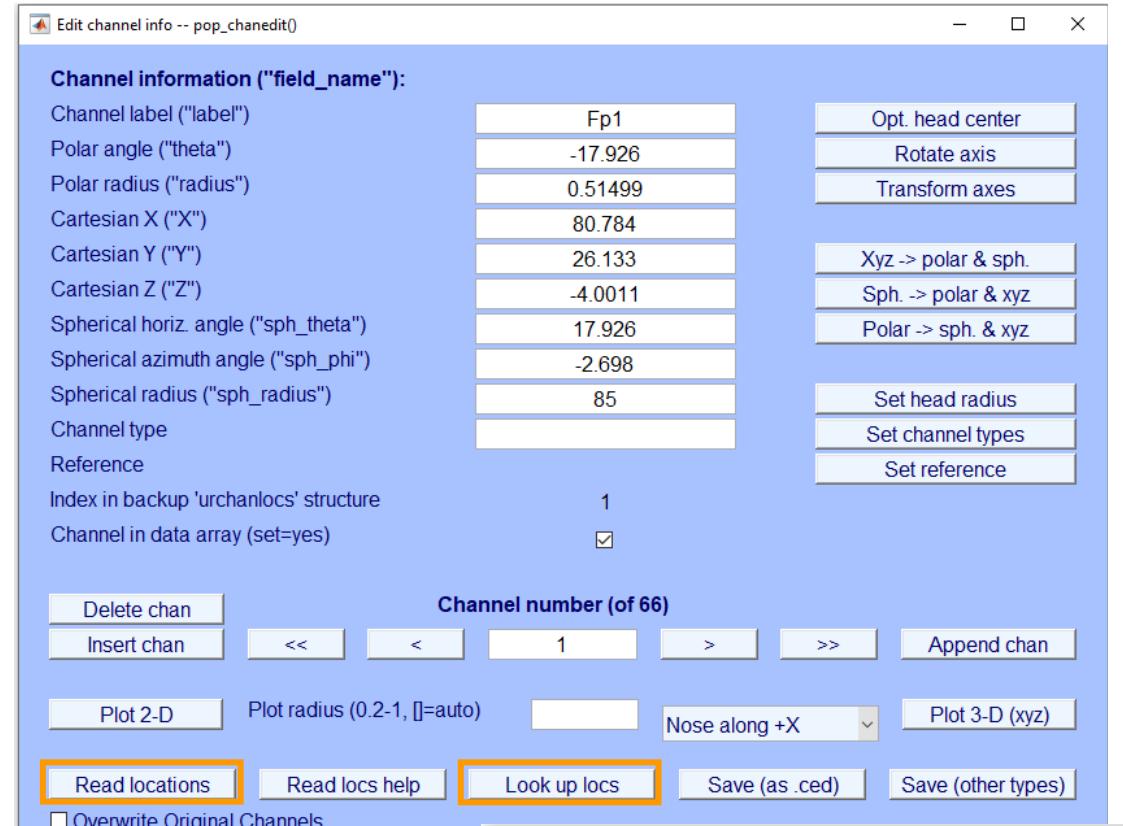
Insert event << < > >> Append event

Help Cancel Ok

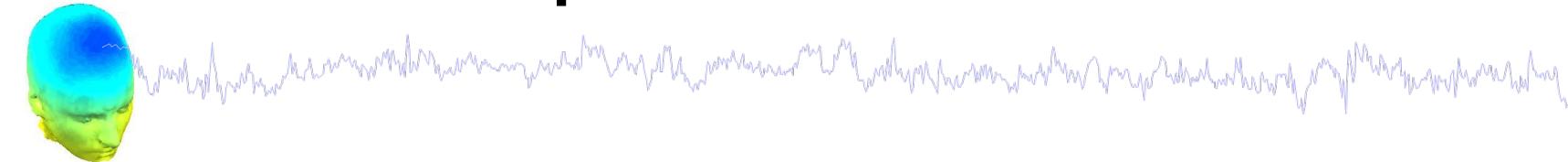
Import channel locations



9 file formats supported:
['loc'|'sph'|'sfp'|'xyz'|'asc'|
'polhemus'|'besa'|
'chanedit'|'custom']



Import channel locations



Edit channel info -- pop_chanedit()

Channel information ("field_name"):

Channel label ("label")

LEYE
-45.1543
0.54374
0.79487
0.79917
-0.15585
45.1543
-7.8725
1.1379
EEG

Polar angle ("theta")

Polar radius ("radius")

Cartesian X ("X")

Cartesian Y ("Y")

Cartesian Z ("Z")

Spherical horiz. angle ("sph_theta")

Spherical azimuth angle ("sph_phi")

Spherical radius ("sph_radius")

Channel type

Reference

Index in backup 'urchanlocs' structure

Channel in data array (set=yes)

Delete chan

Channel number (of 71)

Insert chan

<<

<

1

>

>>

Append chan

Plot 2-D

Plot radius (0.2-1, []=auto)

Nose along +X

Plot 3-D (xyz)

Read locations

Read locs help

Look up locs

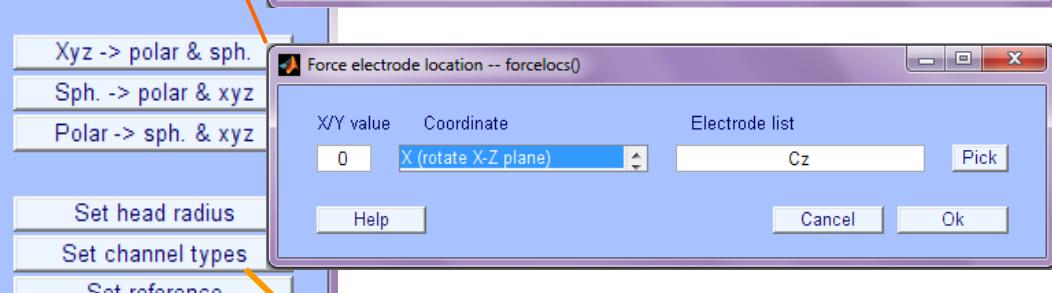
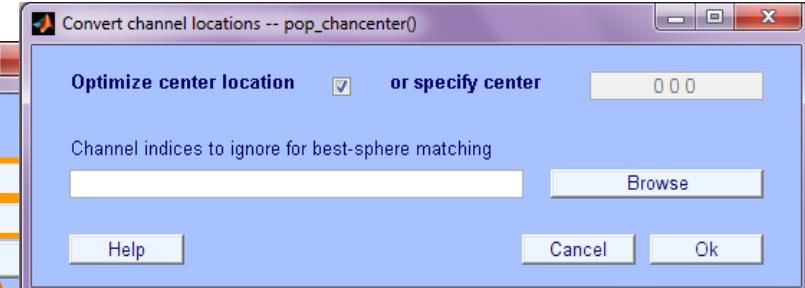
Save (as .ced)

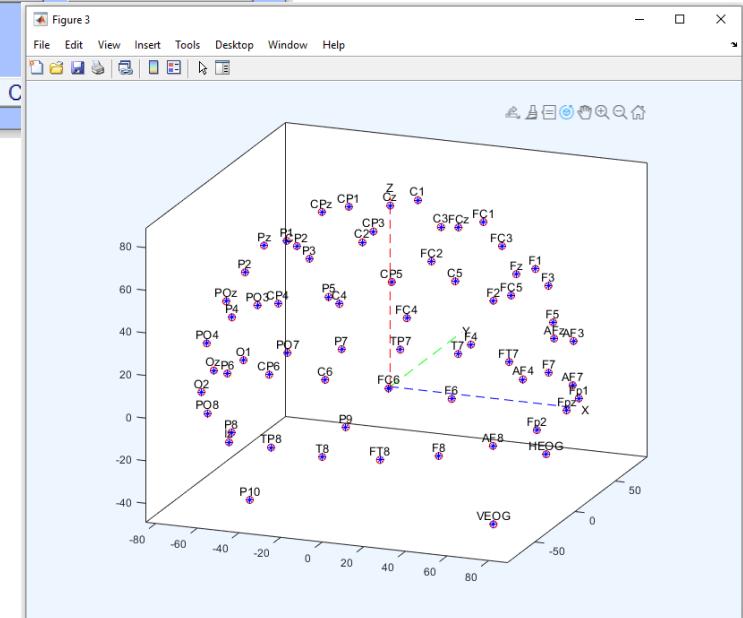
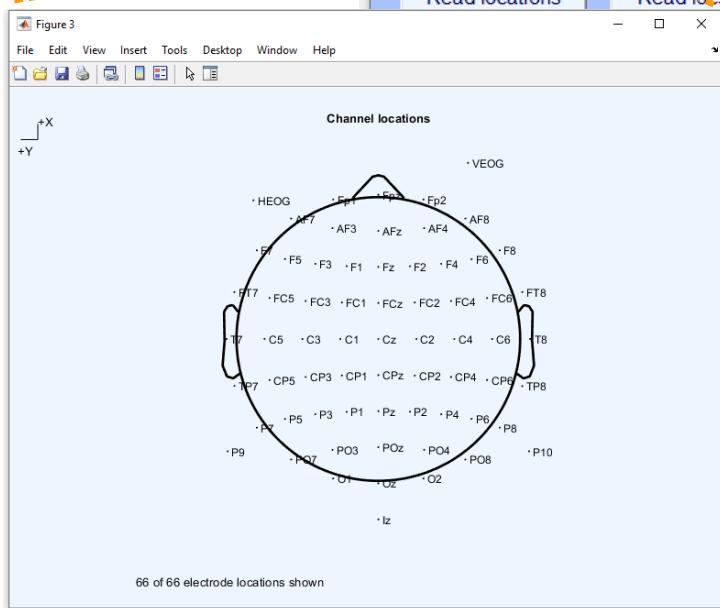
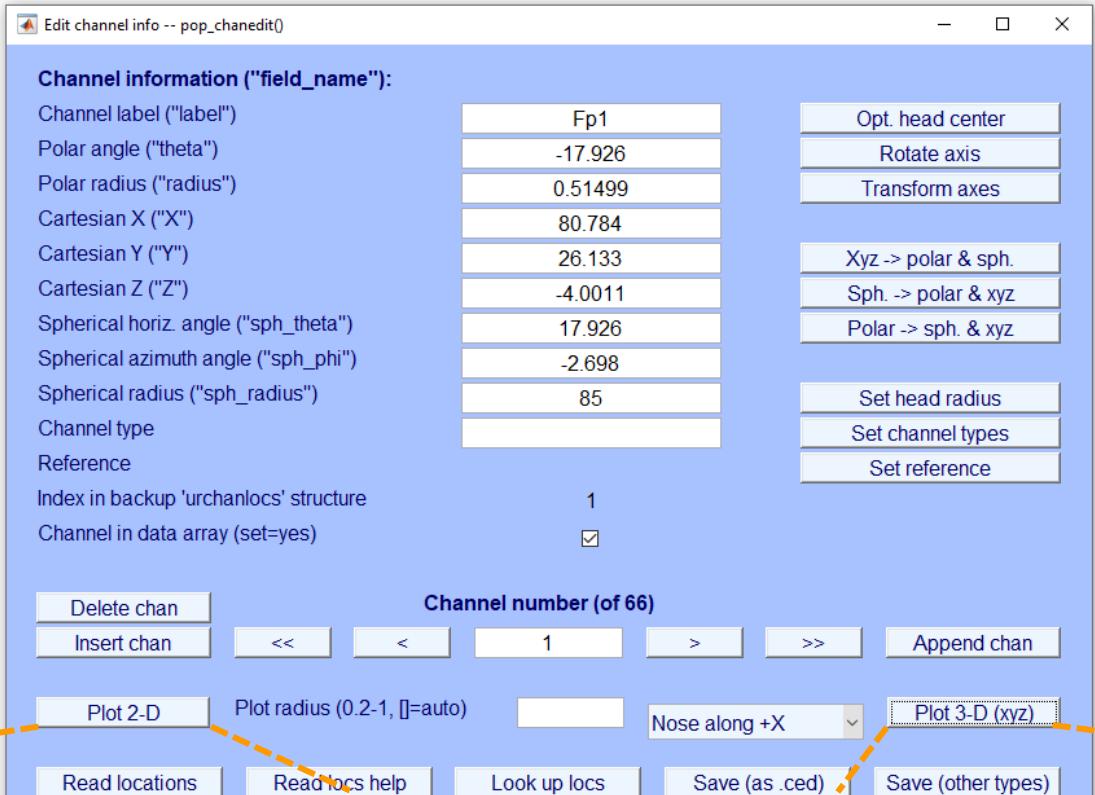
Save (other types)

Help

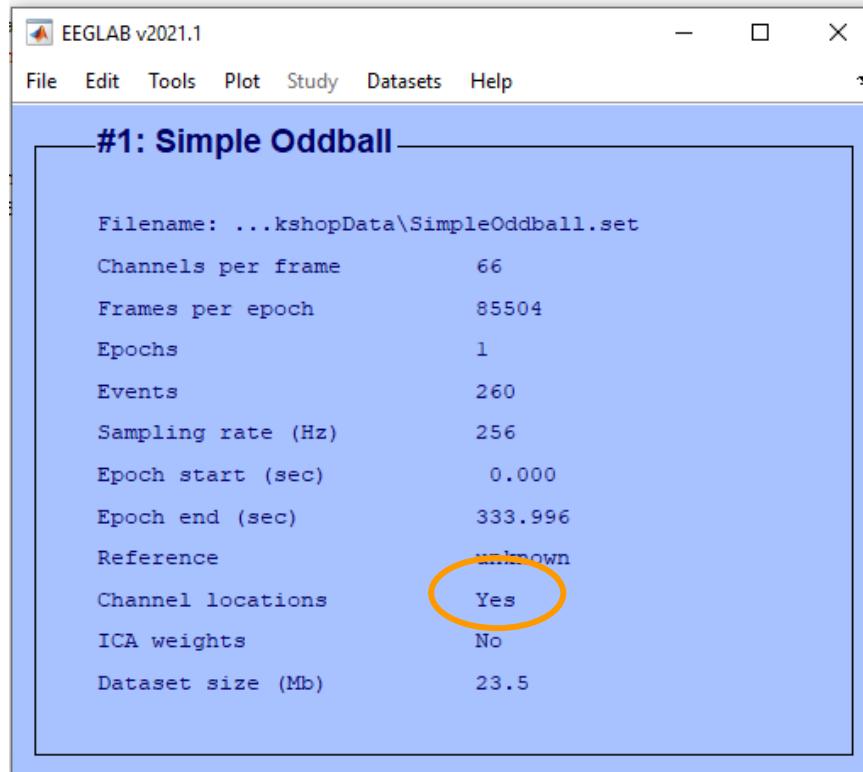
Cancel

Ok

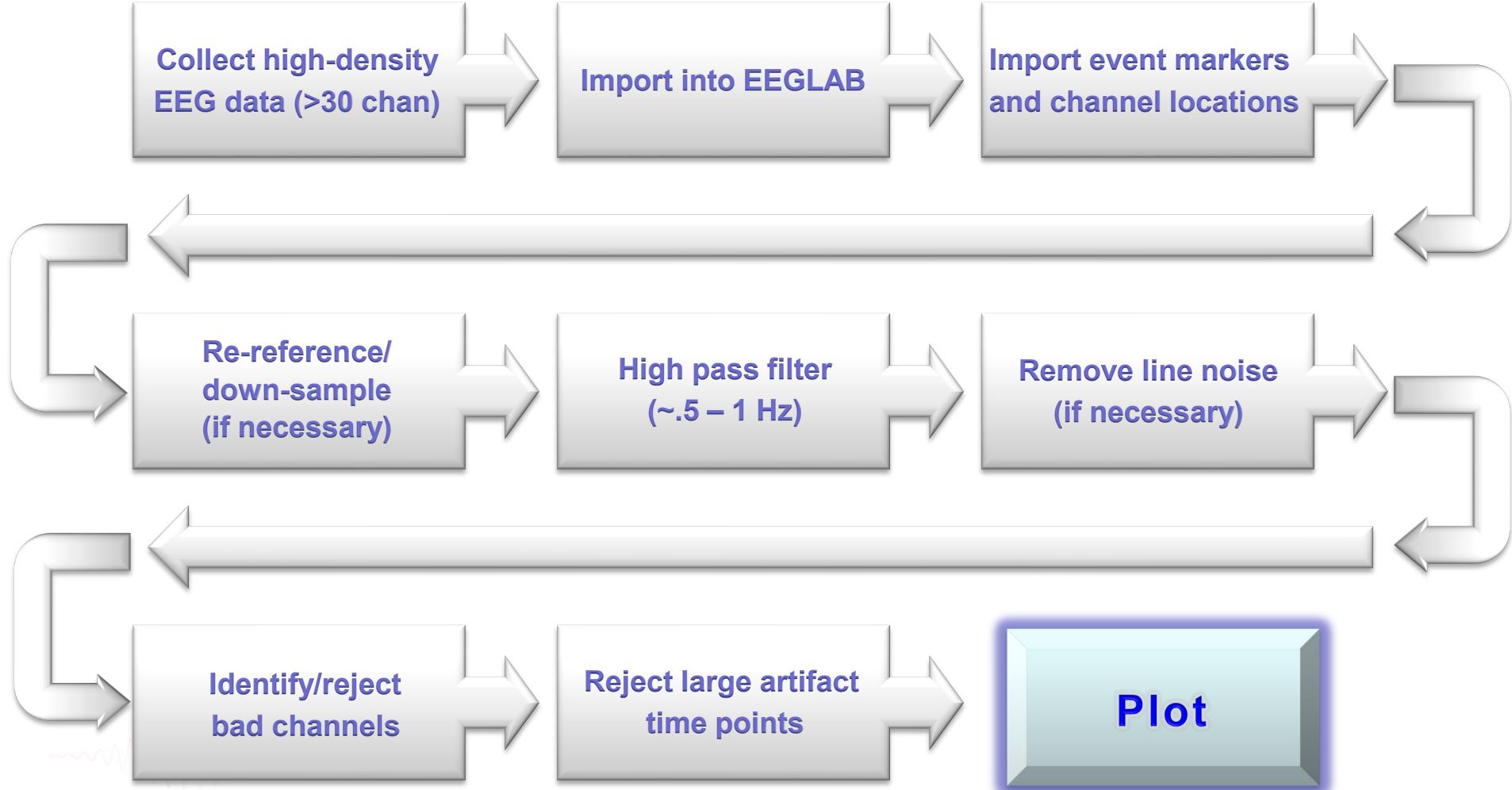




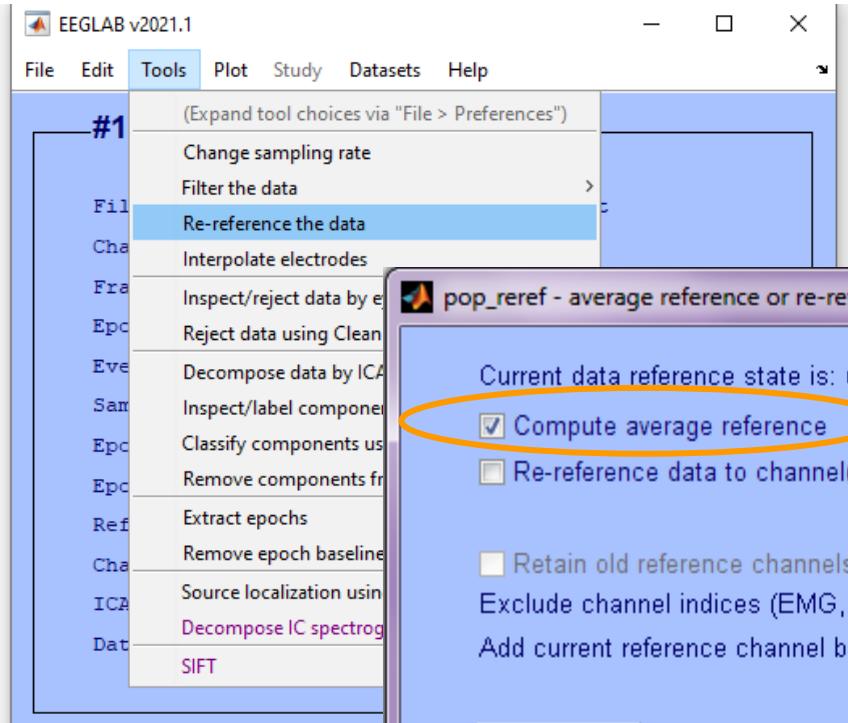
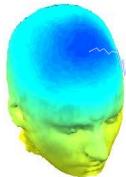
Imported channel locations



