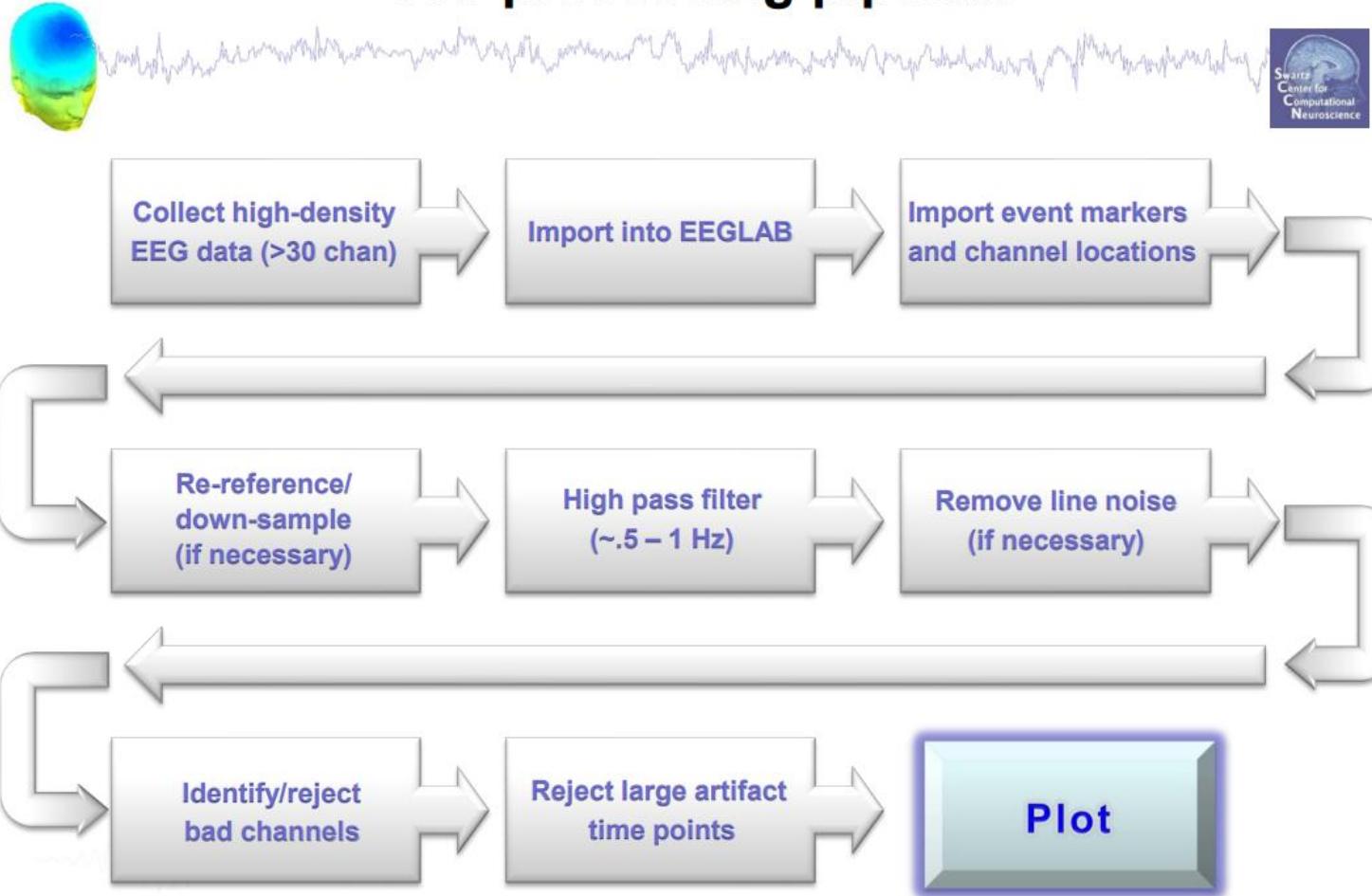


# **EEGLAB and ERPLAB**

Interdisciplinary Schools  
Signal Processing Department  
Parisa Khoorahe

# EEGLAB

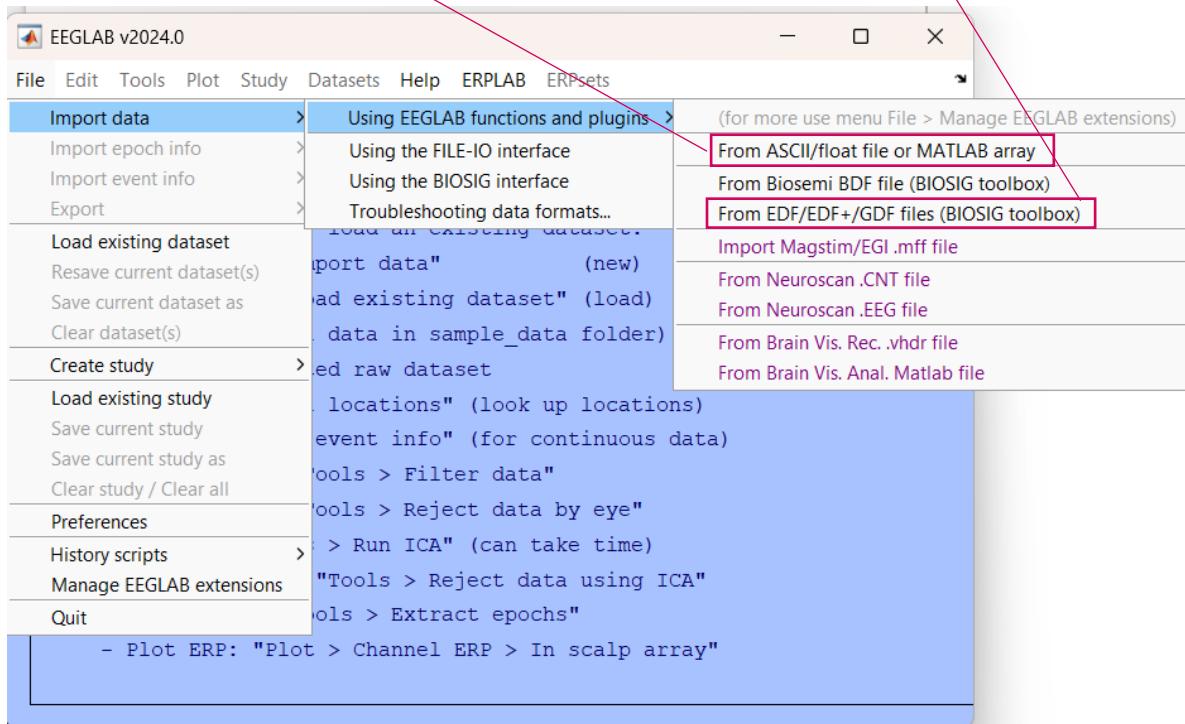