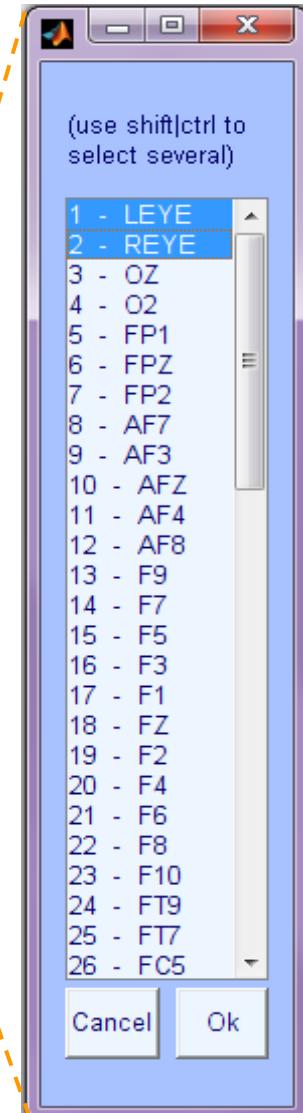
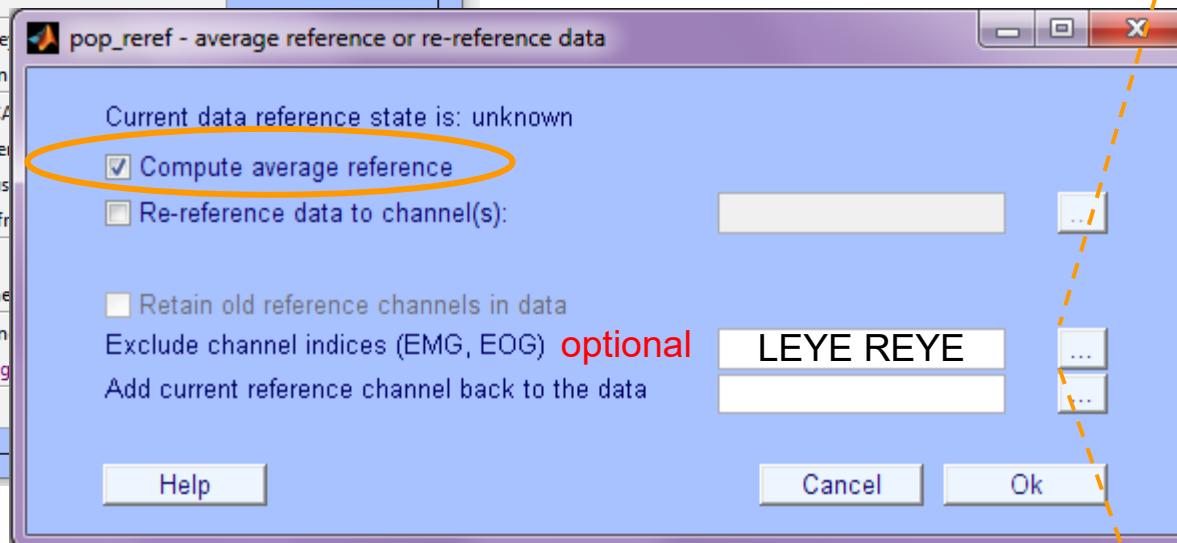
Pre-processing pipeline



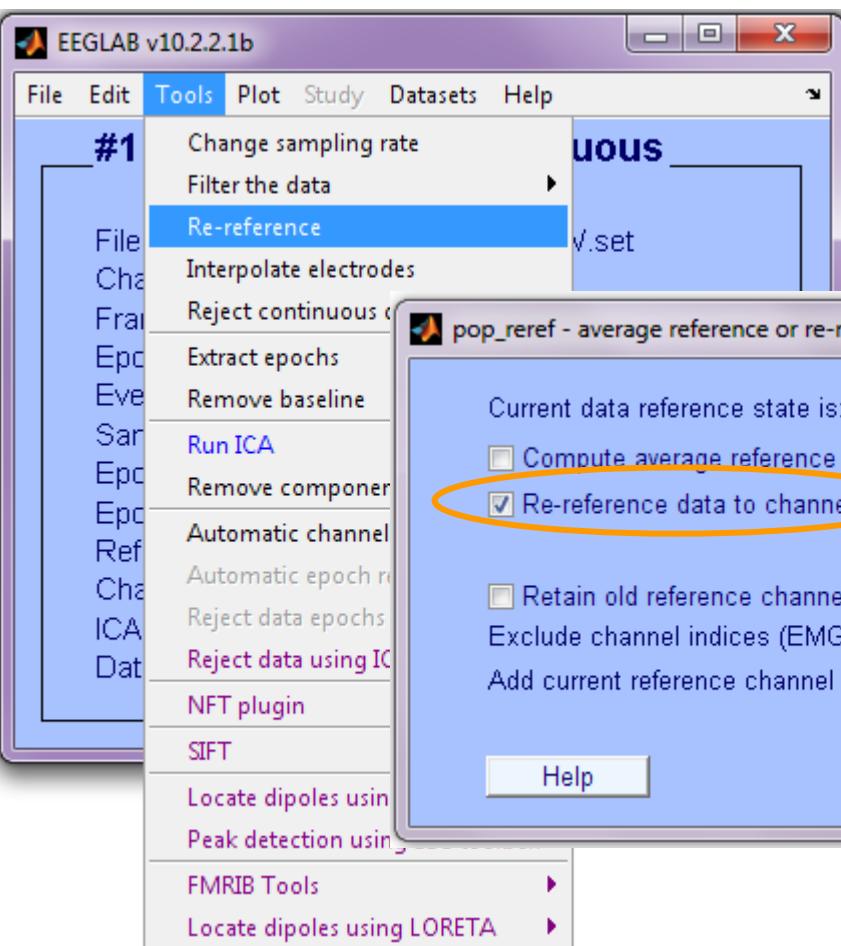
Re-reference data (if necessary/desired)



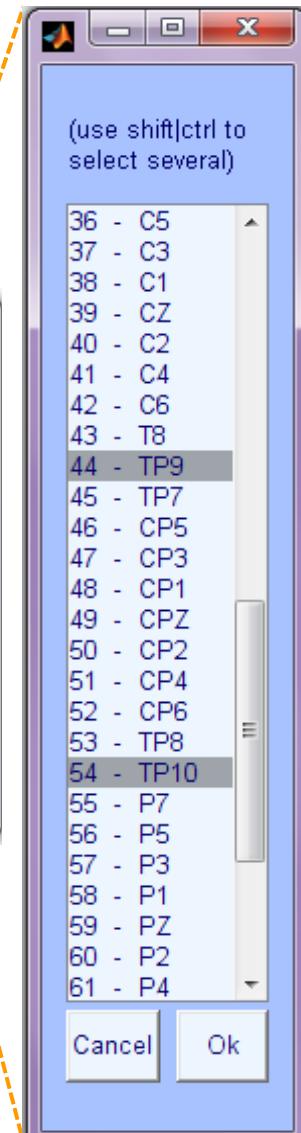
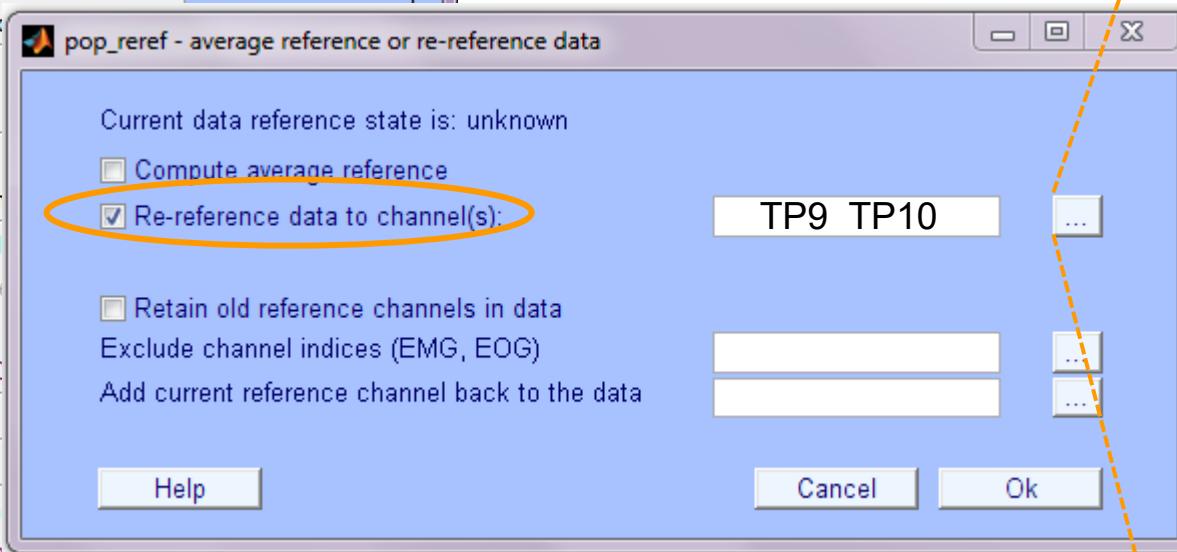
For example,
average reference



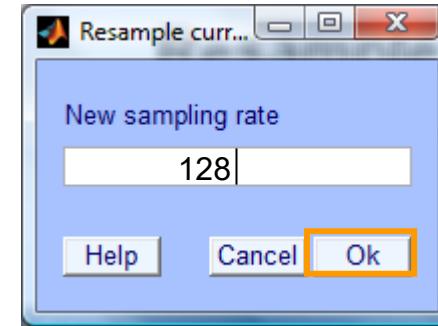
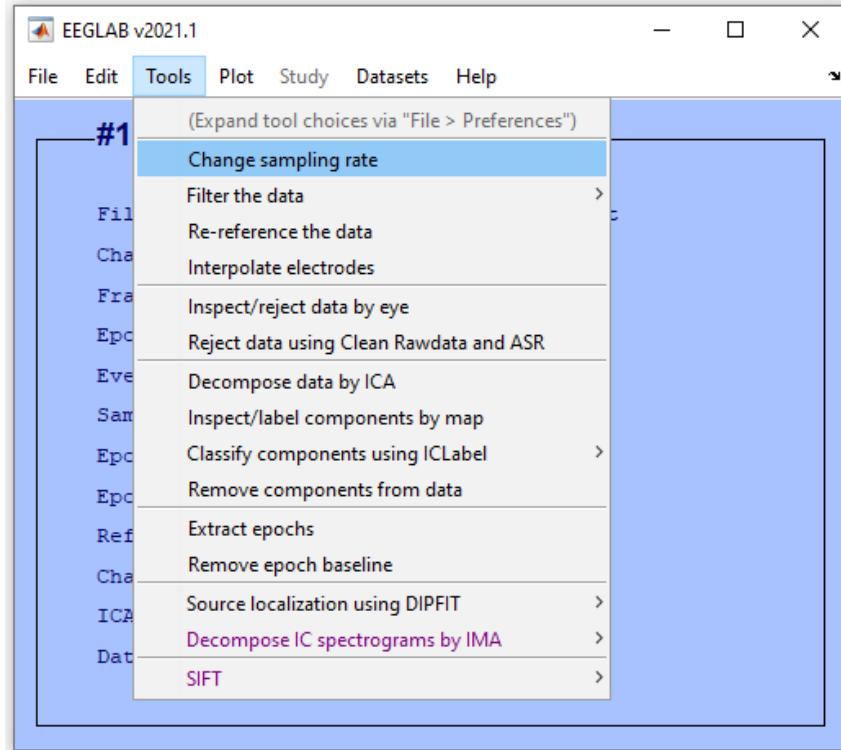
Re-reference data (if necessary/desired)



OR, re-reference to
channel(s)
(i.e.) 'linked mastoids'



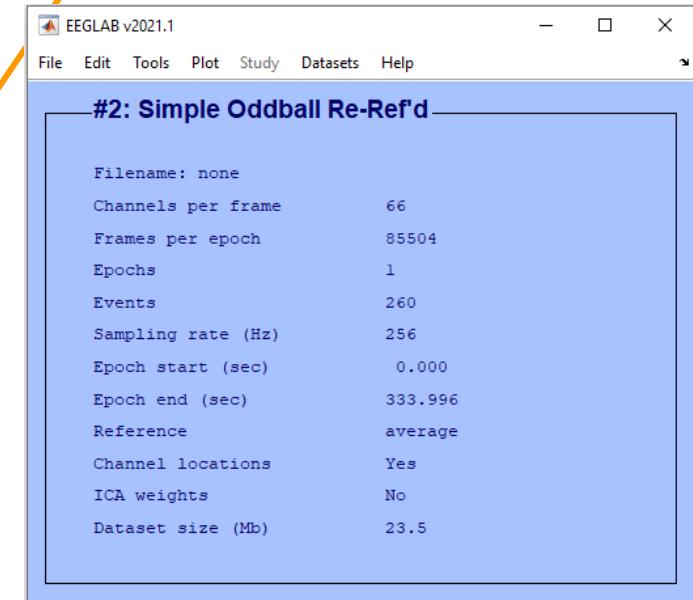
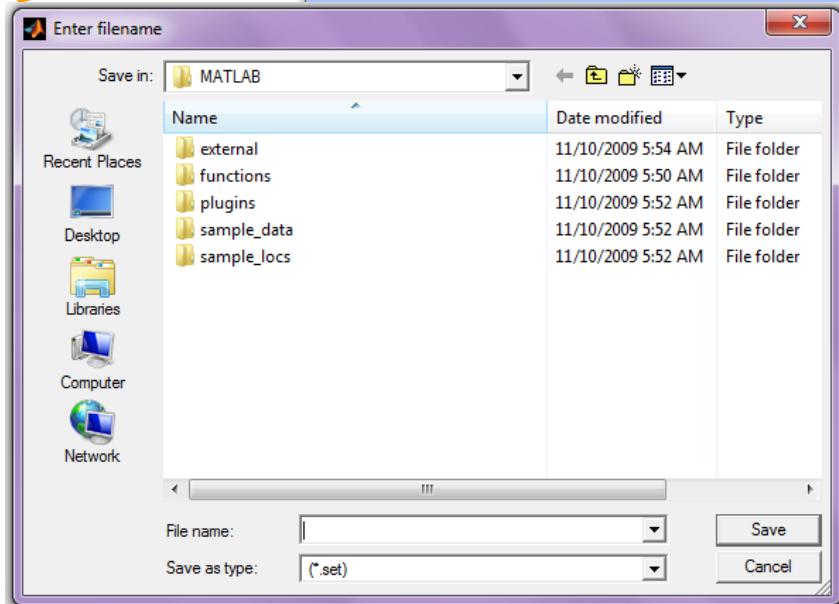
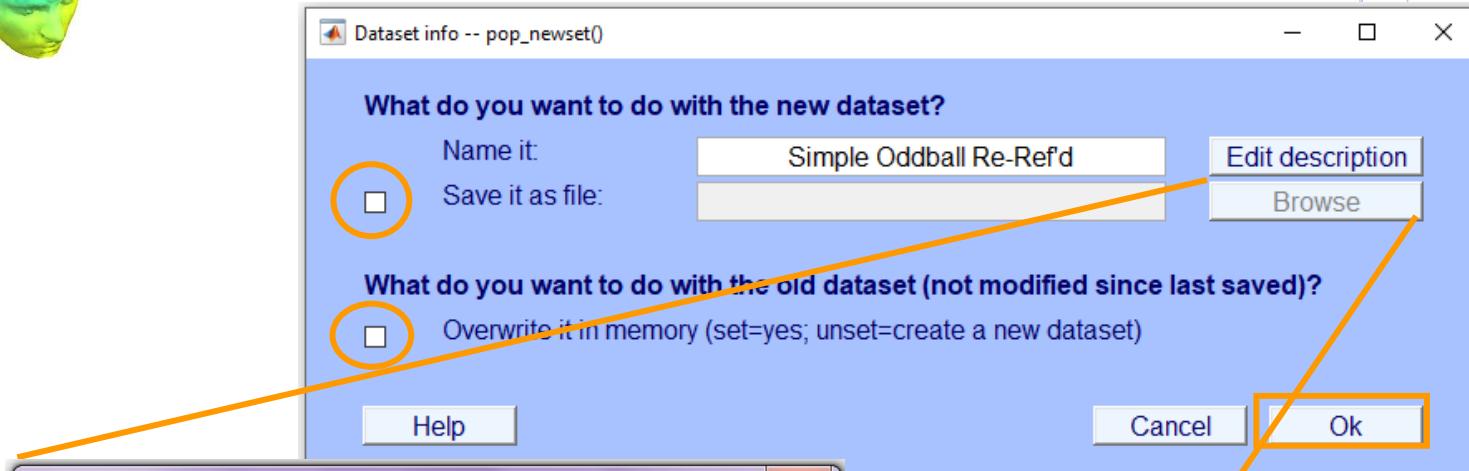
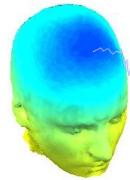
Resample data (if necessary)



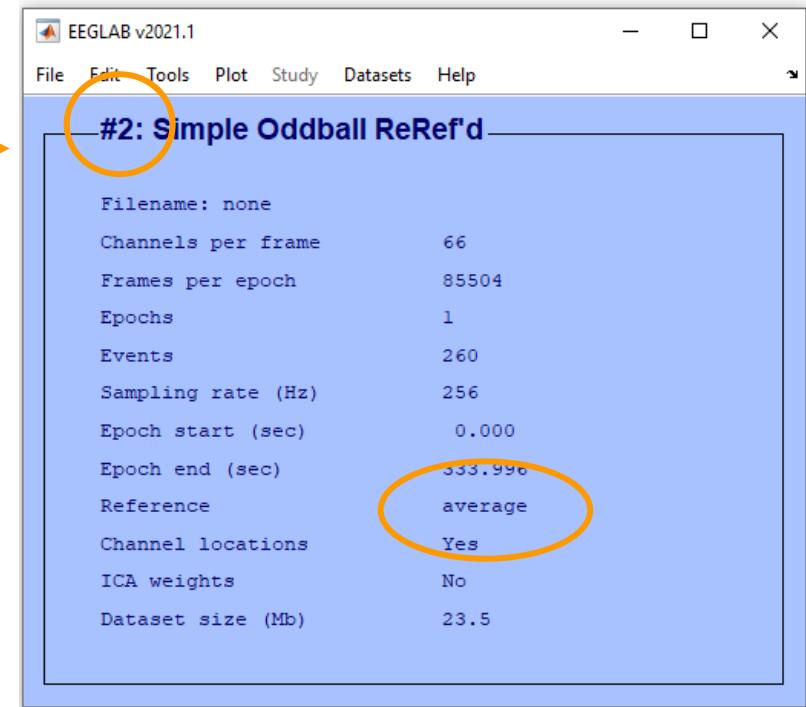
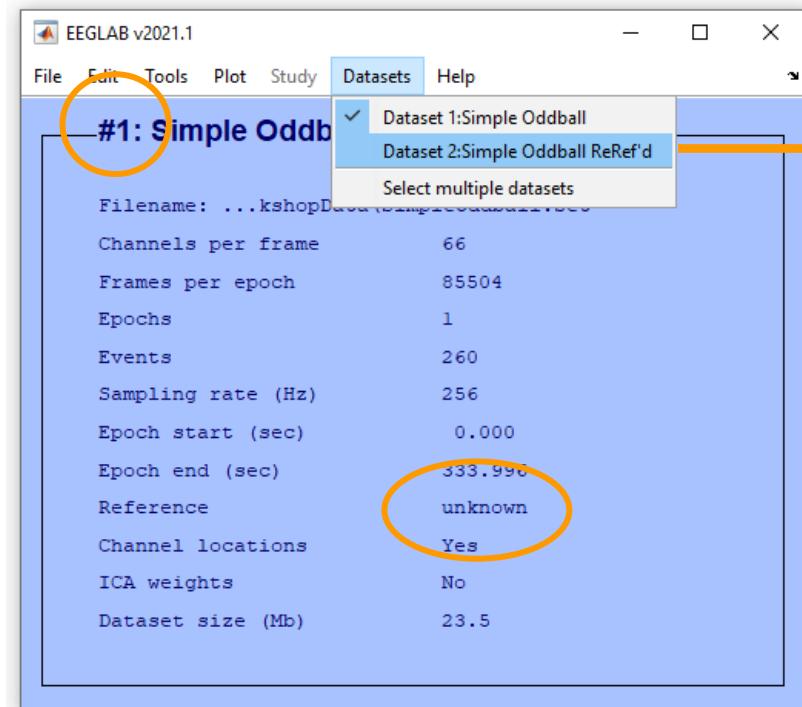
Down-sampling is only necessary when your computing capacity can't handle the original sampling rate