## Pre-processing pipeline



# EEGLAB

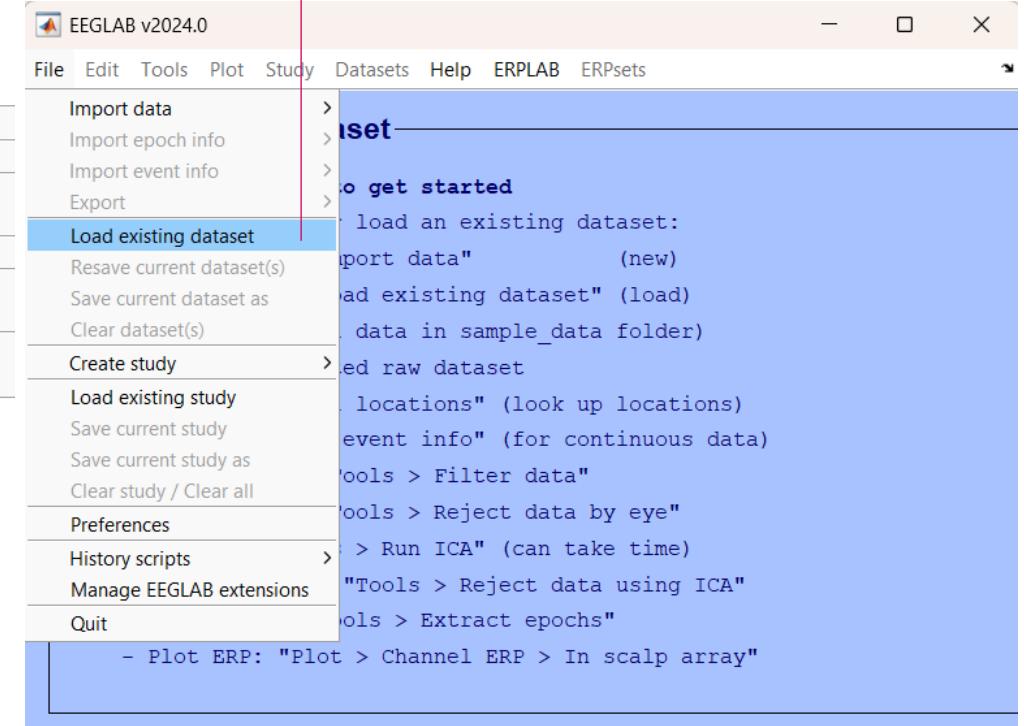
## Import/Load files

For .mat files



For .edf/edf+ files

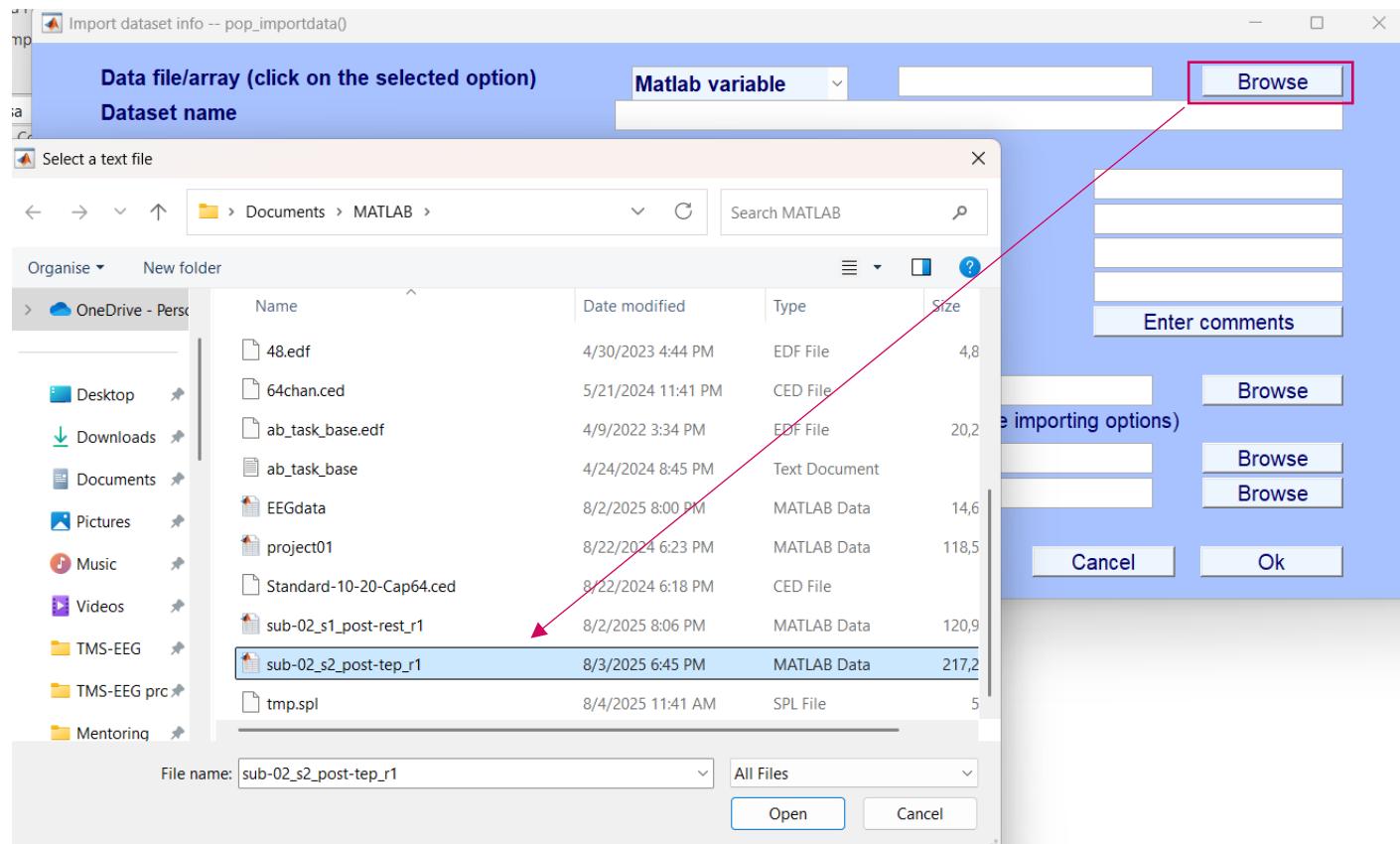
For .set files