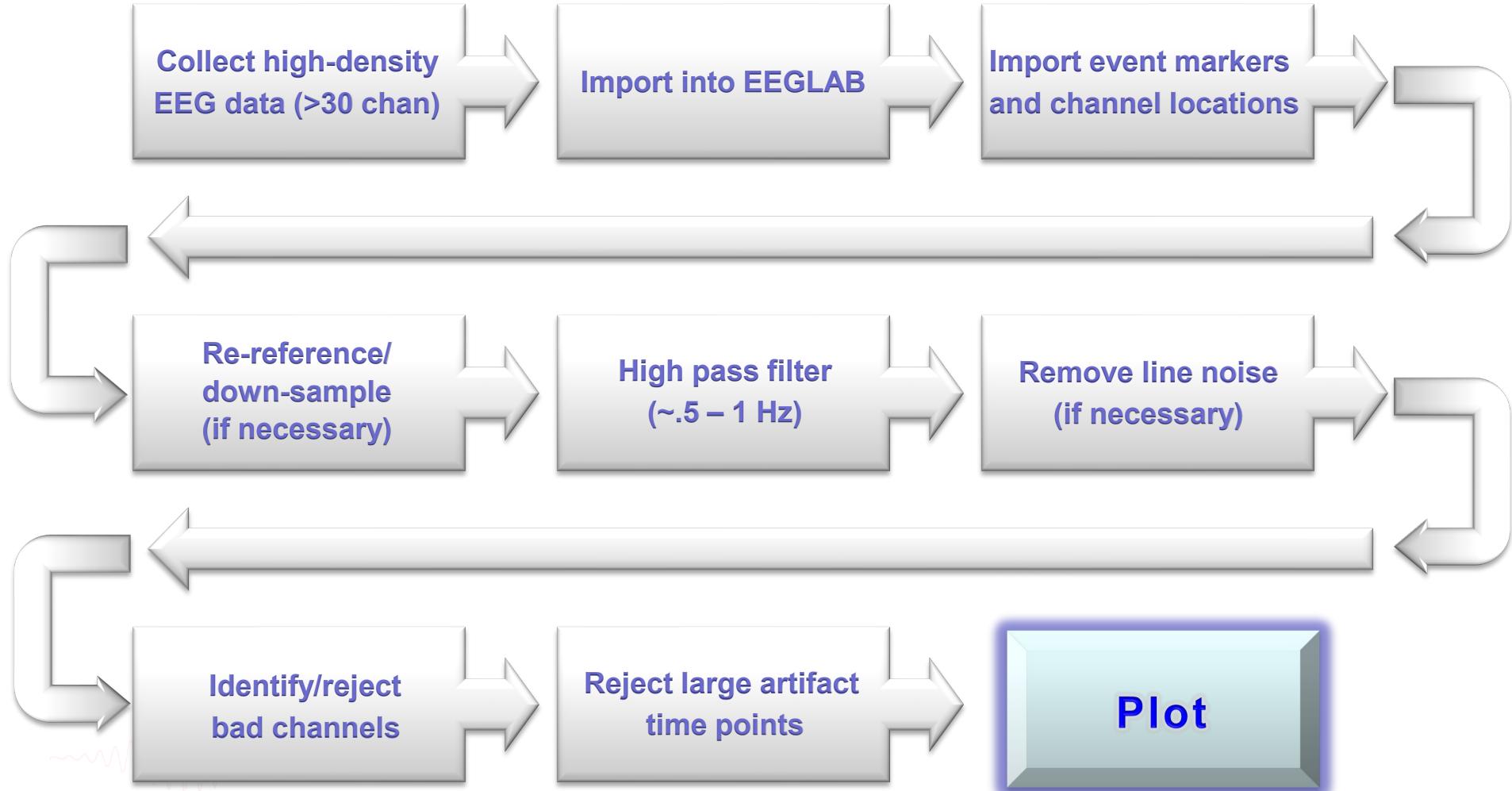
Save new dataset, keep old one



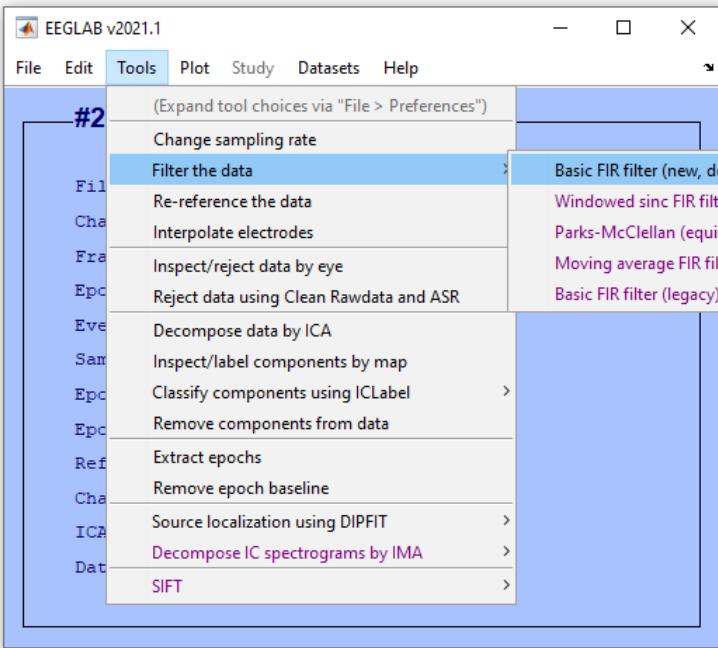
Multiple active datasets (ALLEEG)



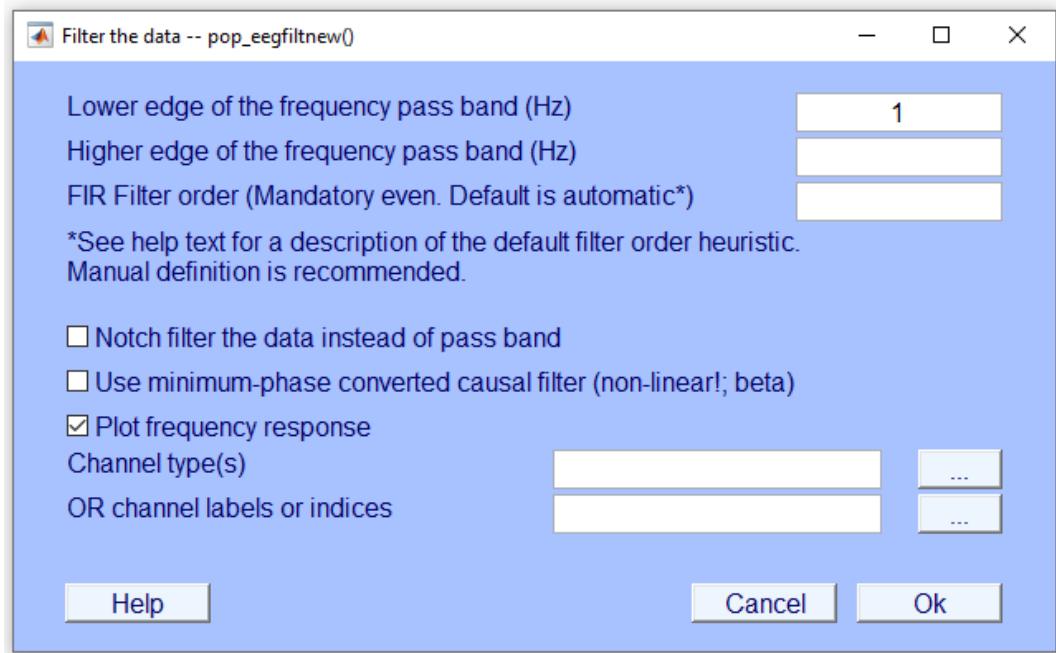
Pre-processing pipeline



Filter the data (if necessary/desired)



High-pass
needed
for ICA



Lower cut off
frequencies require
longer stretches of
continuous data

Filter the data (if necessary/desired)



EEGLAB v2021.1

File Edit Tools Plot Study Datasets Help

#3 (Expand tool choices via "File > Preferences")

Tools menu options:

- Change sampling rate
- Filter the data
- Re-reference the data
- Interpolate electrodes
- Inspect/reject data by eye
- Reject data using Clean Rawdata and ASR** (selected)
- Decompose data by ICA
- Inspect/label components by map
- Classify components using ICLabel
- Remove components from data
- Extract epochs
- Remove epoch baseline
- Source localization using DIPFIT
- CleanLine
- Decompose IC spectrograms by IMA
- SIFT

pop_clean_rawdata()

Remove channel drift (data not already high-pass filtered)
Linear filter (FIR) transition band [lo hi] in Hz

Remove bad channels
 Remove channel if it is flat for more than (seconds)
 Max acceptable high-frequency noise std dev
 Min acceptable correlation with nearby chans [0-1]

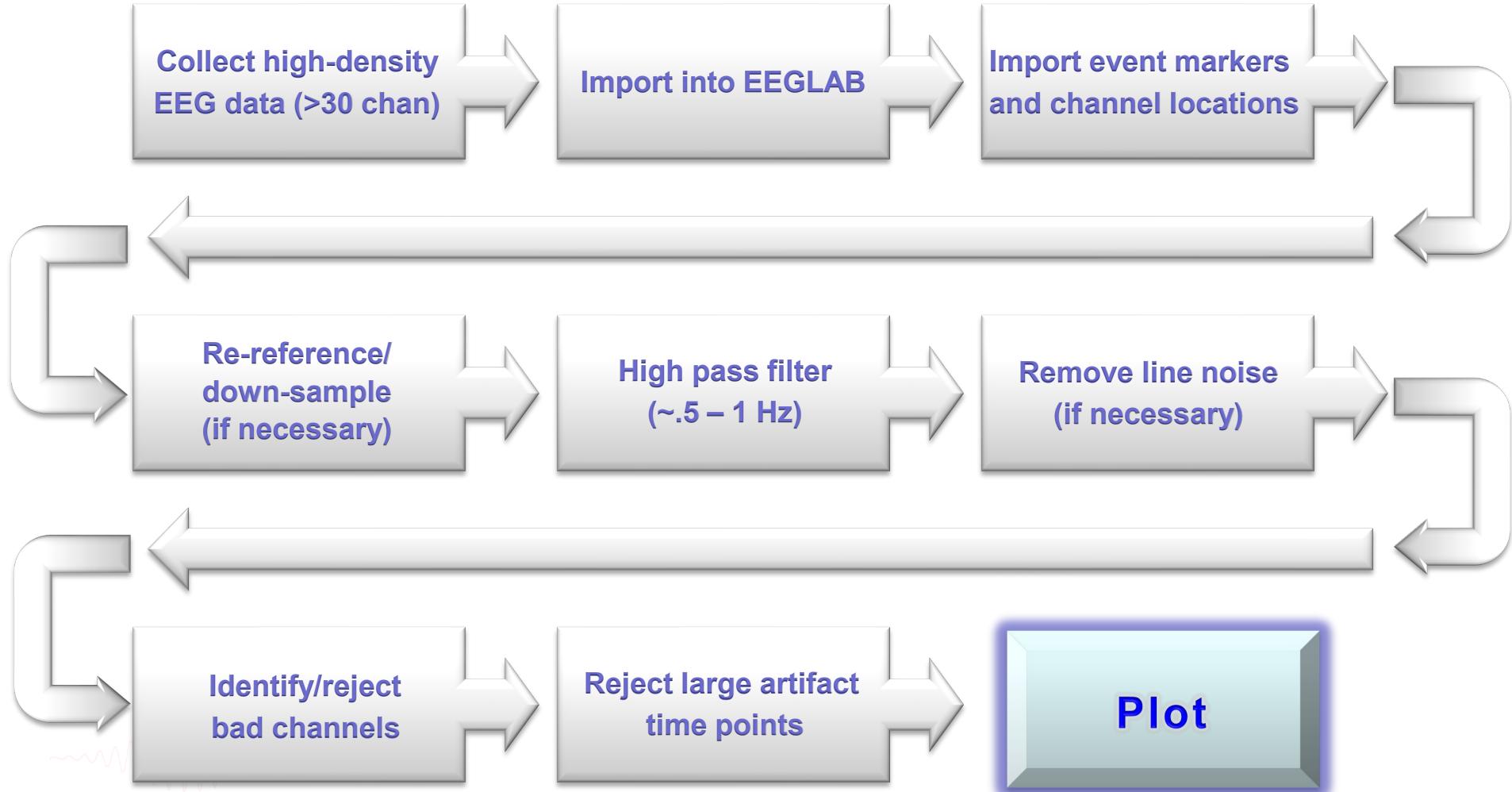
Perform Artifact Subspace Reconstruction bad burst correction
Max acceptable 0.5 second window std dev
 Use Riemanian distance metric (not Euclidean) - beta
 Remove bad data periods (instead of correcting them)

Additional removal of bad data periods
Acceptable [min max] channel power range (+/- std dev)
Maximum out-of-bound channels (%)

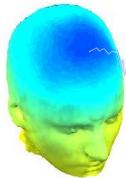
Pop up scrolling data window with rejected data highlighted

Help Cancel Ok

Pre-processing pipeline



Remove line noise, if necessary



Need to install cleanline function:

Search here

EEGLAB v2021.1

File Edit Tools Plot Study Datasets Help

Import data > 66
Import epoch info > 855
Import event info > 1
Export > 260
Load existing dataset 256
Save current dataset(s) 0
Save current dataset as 333
Clear dataset(s) ave:
Create study > Yes
Load existing study 23.
Save current study 23.
Save current study as 23.
Clear study / Clear all 23.
Preferences 23.
History scripts 23.
Manage EEGLAB extensions 23.
Quit 23.

List of plugins (bolded means installed)

No install status filter No topic filter cleanline

★★★★★ - Cleanline v2.00 (8074 downloads; 4 rating)

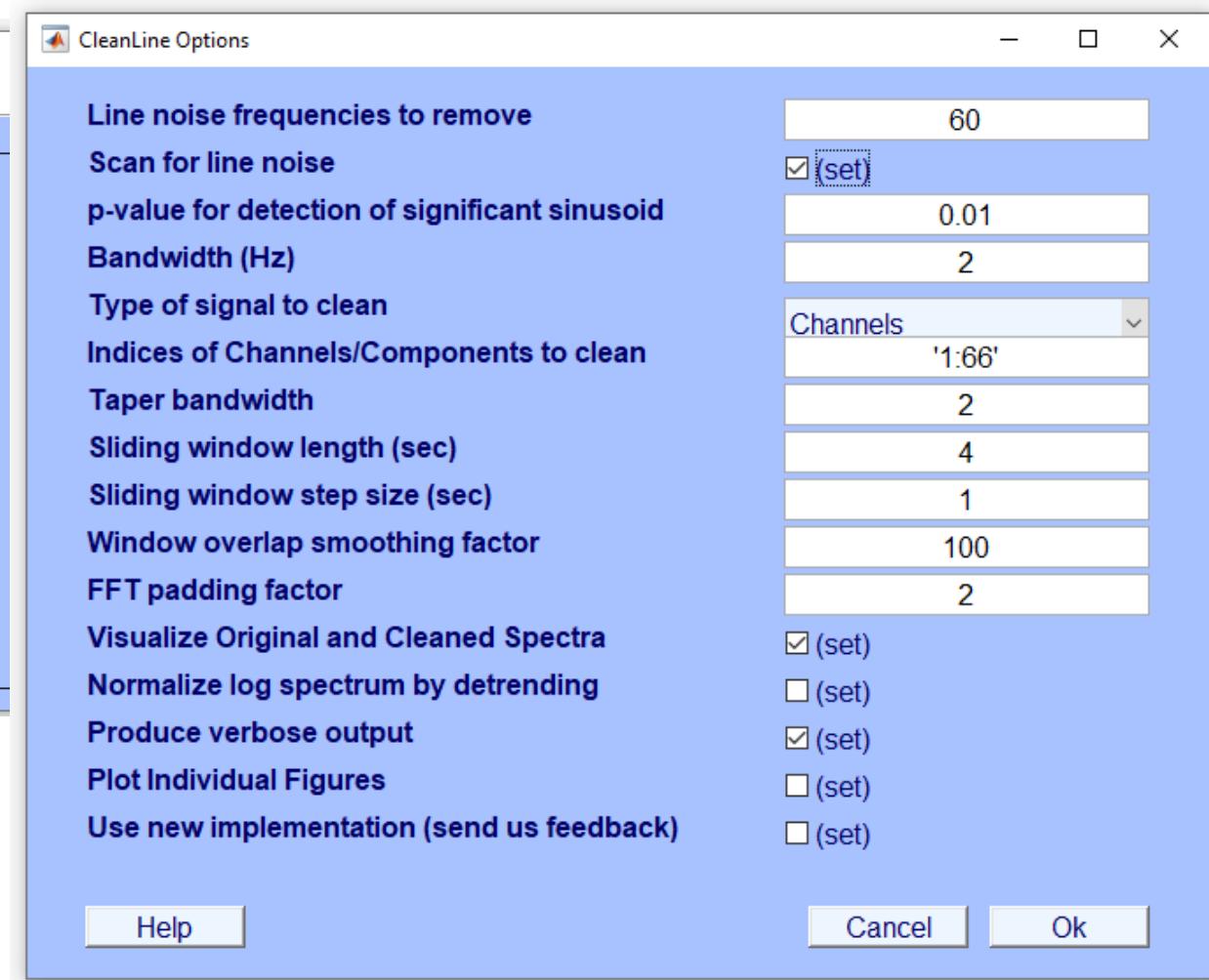
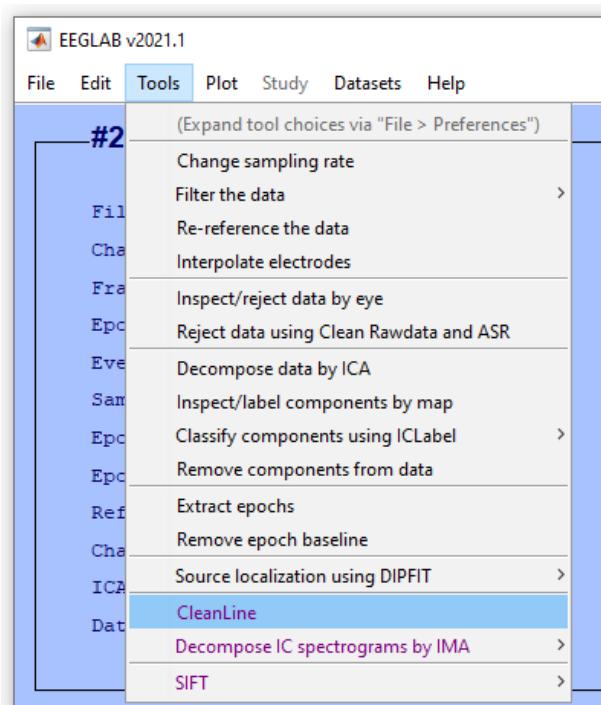
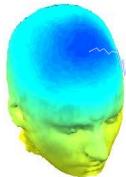
Rate this plugin Web documentation Upload new plugin