# EEGLAB

## Import/Load files

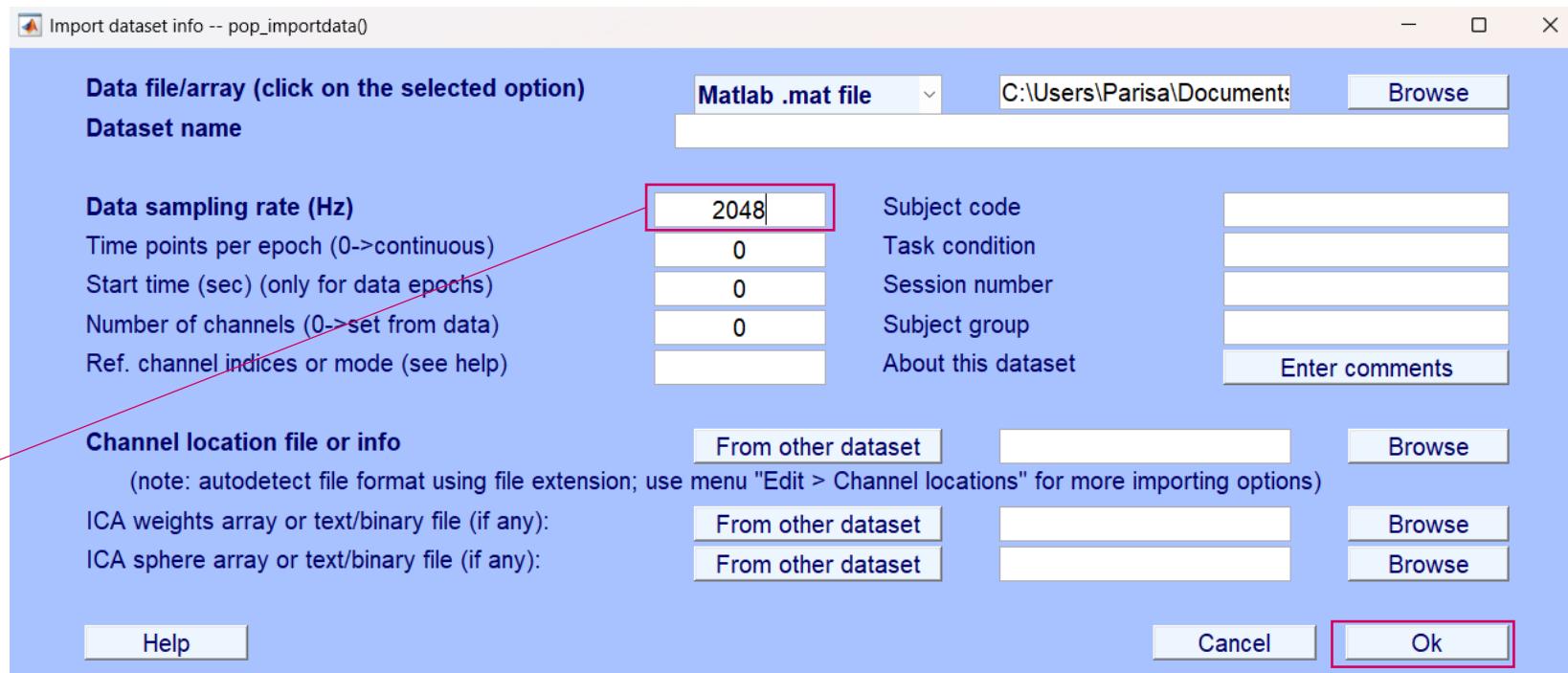
For .mat files



# EEGLAB

## Import/Load files

For .mat files

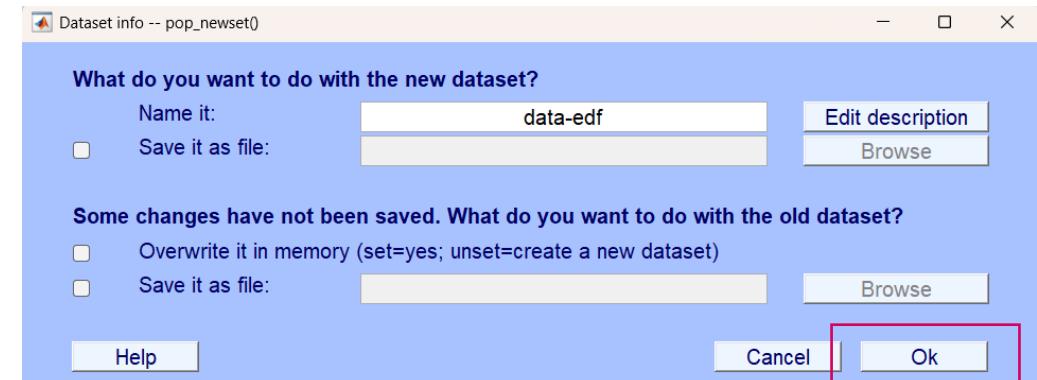
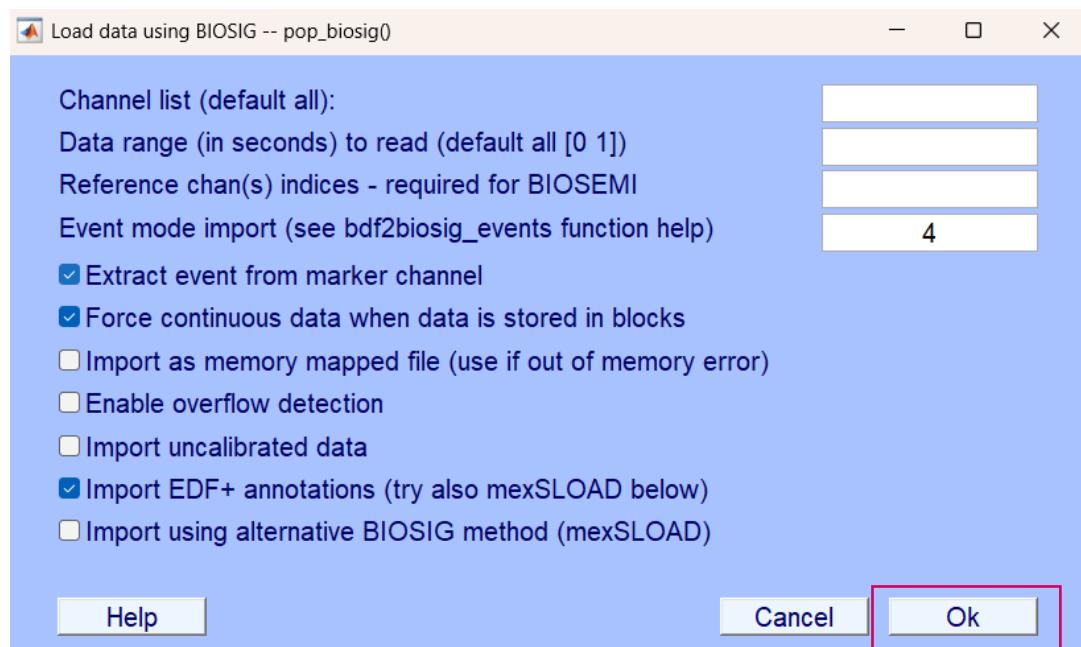