Tags: artifact
Status: installed
Size: 1 MB

Description of the plugin:
Removes sinusoidal artifacts (line noise)

Cancel Remove Install/Update

Remove line noise, if necessary

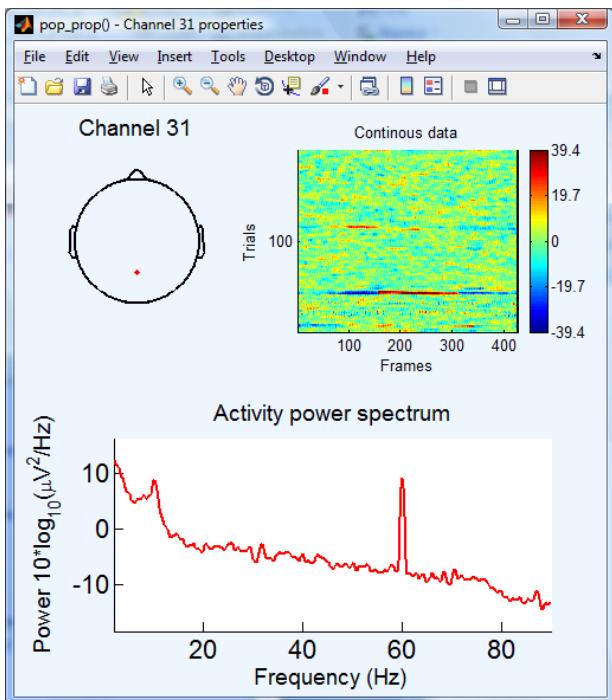


<https://www.nitrc.org/docman/view.php/572/1117/Readme.txt>

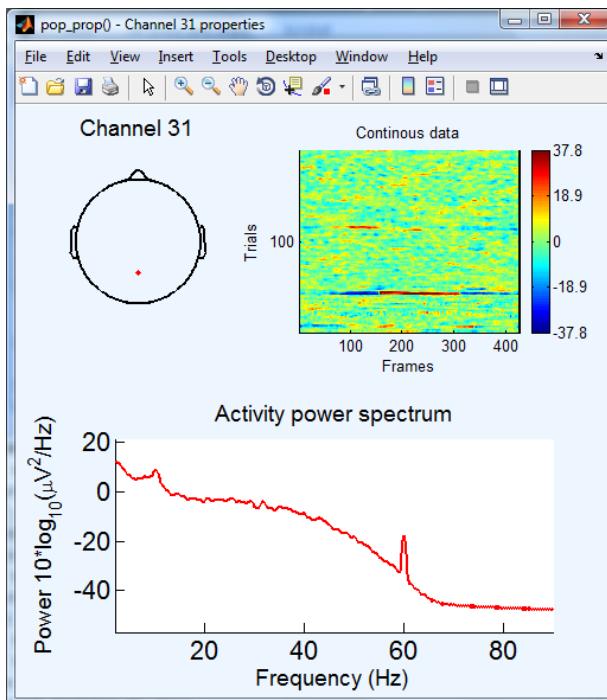
60 Hz line noise reduction via cleanline()



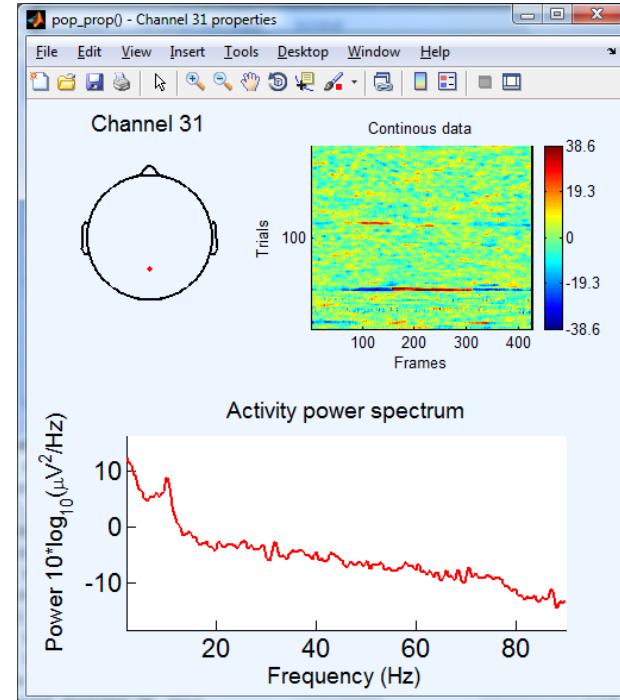
No filter



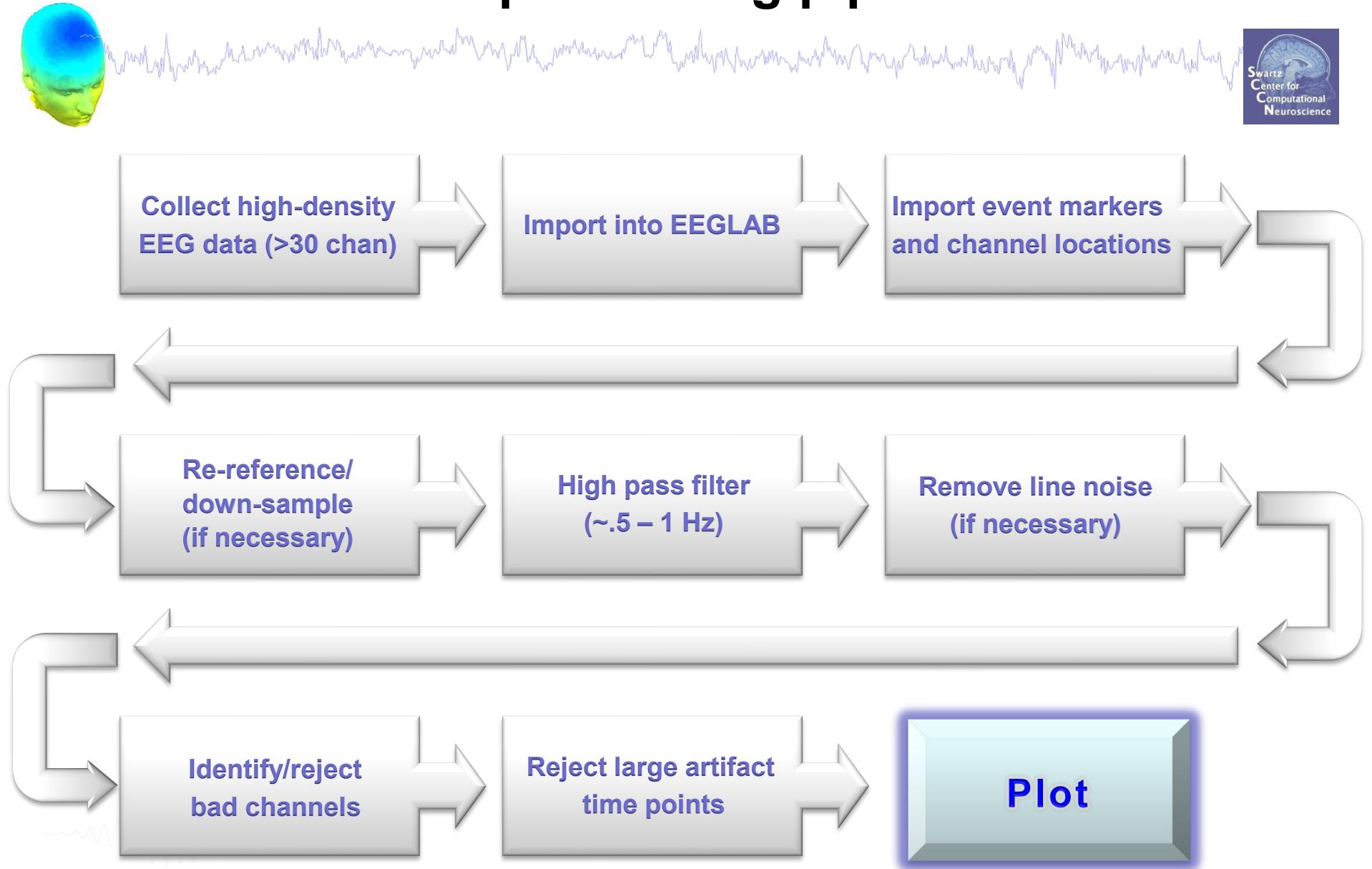
50 Hz low-pass filter



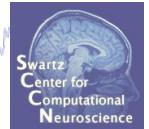
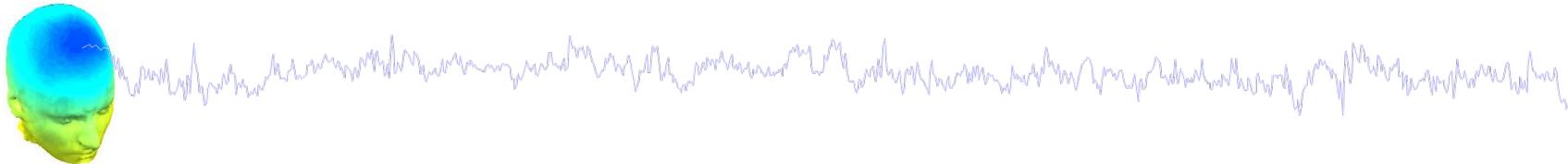
Cleanline: 60 Hz



Pre-processing pipeline



Scroll channel data



Two ways to access the same data scroll:

EEGLAB v2021.1

File Edit Tools Plot Study Datasets Help

#3 (Expand tool choices via "File > Preferences")

- File
- Change sampling rate
- Filter the data
- Re-reference the data
- Interpolate electrodes
- Frames per second
- Inspect/reject data by eye
- Reject data using Clean Rawdata and ASR
- Epochs
- Decompose data by ICA
- Sampling rate
- Inspect/label components by map
- Classify components using ICLabel
- Epoch end time
- Events
- Extract epochs
- Remove epoch baseline
- Reference electrode
- Channel locations
- ICA weights
- Data types
- SIFT

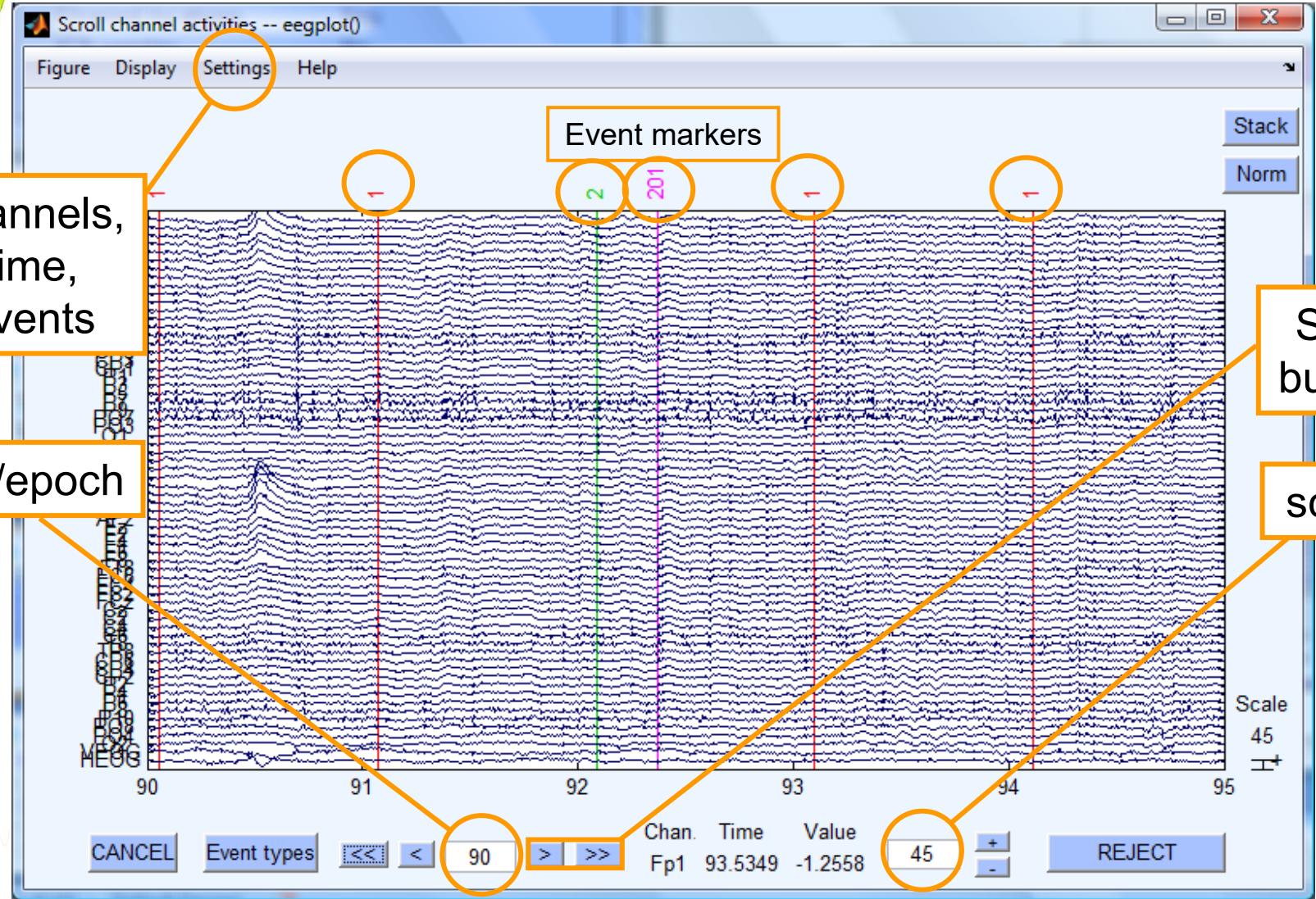
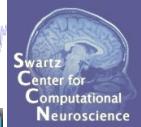
EEGLAB v2021.1

File Edit Tools Plot Study Datasets Help

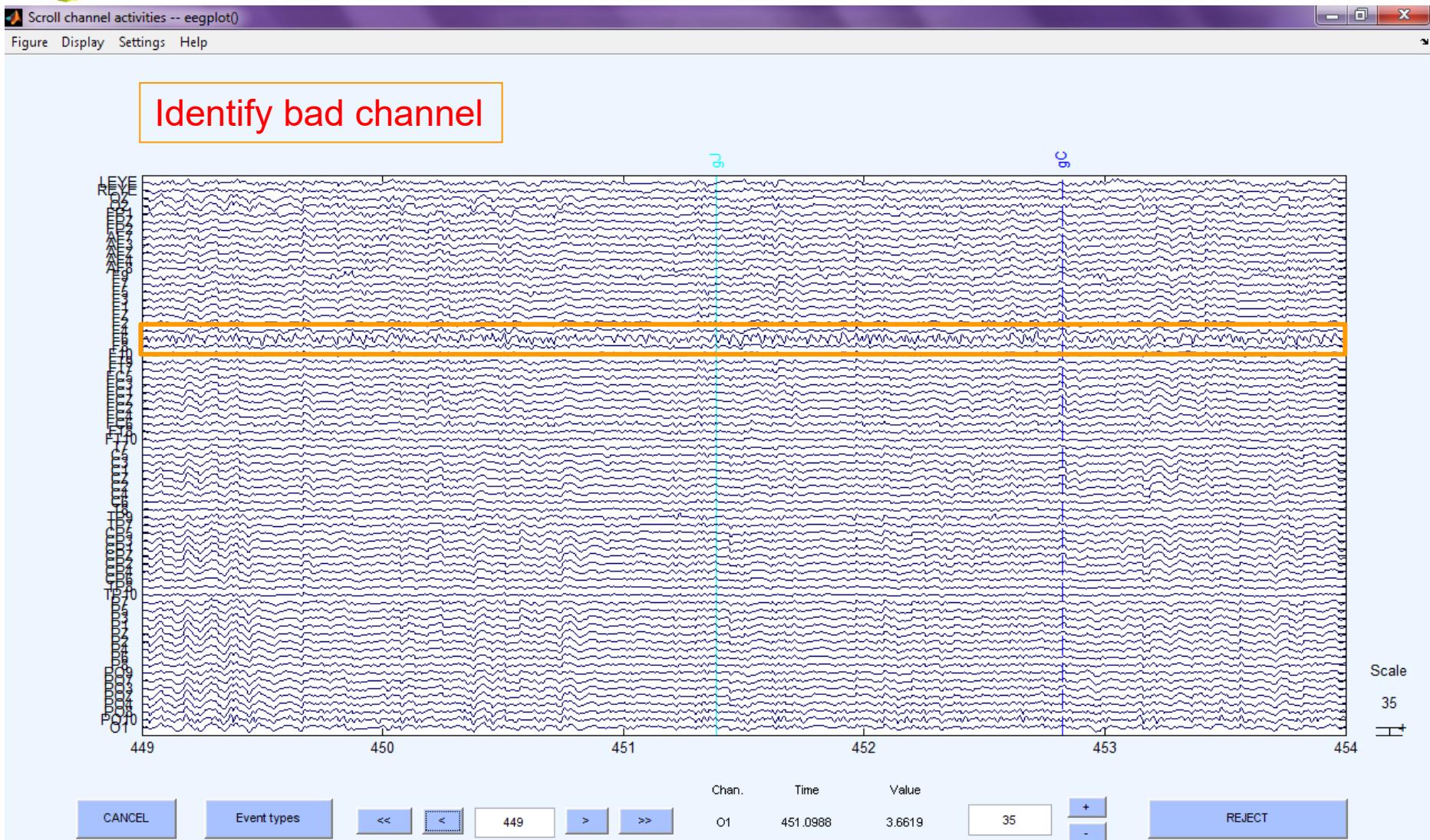
#3: Simulation

- Channel locations
- Channel data (scroll)
- Channel spectra and maps
- Channel properties
- Channel ERP image
- Frames per second
- Epochs
- Epoch end time
- Events
- Sampling rate
- Component activations (scroll)
- Epoch start time
- Epoch end time
- Events
- Sampling rate
- Component spectra and maps
- Component maps
- Component properties
- Component ERP image
- ICA weights
- Component ERPs
- Component time-frequency
- Dataset size (MB) 23.5

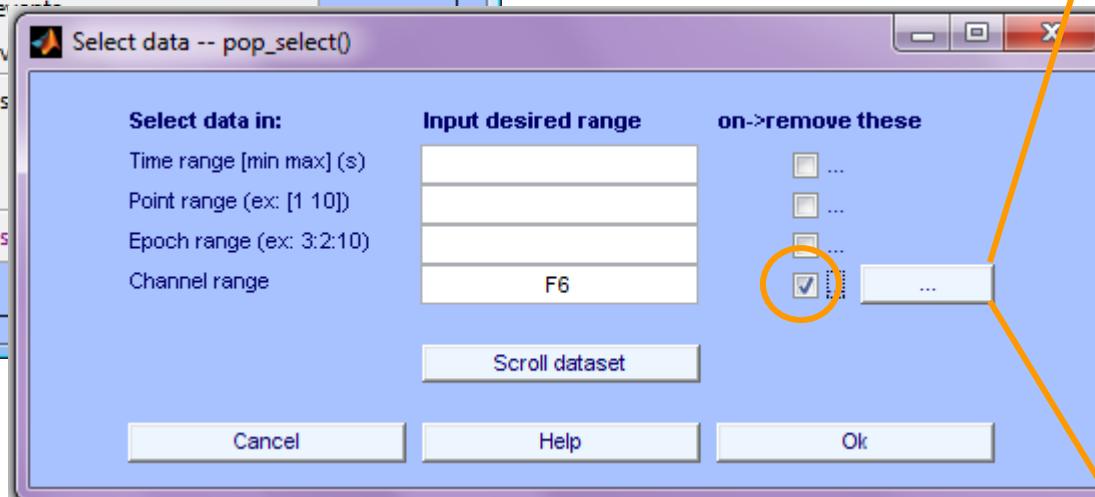
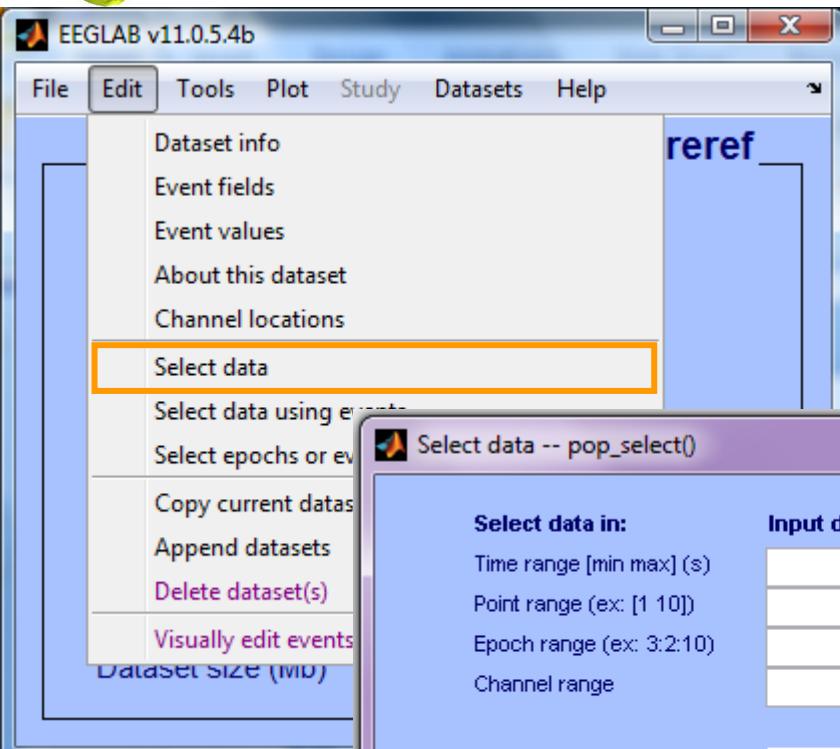
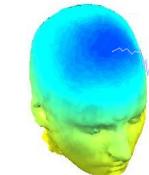
Scroll channel data



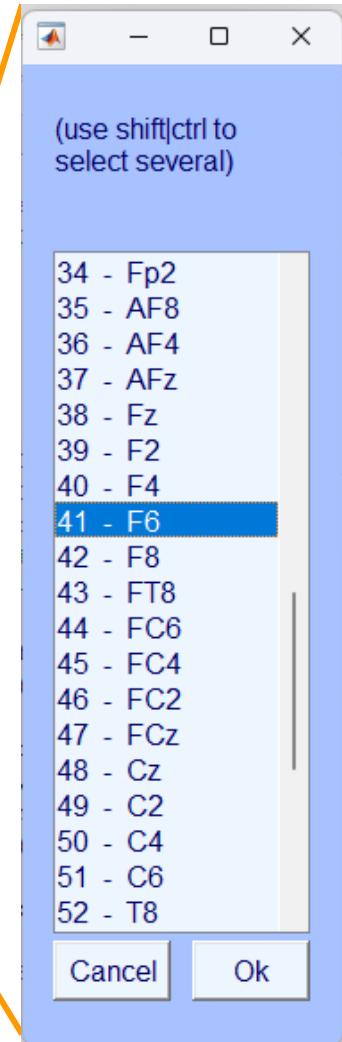
Manually identifying bad channels



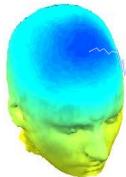
Removing channel(s)



If not checked, will result
in dataset with one channel



Manually identifying bad channels



EEGLAB v11.0.5.4b

File Edit Tools Plot Study Datasets Help

#3: Simple

Filename: n...
Channels per epoch: 256
Frames per epoch: 1000
Epochs: 100
Events: 1000
Sampling rate: 1000 Hz
Epoch start: 0 ms
Epoch end: 1000 ms
Reference: Average
Channel locations: 1024
ICA weights: 1024
Dataset size: 1024

Plot menu options:

- Channel locations
- Channel data (scroll)
- Channel spectra and maps** (highlighted)
- Channel properties
- Channel ERP image
- Channel ERPs
- ERP map series
- Sum/Compare ERPs

- Component activations (scroll)
- Component spectra and maps
- Component maps
- Component properties
- Component ERP image
- Component ERPs
- Sum/Compare comp. ERPs

- Data statistics
- Time-frequency transforms
- Cluster dataset ICs

Channel spectra and maps -- pop_spectopo()

Epoch time range to analyze [min_ms max_ms]: 0 333996.0938

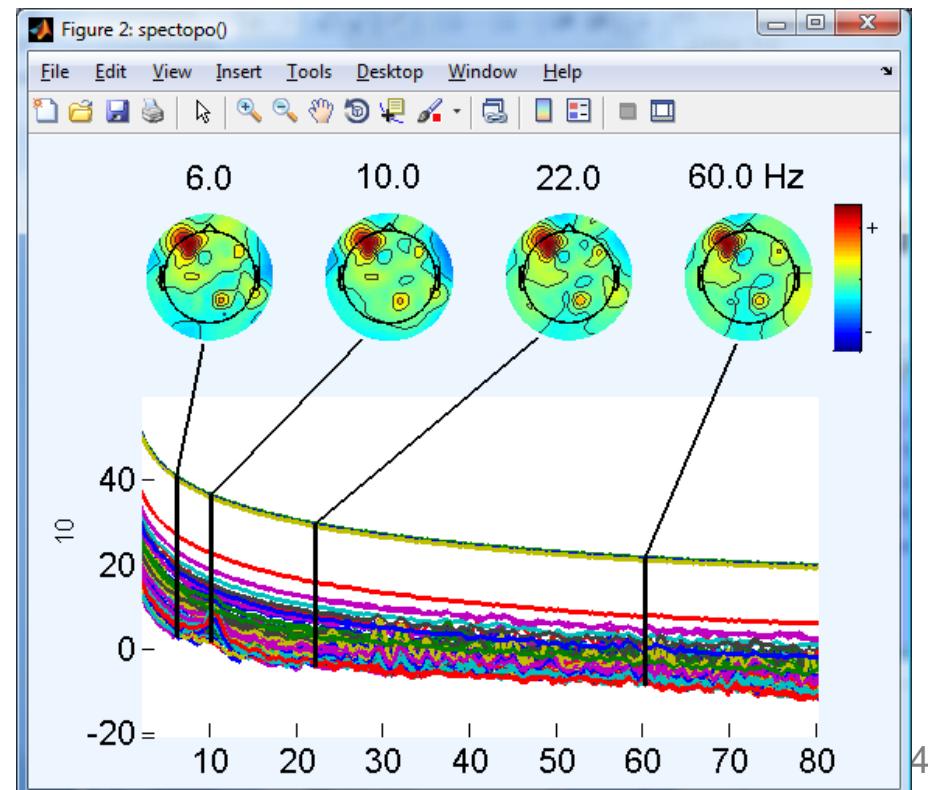
Percent data to sample (1 to 100): 100

Frequencies to plot as scalp maps (Hz): 6 10 22 60

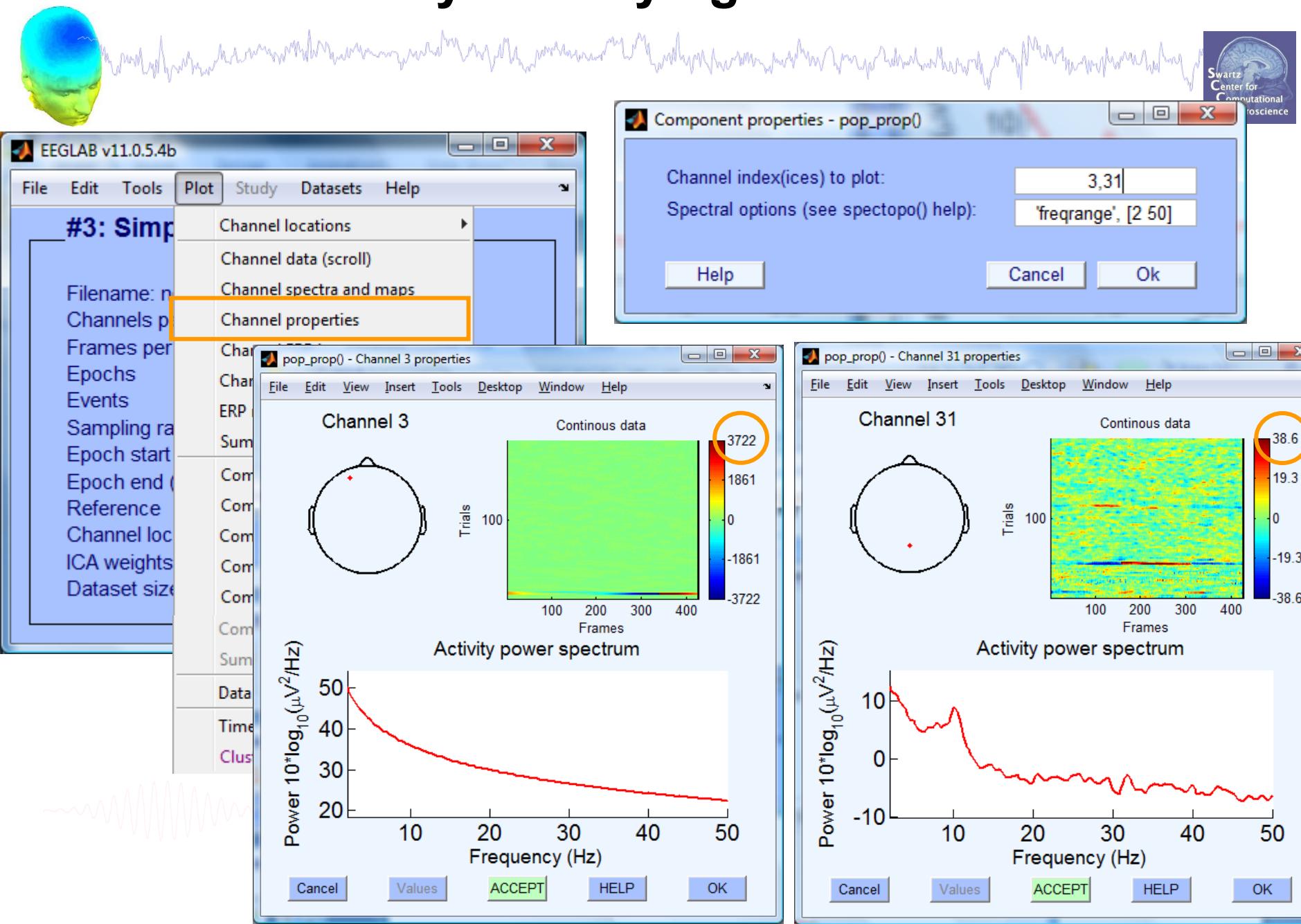
Plotting frequency range [lo_Hz hi_Hz]: 2 80

Spectral and scalp map options (see topoplots): 'electrodes','off'

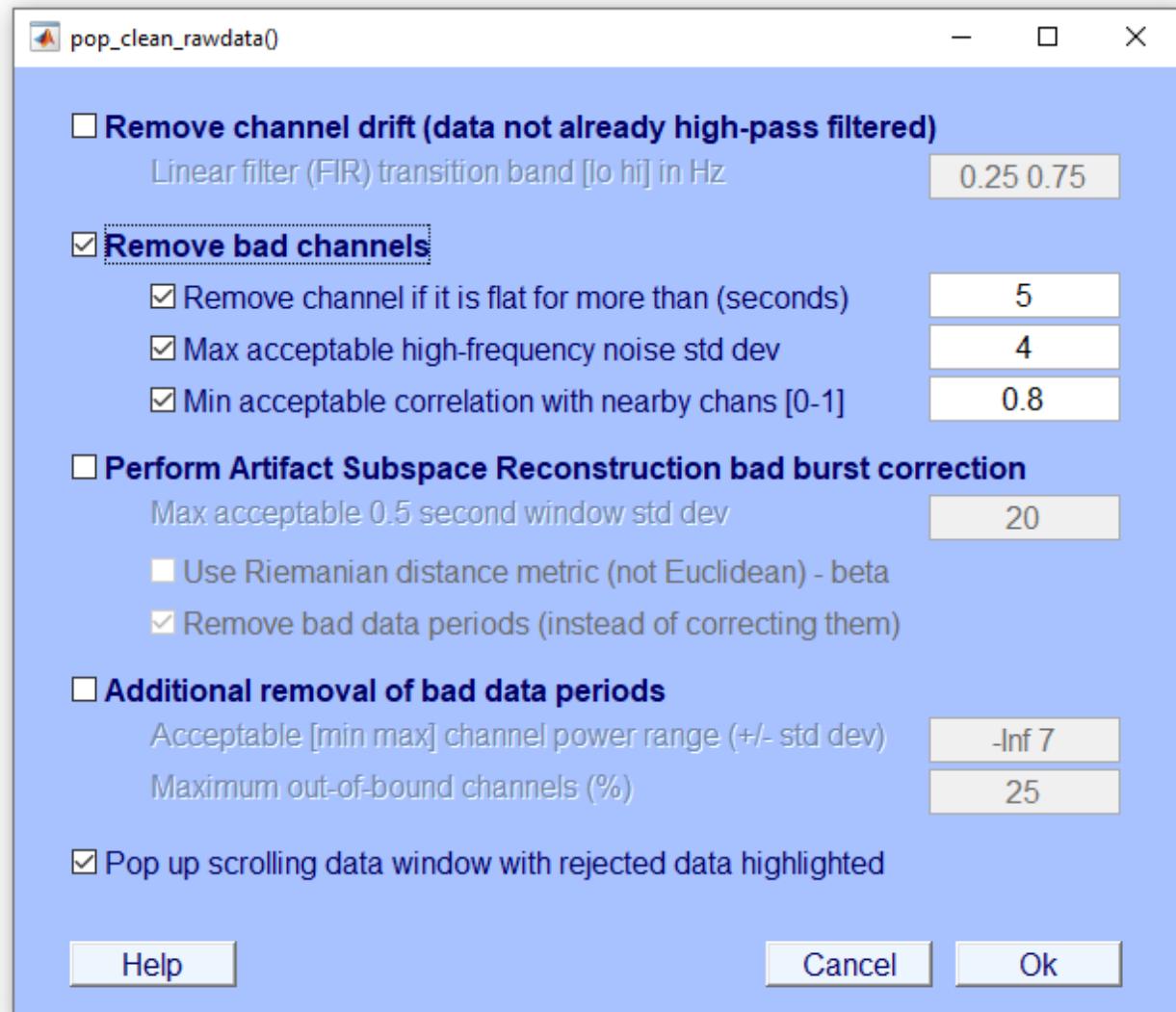
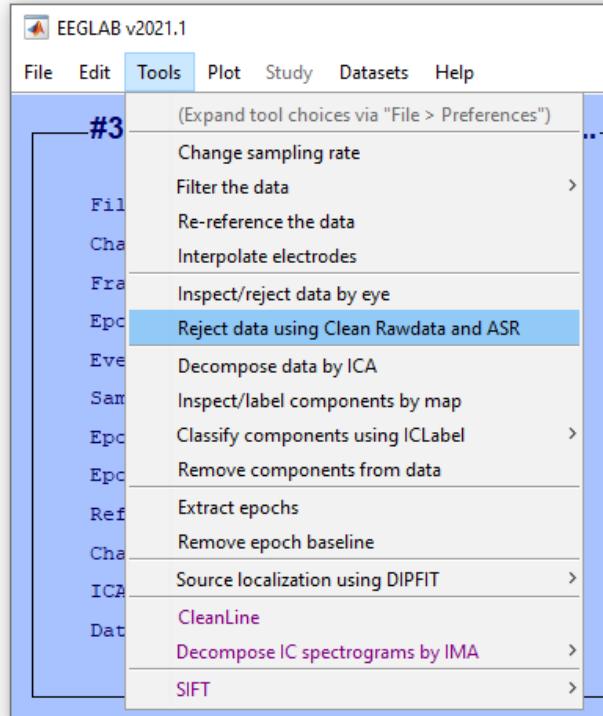
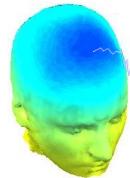
Help Cancel Ok