Based on the data sampling rate

# EEGLAB

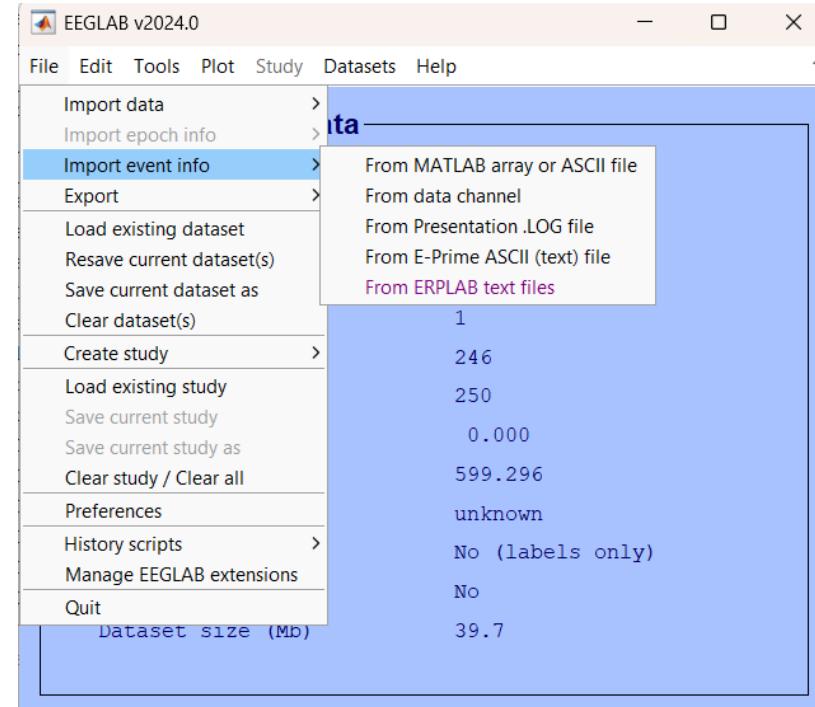
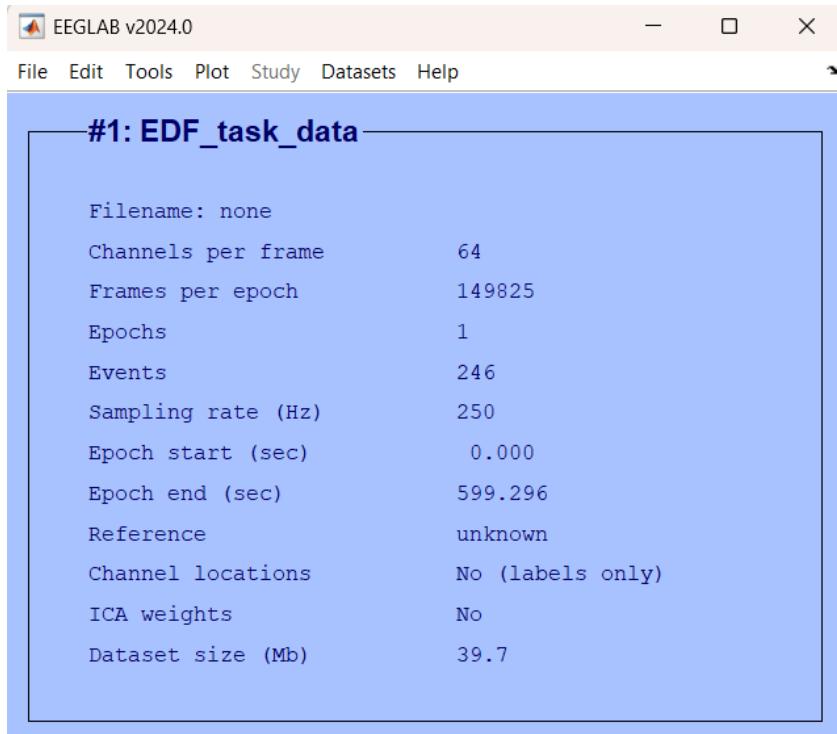
## Import/Load files

For .edf/edf+ files



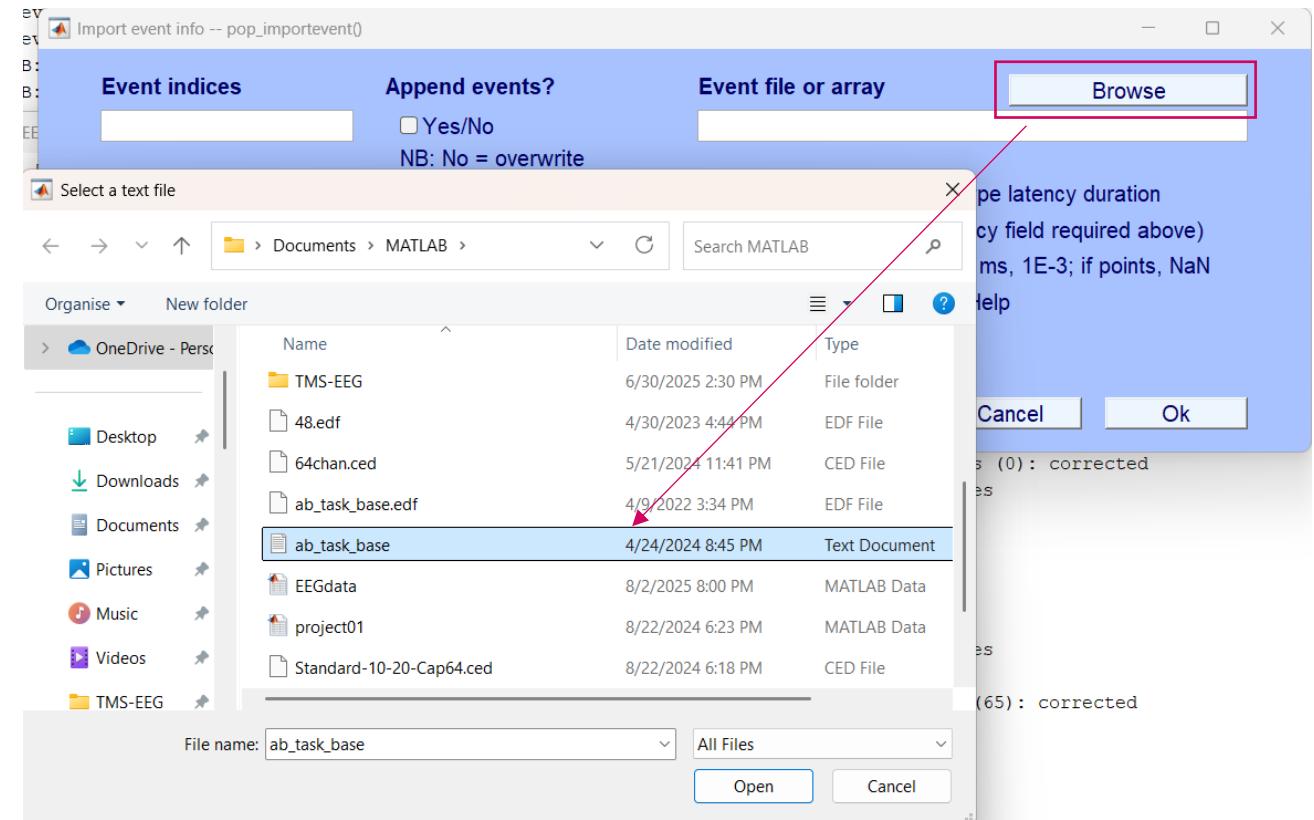
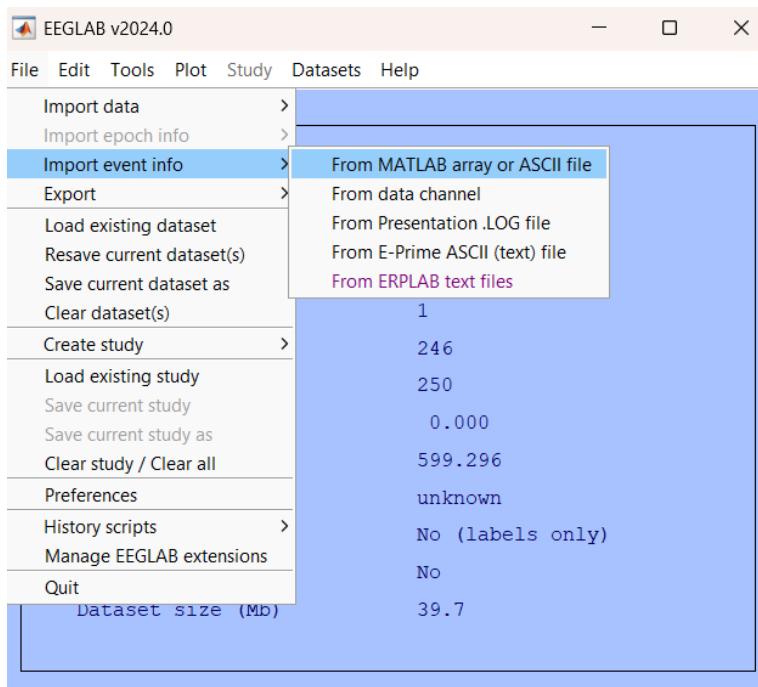
# EEGLAB