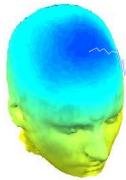
Manually identifying bad channels



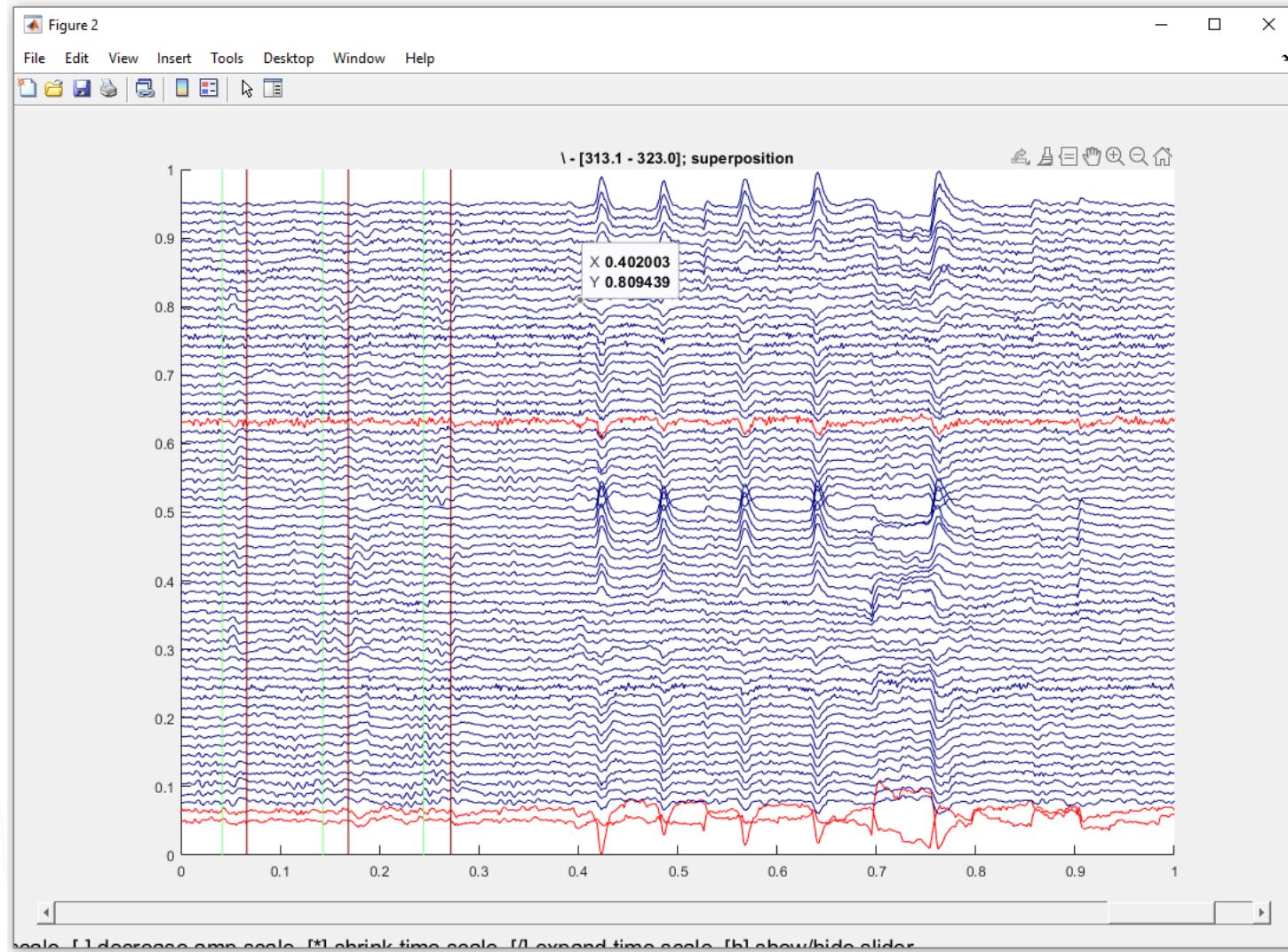
Auto-detection of noisy channels



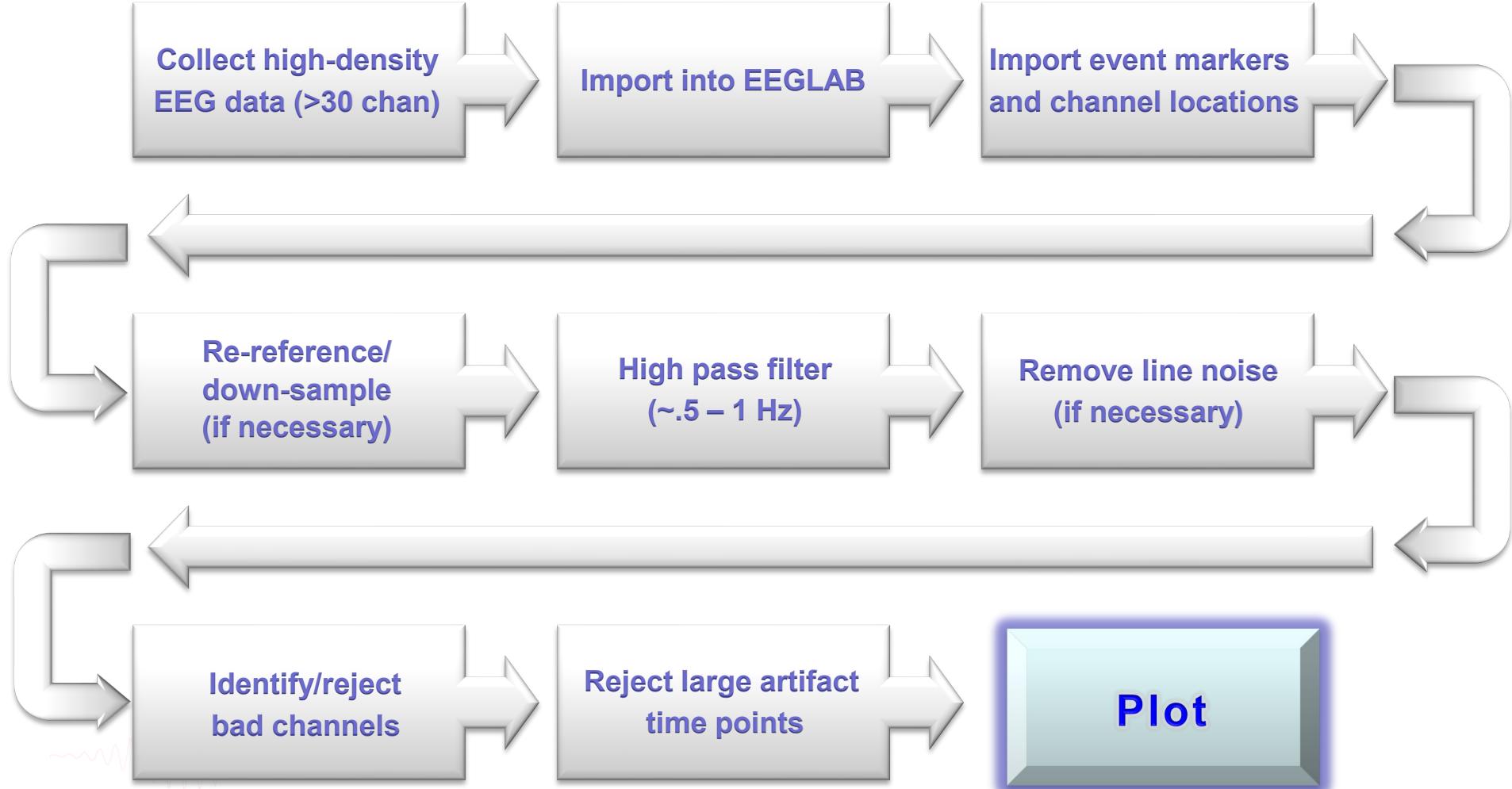
Auto-detection of noisy channels



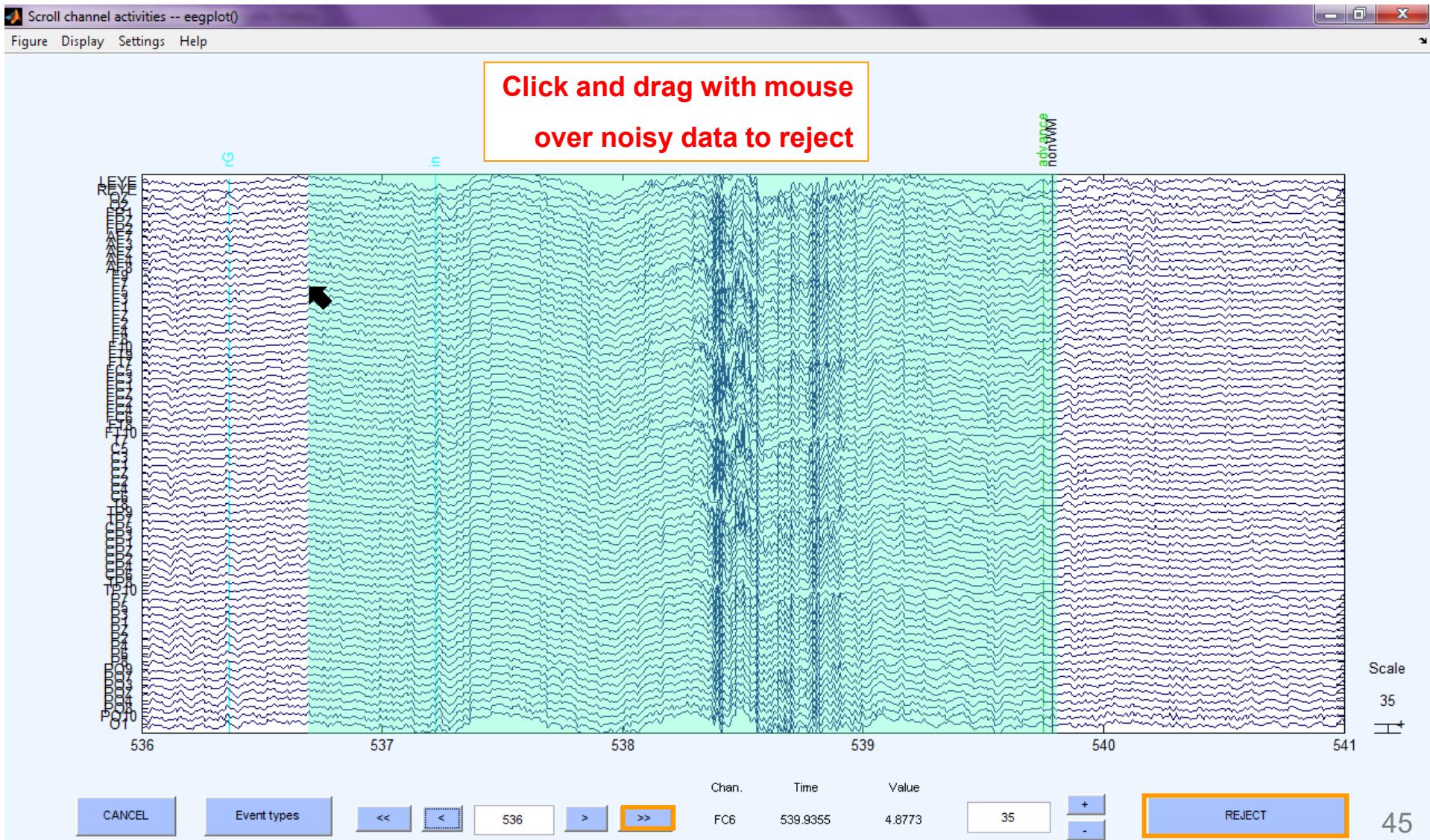
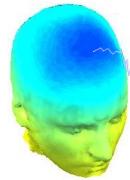
Deleted channels highlighted in red:



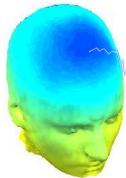
Pre-processing pipeline



Reject continuous data



Rejecting data for ICA



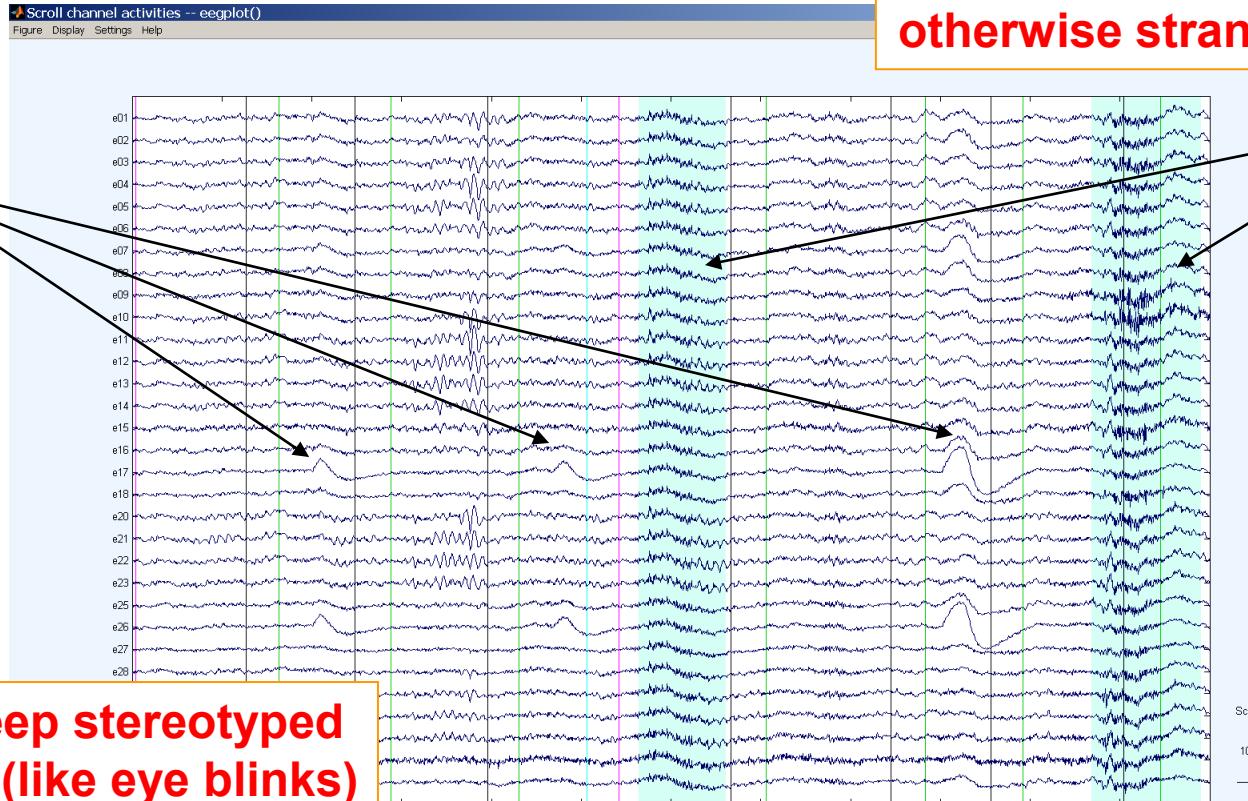
To prepare data for ICA:

Reject large muscle or otherwise strange events...

Keep

Reject

... but keep stereotyped artifacts (like eye blinks)



Auto-detection of noisy data stretches



EEGLAB v2021.1

File Edit Tools Plot Study Datasets Help

#3 (Expand tool choices via "File > Preferences")

Change sampling rate
Filter the data
Re-reference the data
Interpolate electrodes
Inspect/reject data by eye
Reject data using Clean Rawdata and ASR
Epoch data by ICA
Inspect/label components by map
Classify components using ICLabel
Remove components from data
Extract epochs
Remove epoch baseline
Source localization using DIPFIT
CleanLine
Decompose IC spectrograms by IMA
SIFT

pop_clean_rawdata()

Remove channel drift (data not already high-pass filtered)
Linear filter (FIR) transition band [lo hi] in Hz 0.25 0.75

Remove bad channels
 Remove channel if it is flat for more than (seconds) 5
 Max acceptable high-frequency noise std dev 4
 Min acceptable correlation with nearby chans [0-1] 0.8

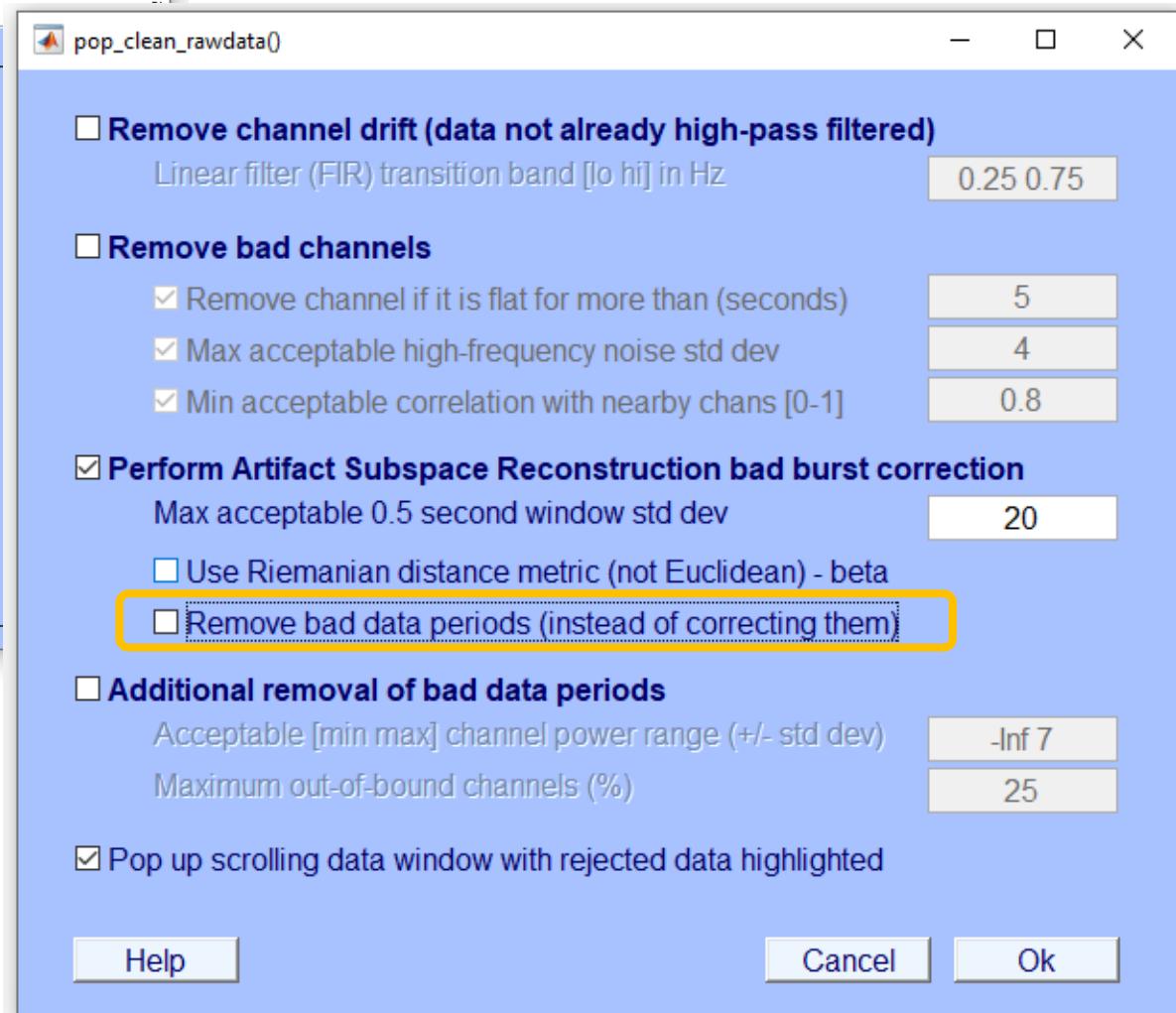
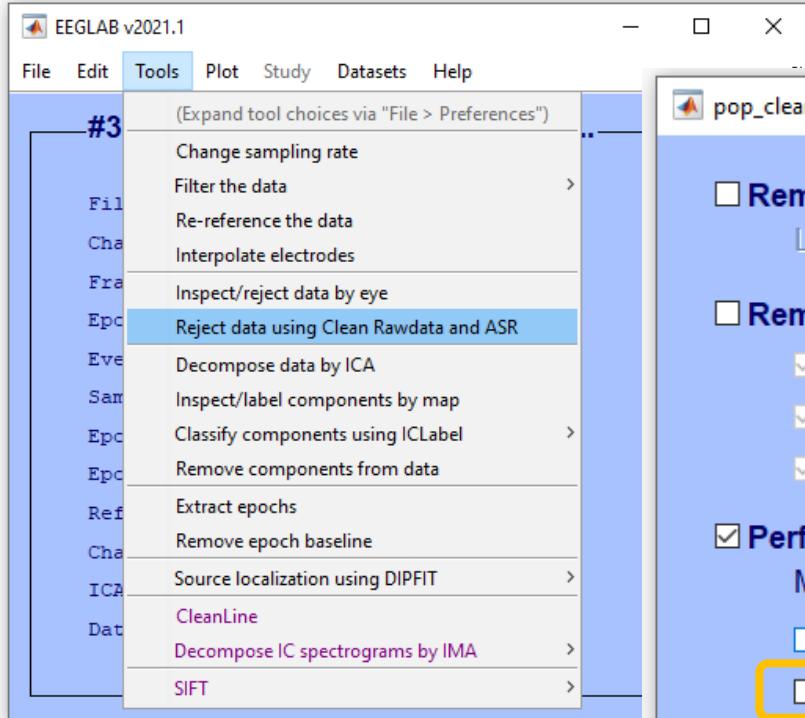
Perform Artifact Subspace Reconstruction bad burst correction
Max acceptable 0.5 second window std dev 20
 Use Riemanian distance metric (not Euclidean) - beta
 Remove bad data periods (instead of correcting them)

Additional removal of bad data periods
Acceptable [min max] channel power range (+/- std dev) -Inf 7
Maximum out-of-bound channels (%) 25

Pop up scrolling data window with rejected data highlighted

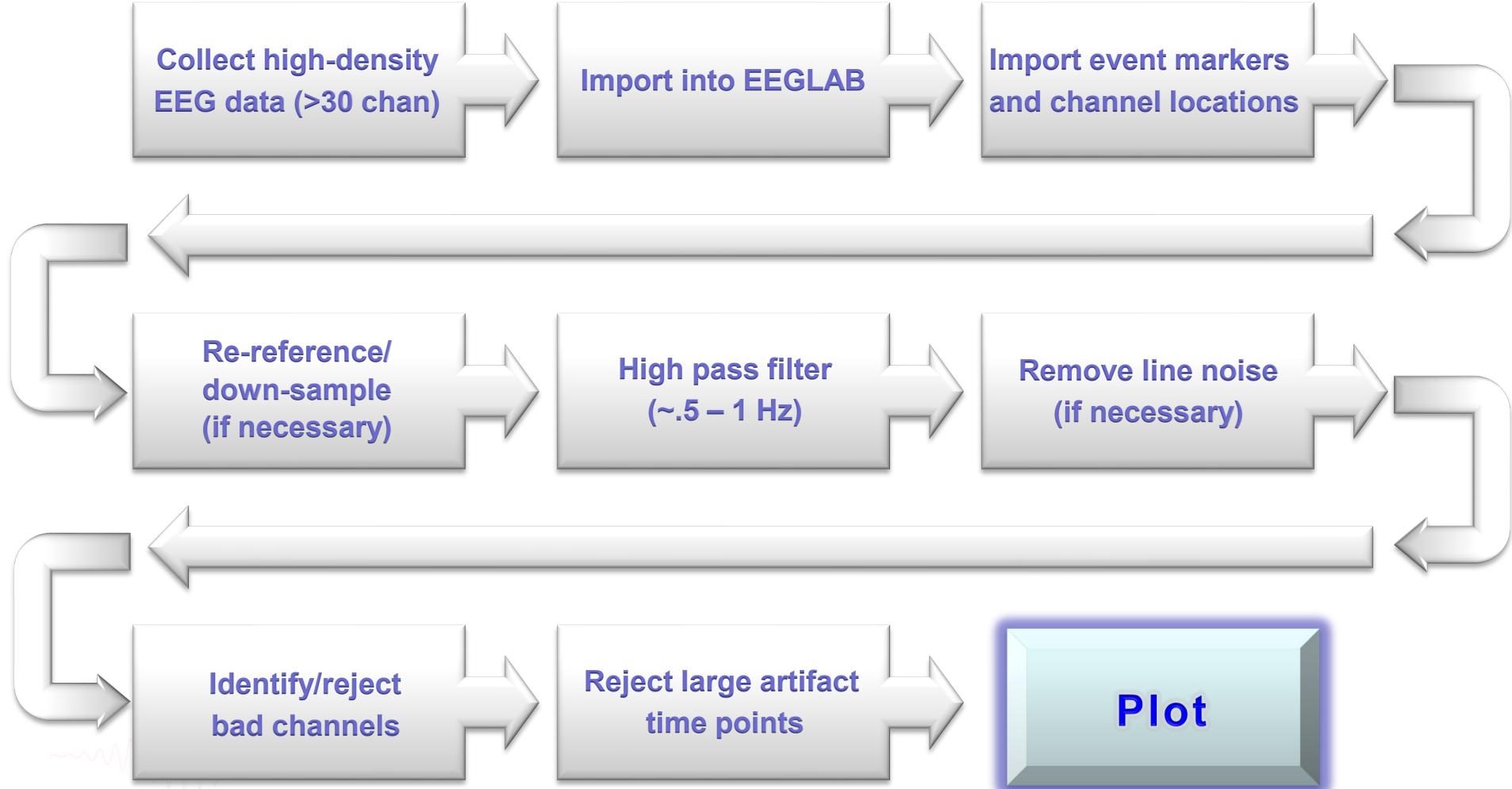
Help Cancel Ok

ASR reconstruction (burst correction)

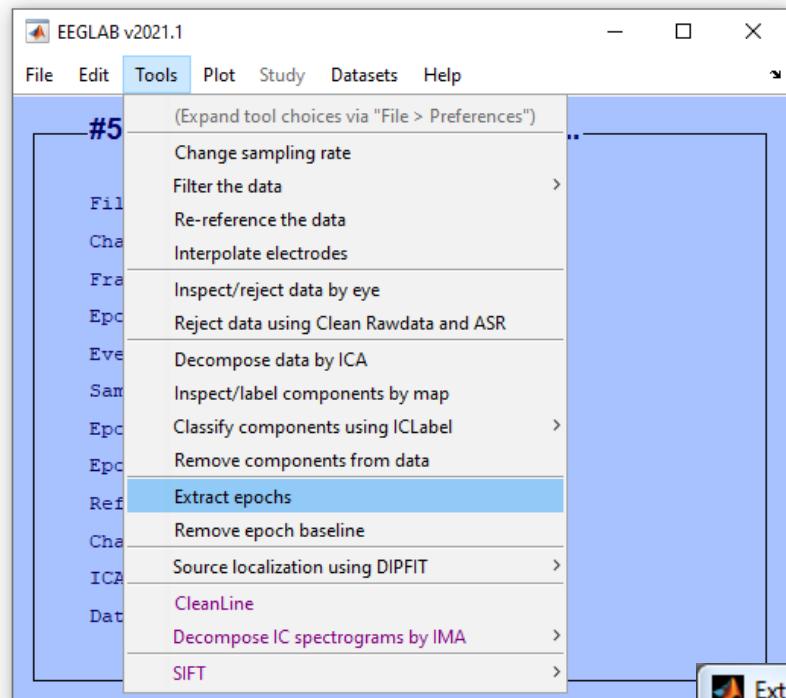
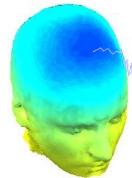


ASR reconstruction
has an option to also
delete noisy periods

Pre-processing pipeline

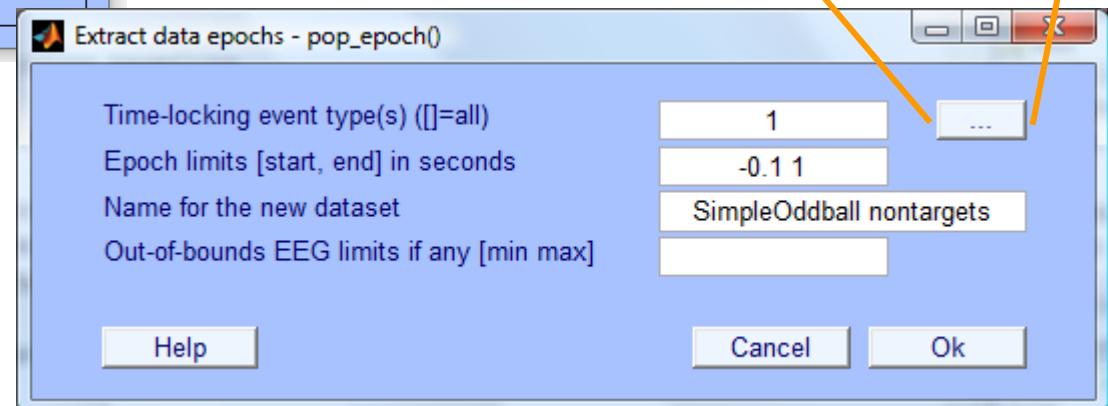


Extract epochs



```
>> eeg_eventtypes (EEG)
```

1	140	star
2	60	circle
201	60	button press



Extract epochs



Dataset info -- pop_newset()

What do you want to do with the new dataset?

Name it: SimpleOddball nontargets

Save it as file:

Some changes have not been saved.

Overwrite it in memory (set=yes; unset=unset)

Save it as file: C:\Users\marissa\Desktop\EEGLABwork

Help

Epoch baseline removal -- pop_rmbase()

Baseline latency range (min_ms max_ms) ([] = [-101.5625 0])

Else, baseline points vector (ex:1:56) ([] = whole epoch) (overwritten by latency range above).

Help

Dataset info -- pop_newset()

What do you want to do with the new dataset?

Name it: SimpleOddball nontargets

Save it as file:

Some changes have not been saved. What would you like to do?

Overwrite it in memory (set=yes; unset=unset)

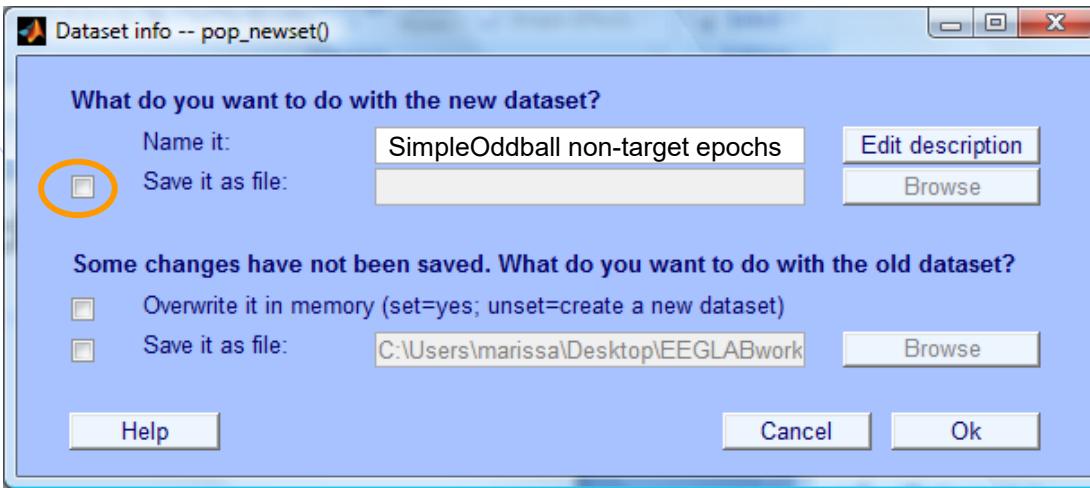
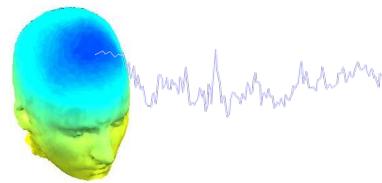
Save it as file: C:\Users\marissa\Desktop\EEGLABwork

Help

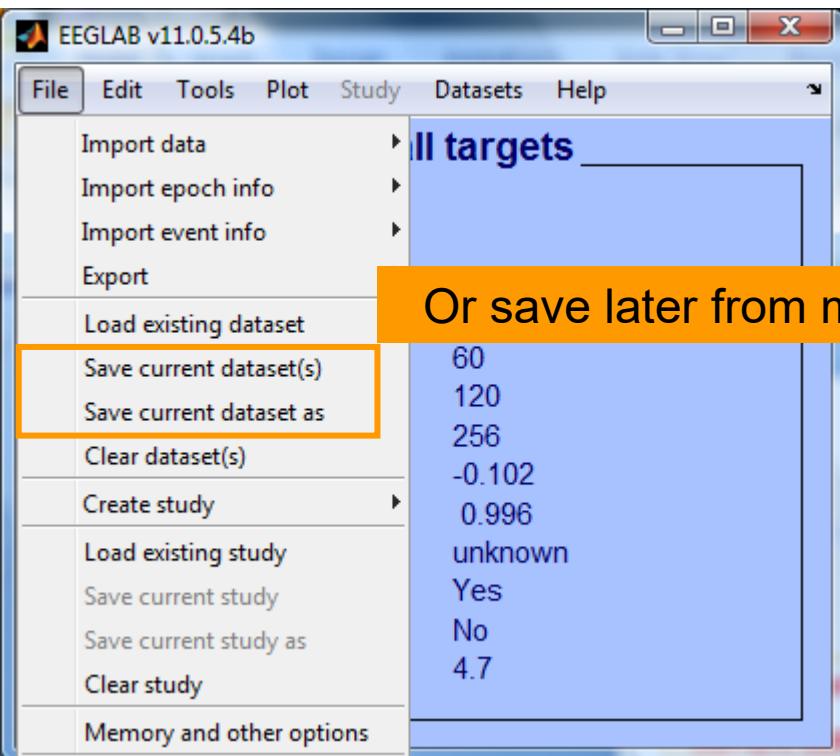
EEGLAB v11.0.5.4b

#2: SimpleOddball nontargets

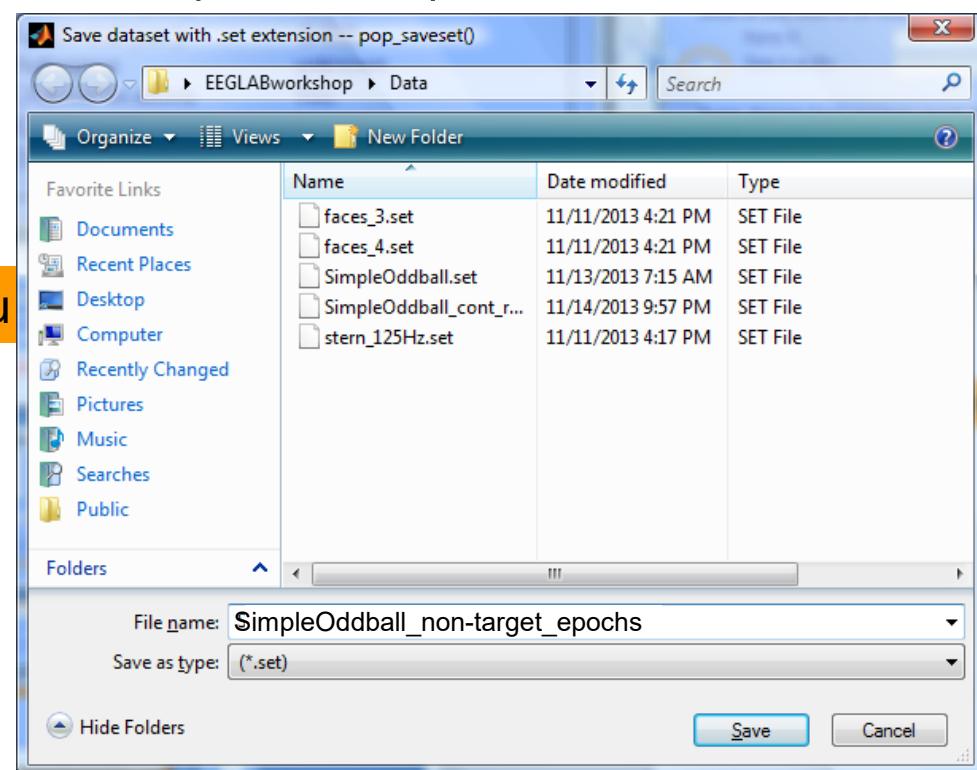
Filename:	none
Channels per frame:	66
Frames per epoch:	282
Epochs:	140
Events:	140
Sampling rate (Hz):	256
Epoch start (sec):	-0.102
Epoch end (sec):	0.996
Reference:	unknown
Channel locations:	Yes
ICA weights:	No
Dataset size (Mb):	10.6



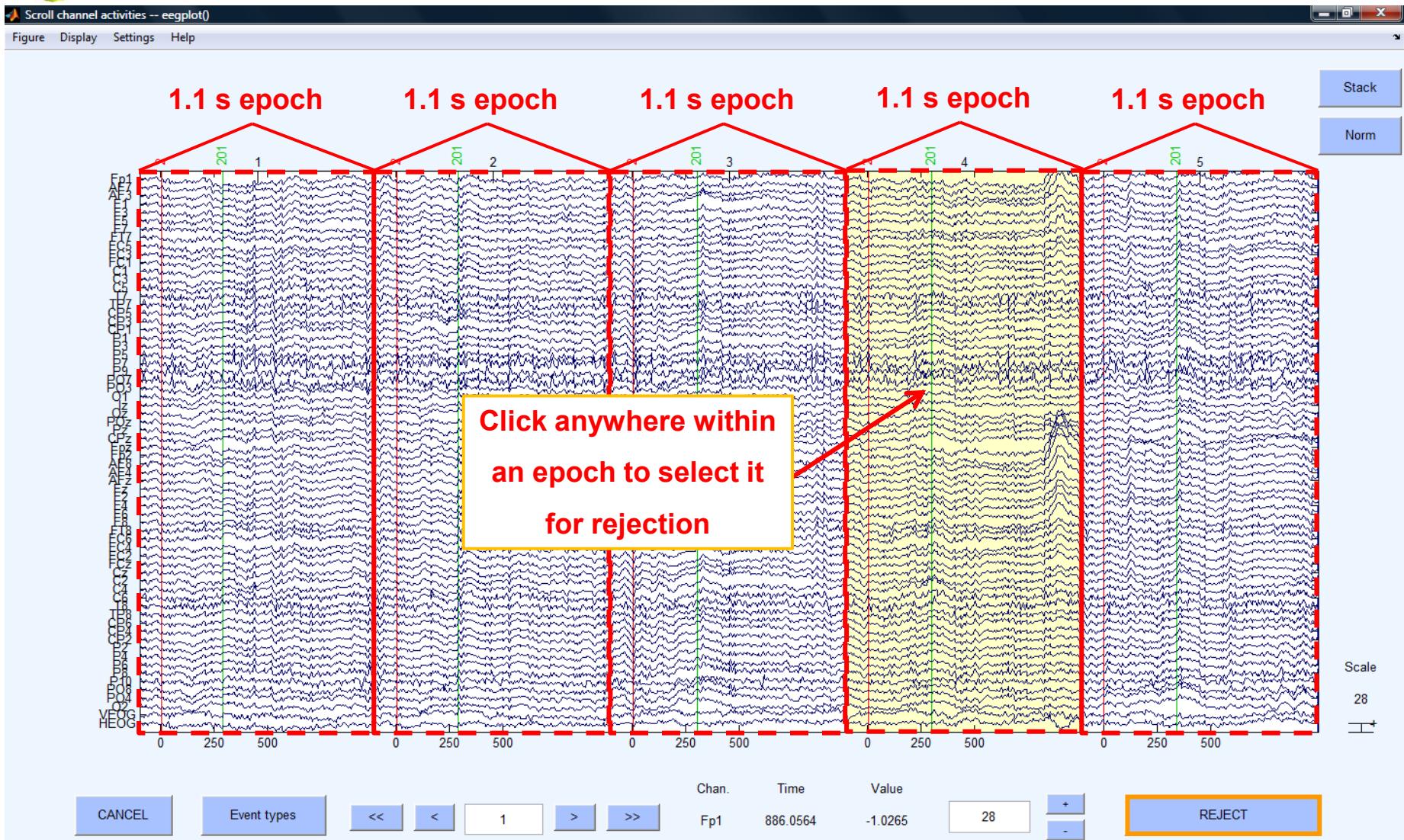
Save dataset to disk (optional)