## Import events



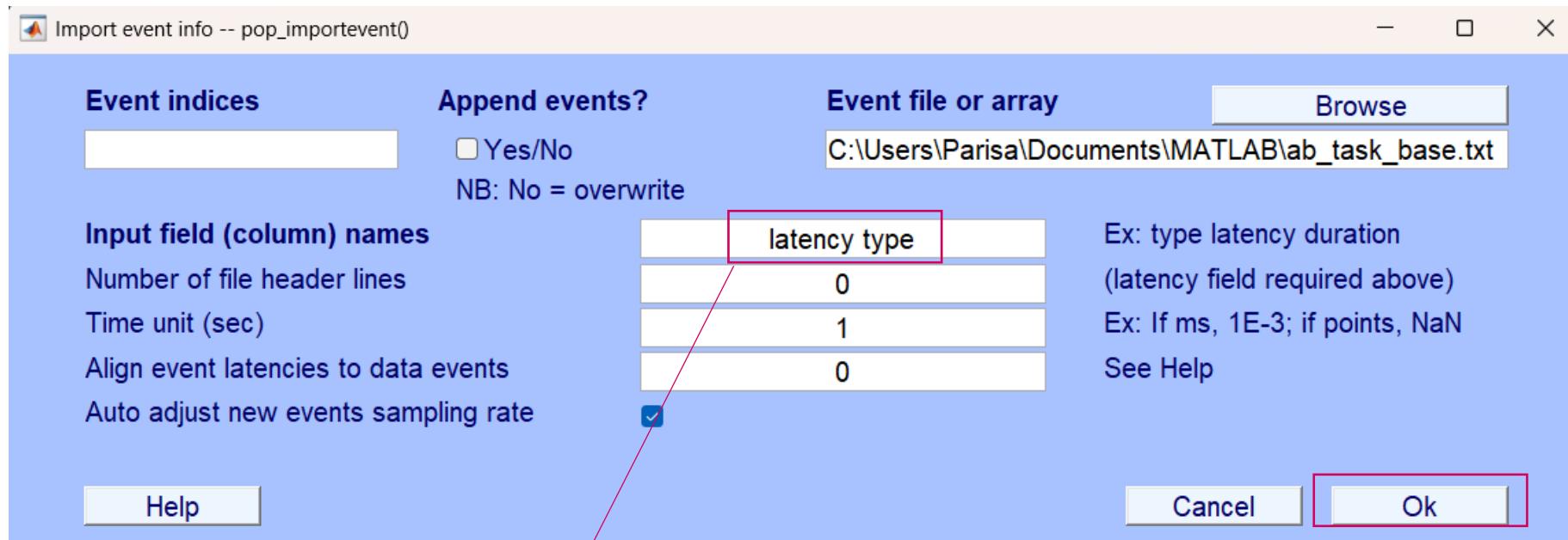
# EEGLAB

## Import events



# EEGLAB

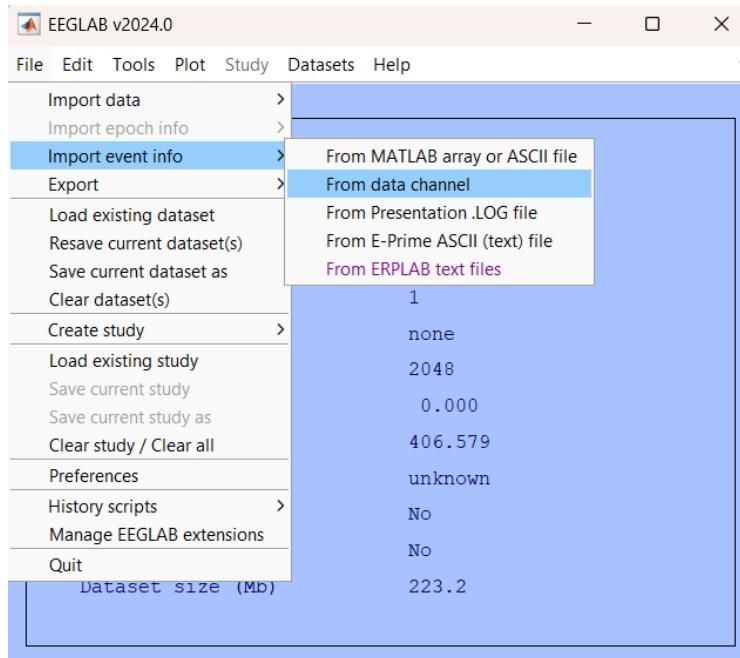
## Import events



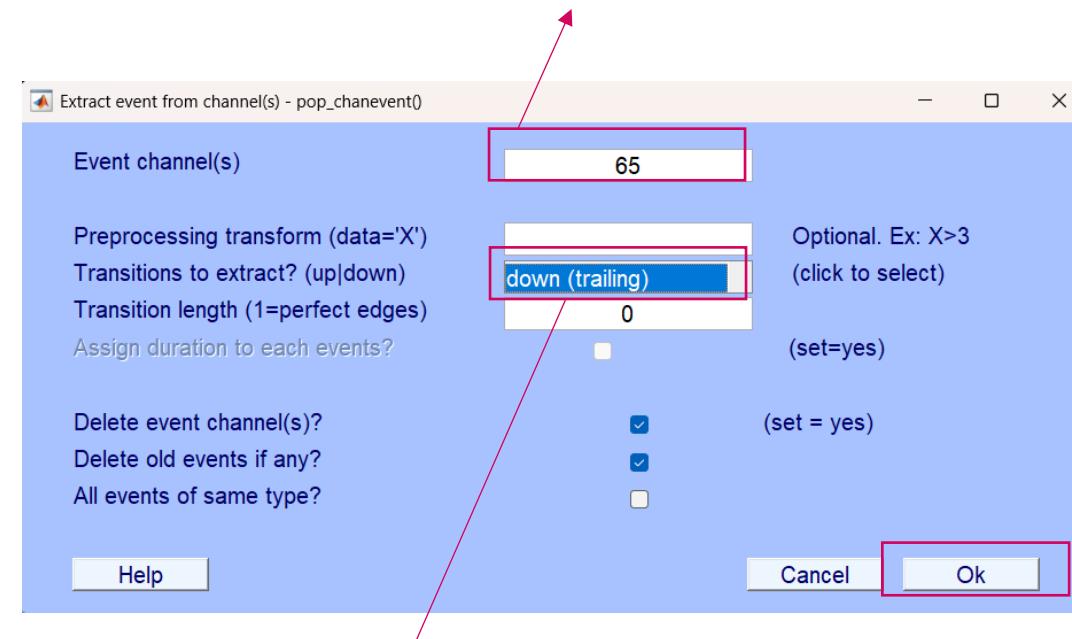
Based on the structure of  
the event file

# EEGLAB

## Import events



The channel  
containing event info



Based on the data

# EEGLAB

## Import events

```
ab_task_base.txt
File Edit View
7.428 10
8.968 10
10.508 10
12.04 10
13.572 10
15.108 10
16.644 10
18.18 10
19.712 10
21.244 10
22.78 10
24.316 10
25.848 10
27.38 10
28.916 10
30.452 10
31.996 10
33.532 10
35.068 10
36.604 10
38.14 15
129.66 20
135.52 1000
137.41 100
139.53 40
140.06 500
141.18 50
142.25 40
142.78 1000
144.06 100
145.36 40
```

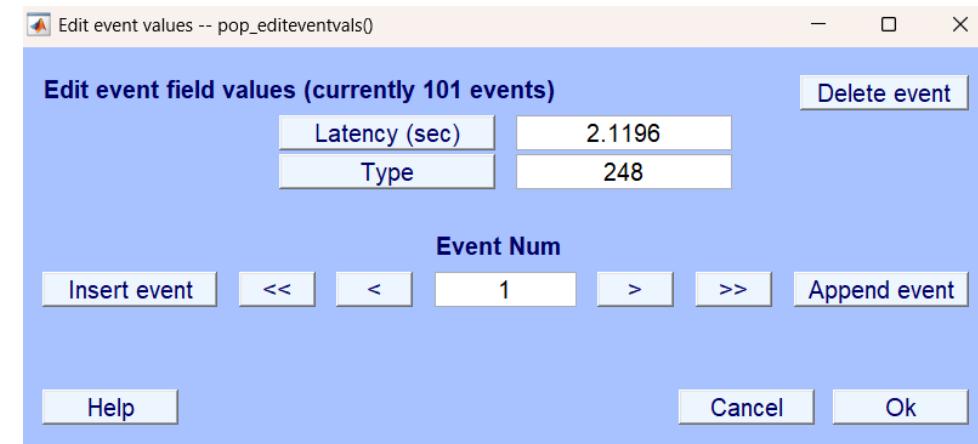
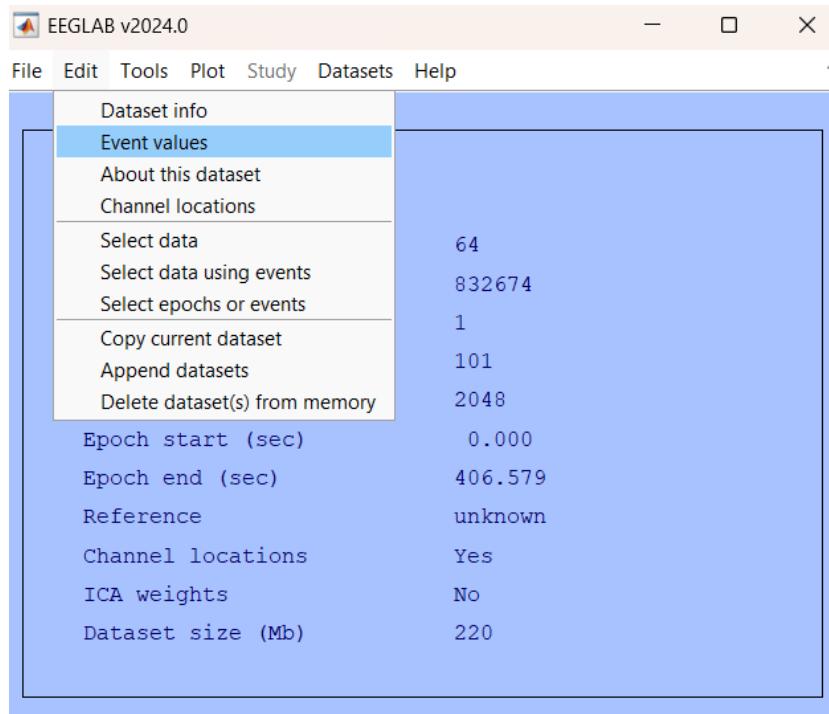
	1	2	3	4	5	6	7	8	9	10	11	12	13	
61	7.7296e+03	7.7321e+03	7.7353e+03	7.7369e+03	7.7348e+03	7.7364e+03	7.7376e+03	7.7404e+03	7.7404e+03	7.7337e+03	7.7347e+03	7.7337e+03	7.7368e+03	7.7
62	6.5322e+03	6.5362e+03	6.5378e+03	6.5384e+03	6.5351e+03	6.5357e+03	6.5397e+03	6.5427e+03	6.5433e+03	6.5346e+03	6.5351e+03	6.5356e+03	6.5383e+03	6.5
63	1.2613e+04	1.2617e+04	1.2619e+04	1.2618e+04	1.2617e+04	1.2617e+04	1.2618e+04	1.2622e+04	1.2622e+04	1.2616e+04	1.2614e+04	1.2613e+04	1.2617e+04	1.2
64	-2.3038e+03	-2.3050e+03	-2.3039e+03	-2.3013e+03	-2.2994e+03	-2.3032e+03	-2.3091e+03	-2.3069e+03	-2.3052e+03	-2.3038e+03	-2.3091e+03	-2.3127e+03	-2.3122e+03	-2.3
65	248	248	248	248	248	248	248	248	248	248	248	248	248	248
66														
67														

Events channel (in the data file)

Events files (txt file)