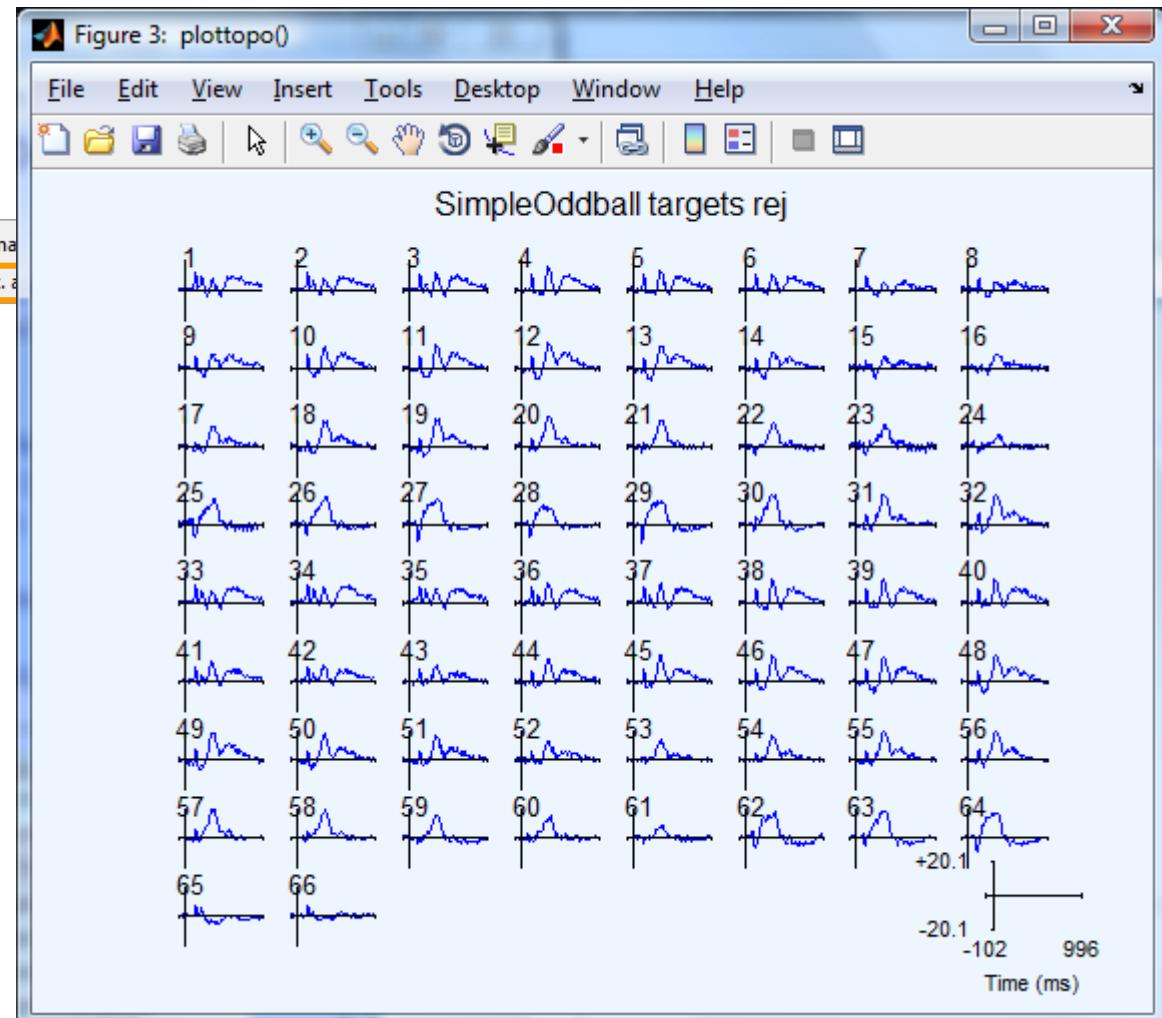
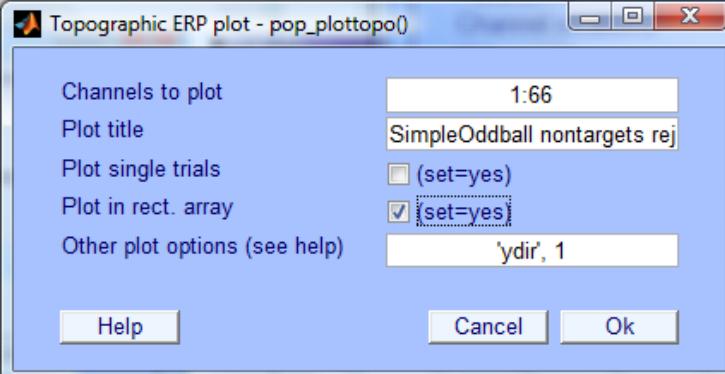
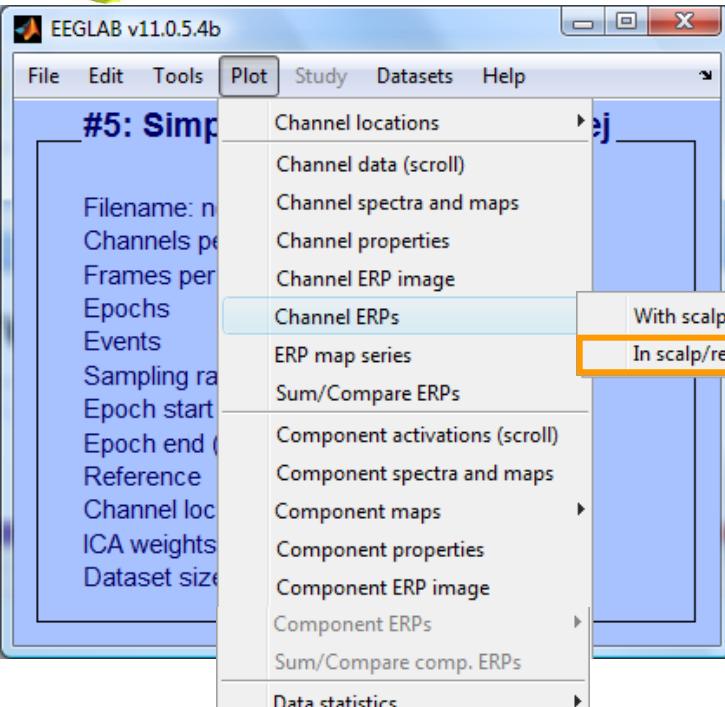
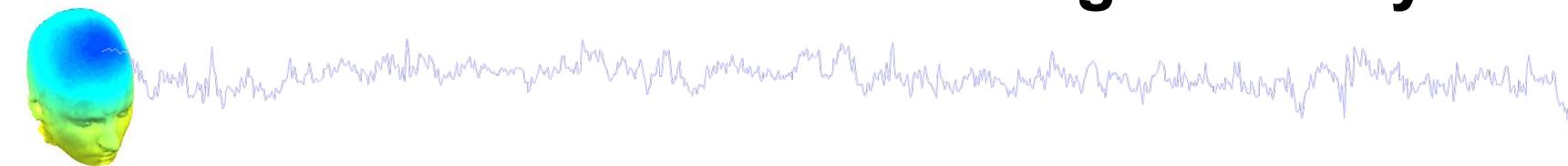
Or save later from menu



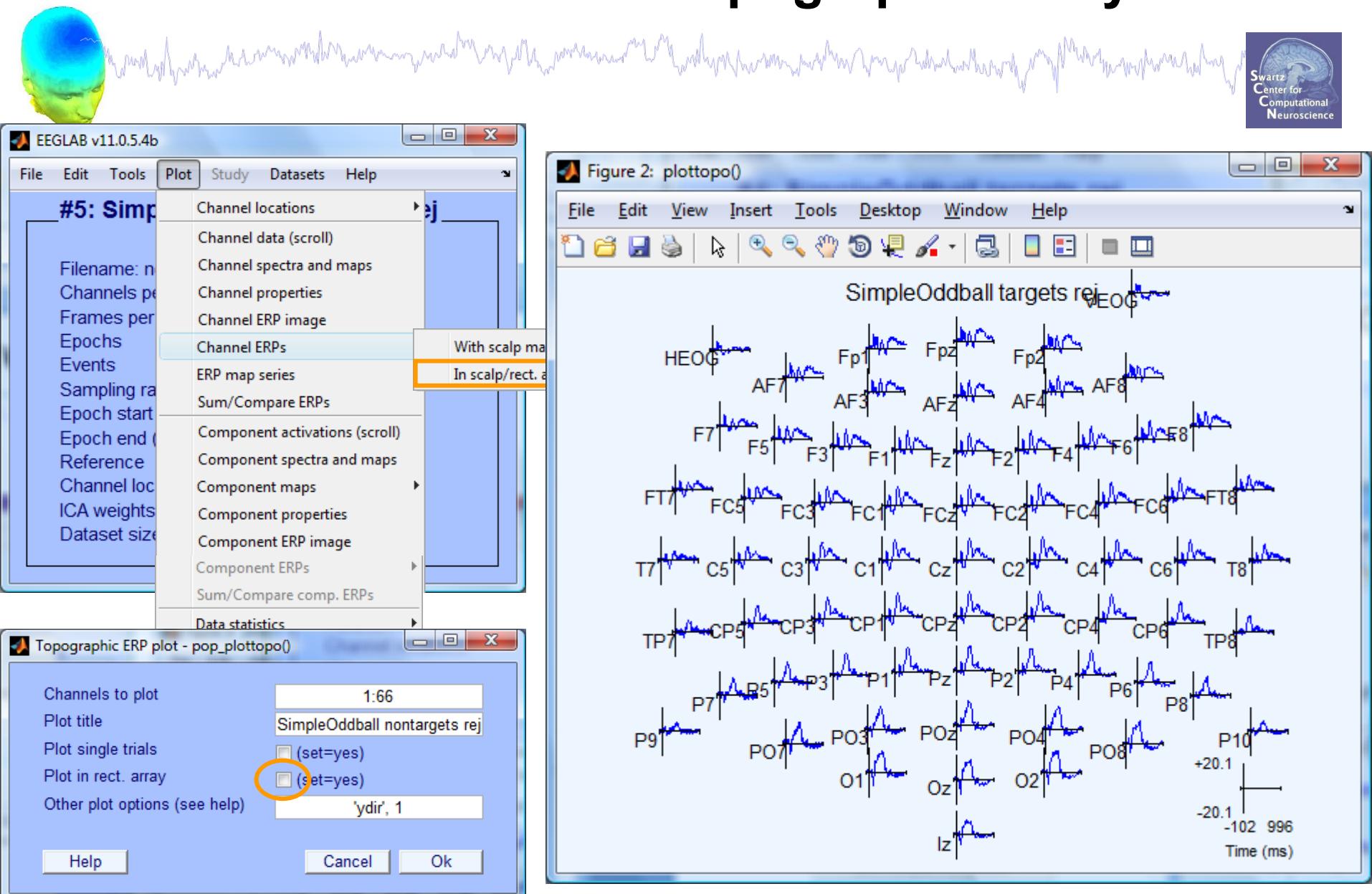
Reject epochs with artifact from scroll



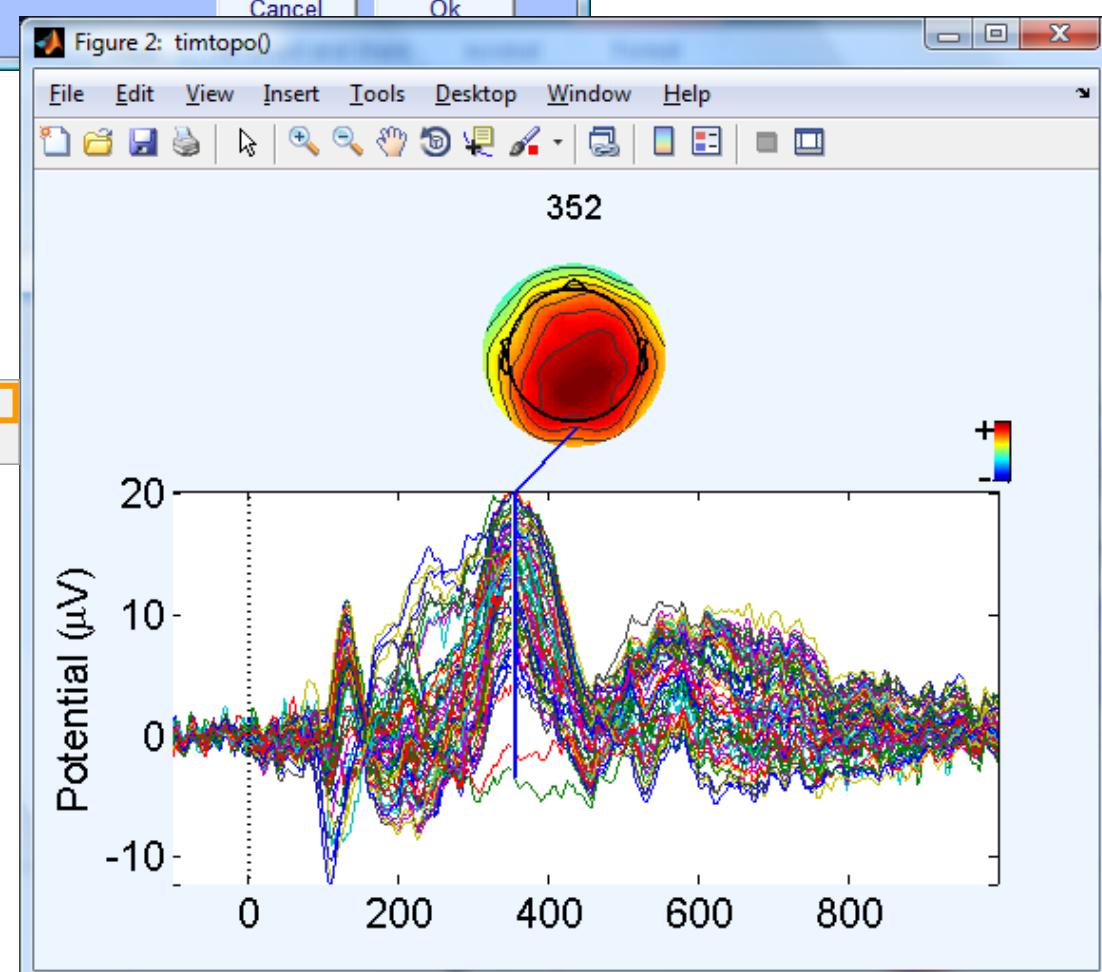
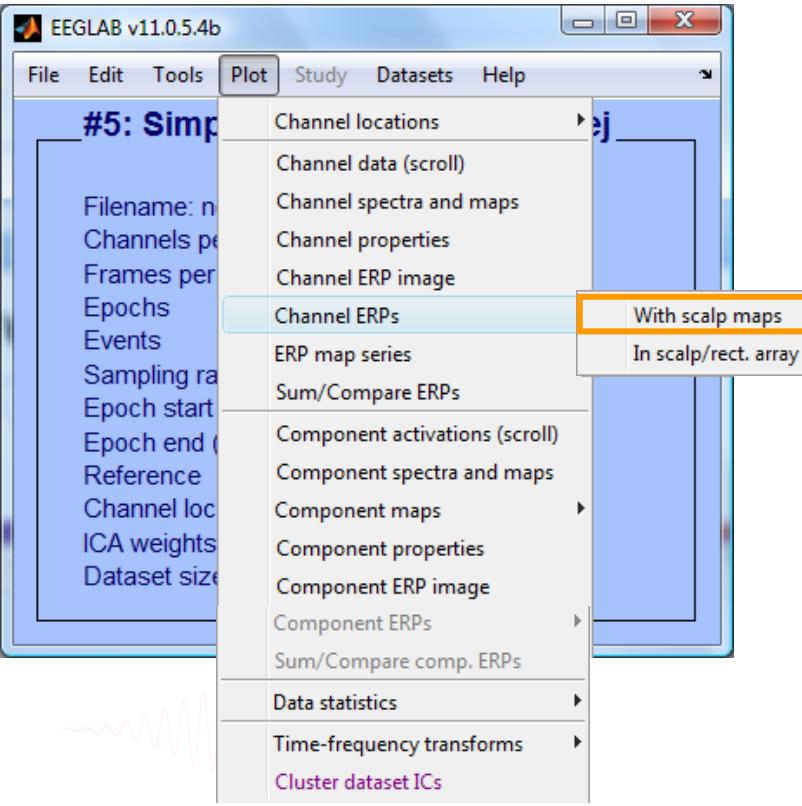
Visualize ERP in rectangular array



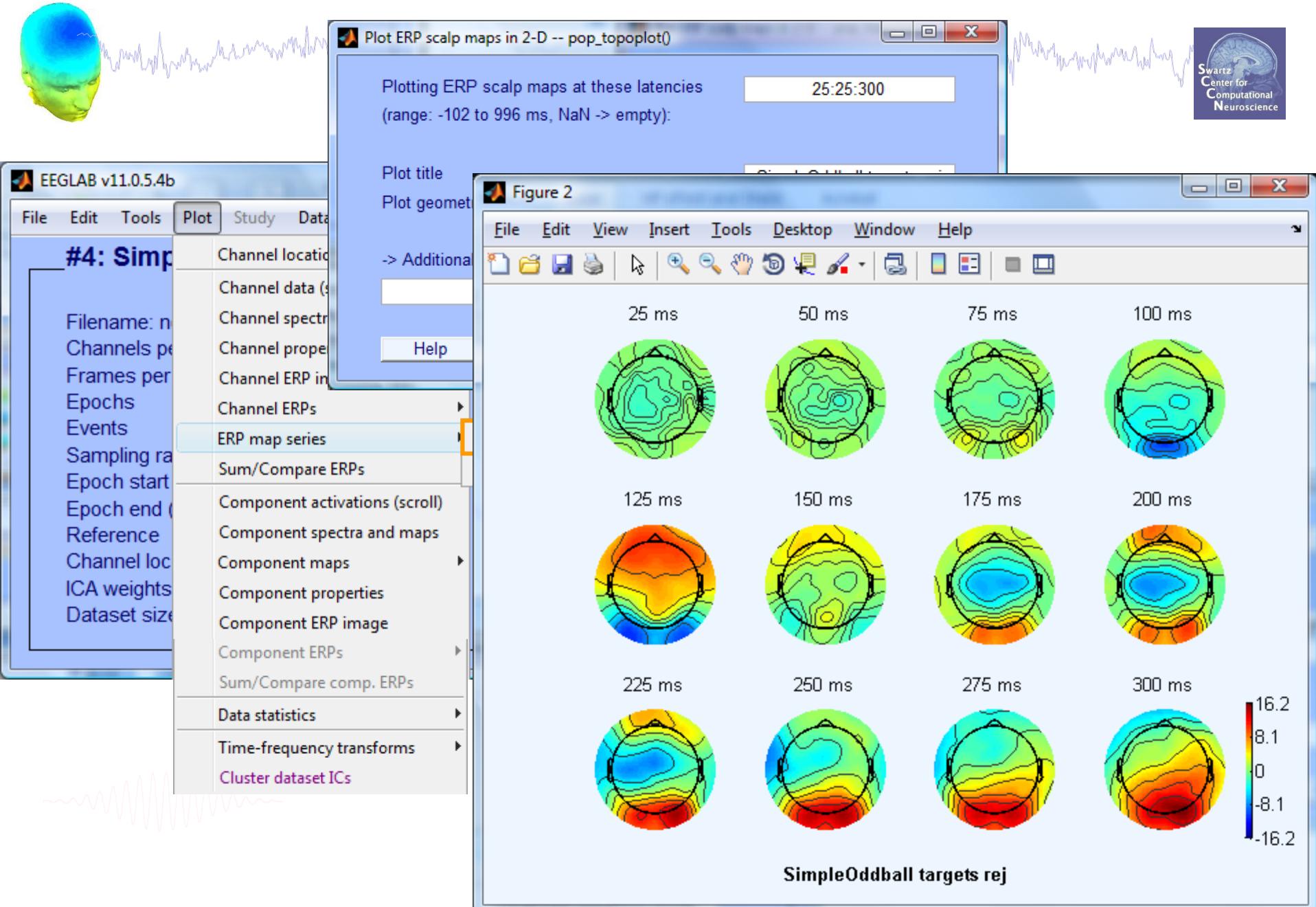
Visualize ERP in topographic array



Visualize ERP scalp distribution



Visualize channel ERPs in 2D



Visualize channel ERPs in 3D