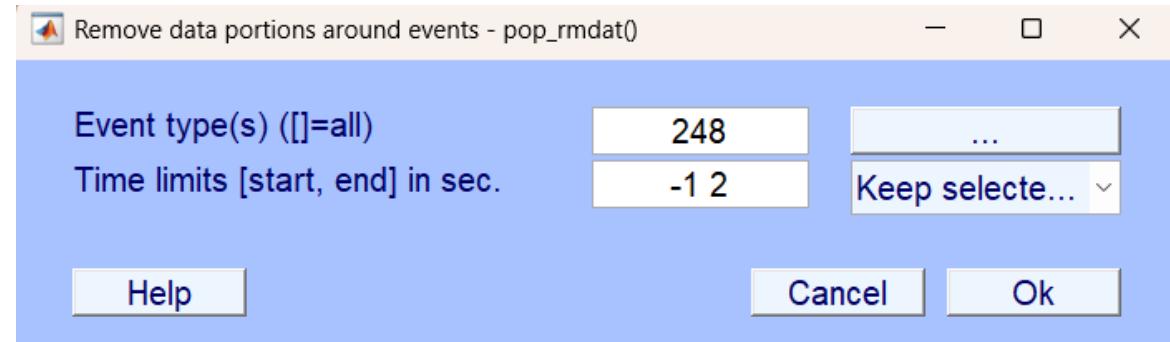
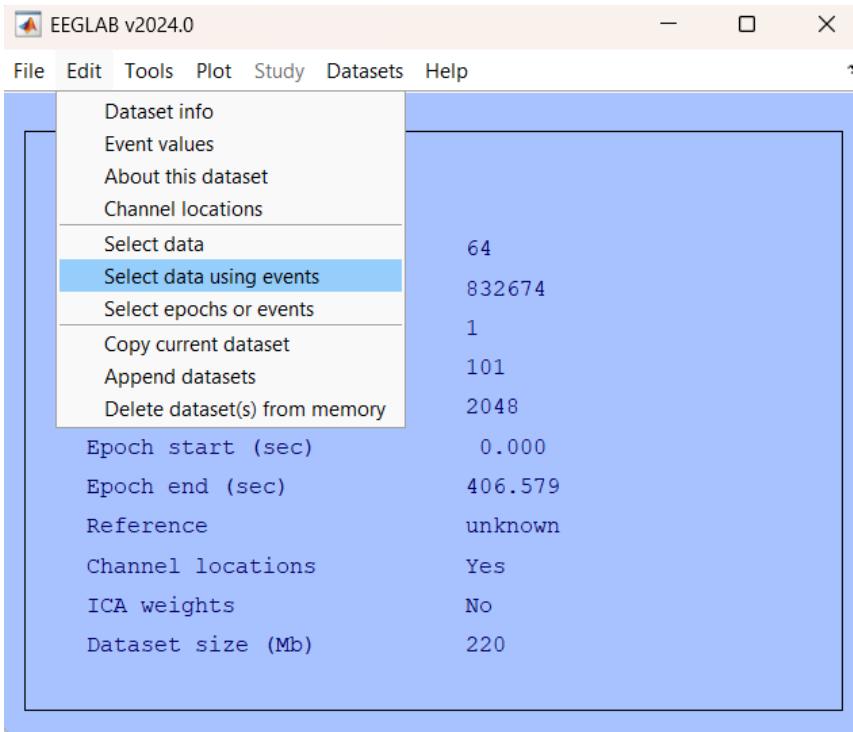
# EEGLAB

## Event values



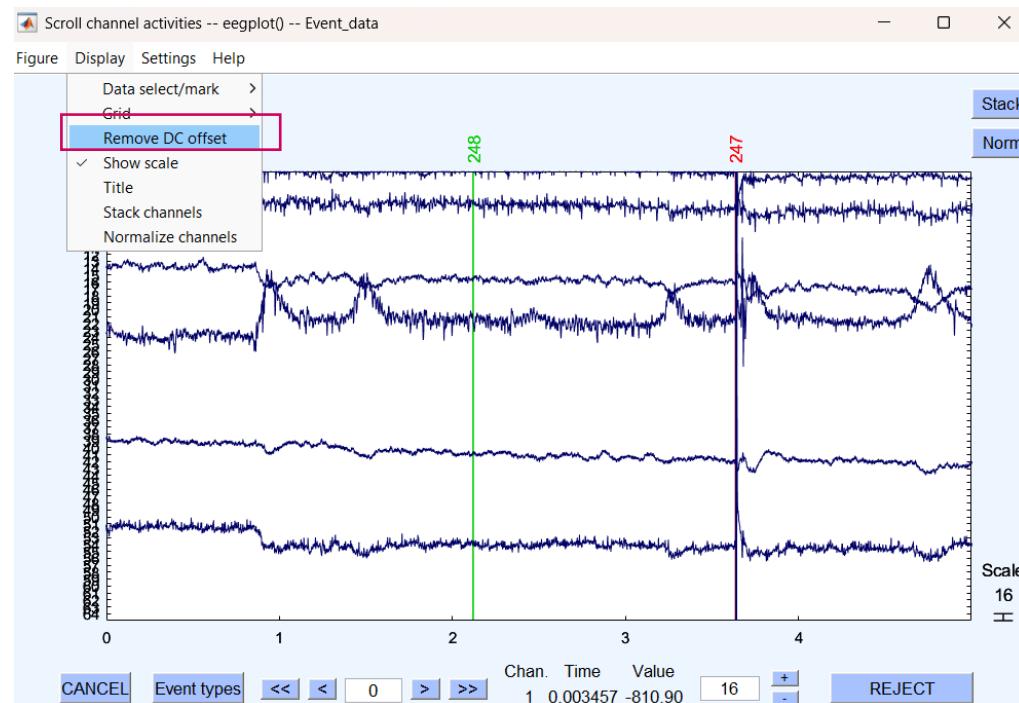
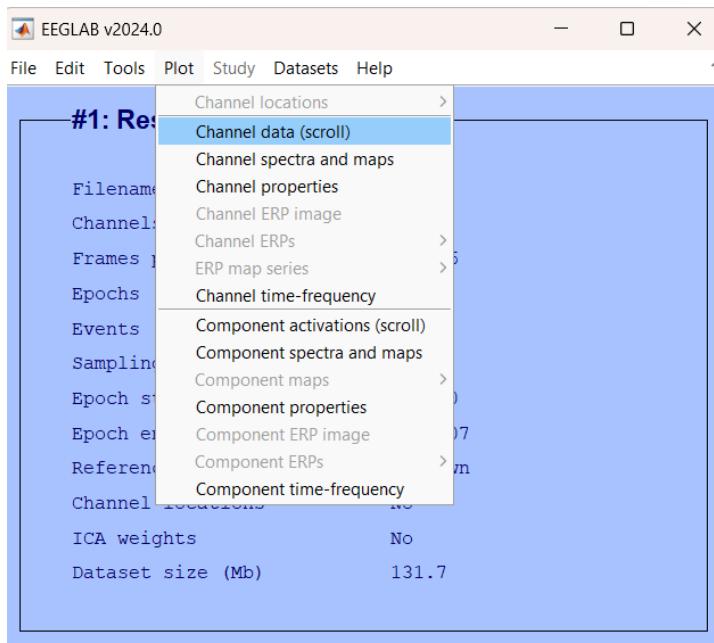
# EEGLAB

## Select data using events



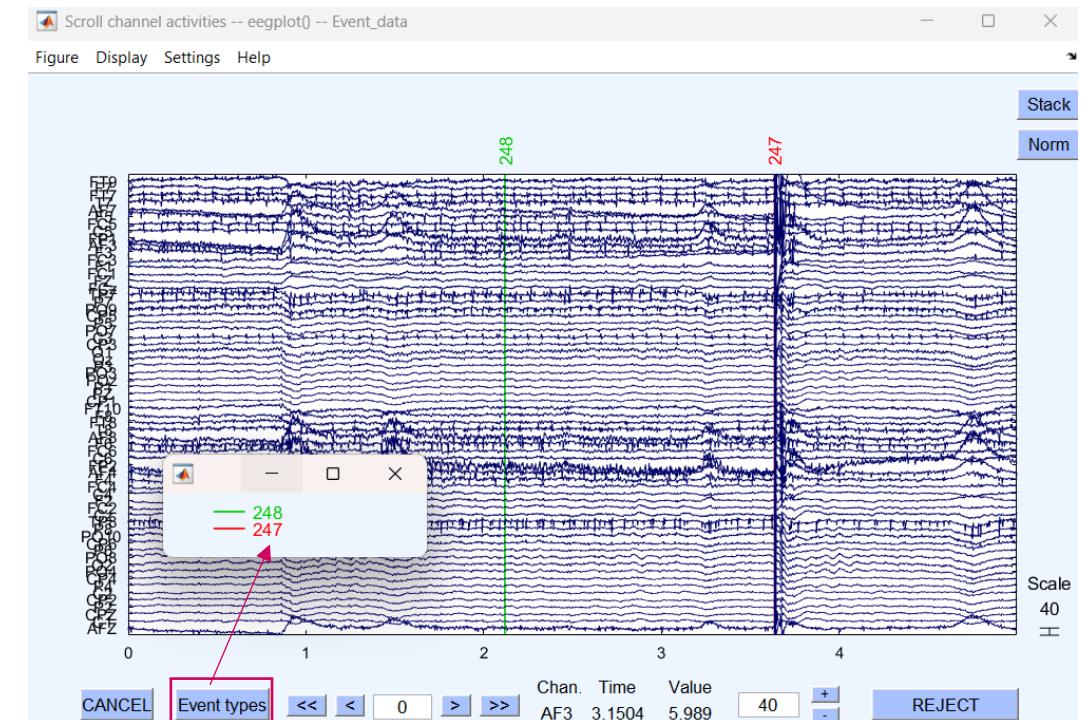
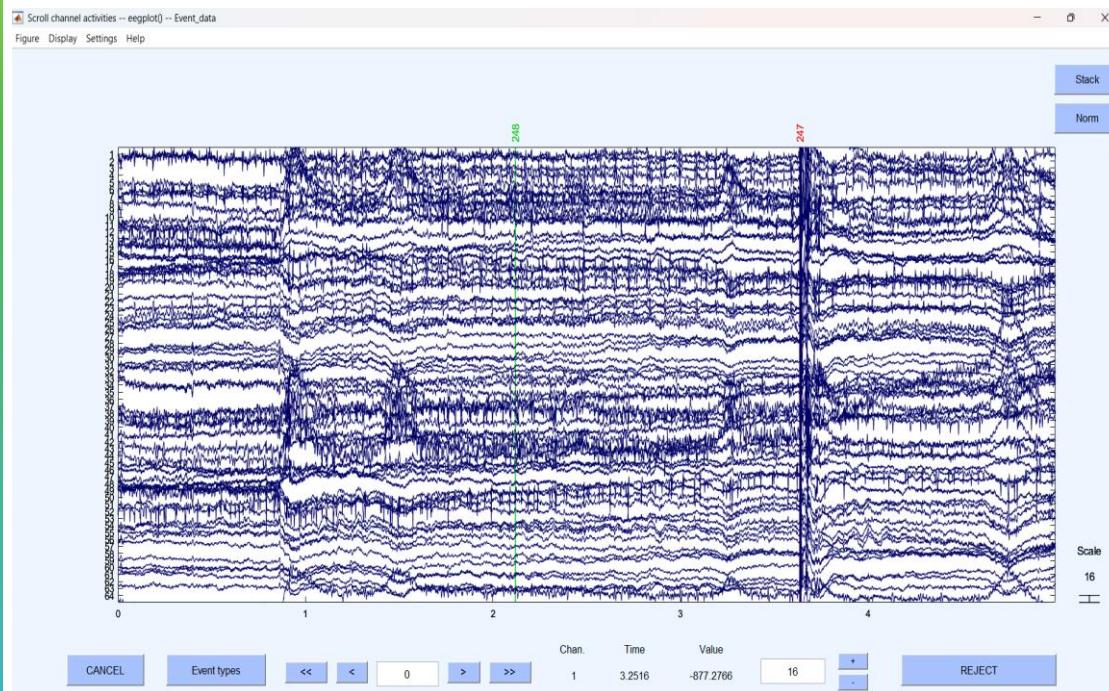
# EEGLAB

Plot channel data



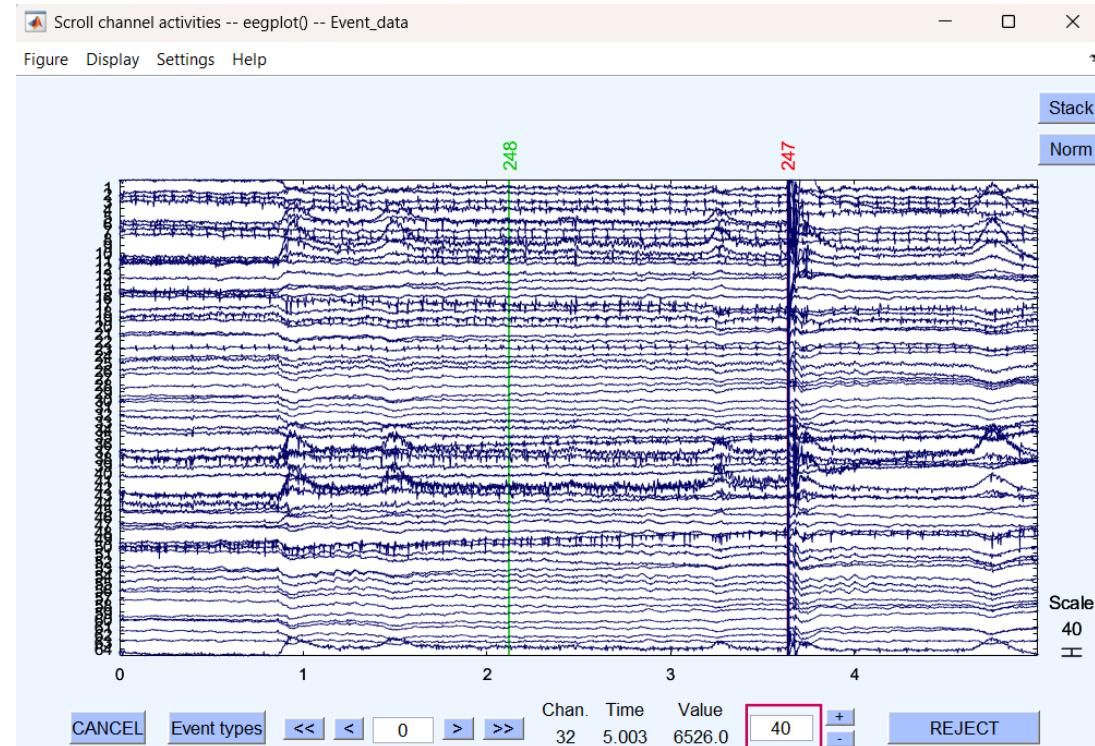
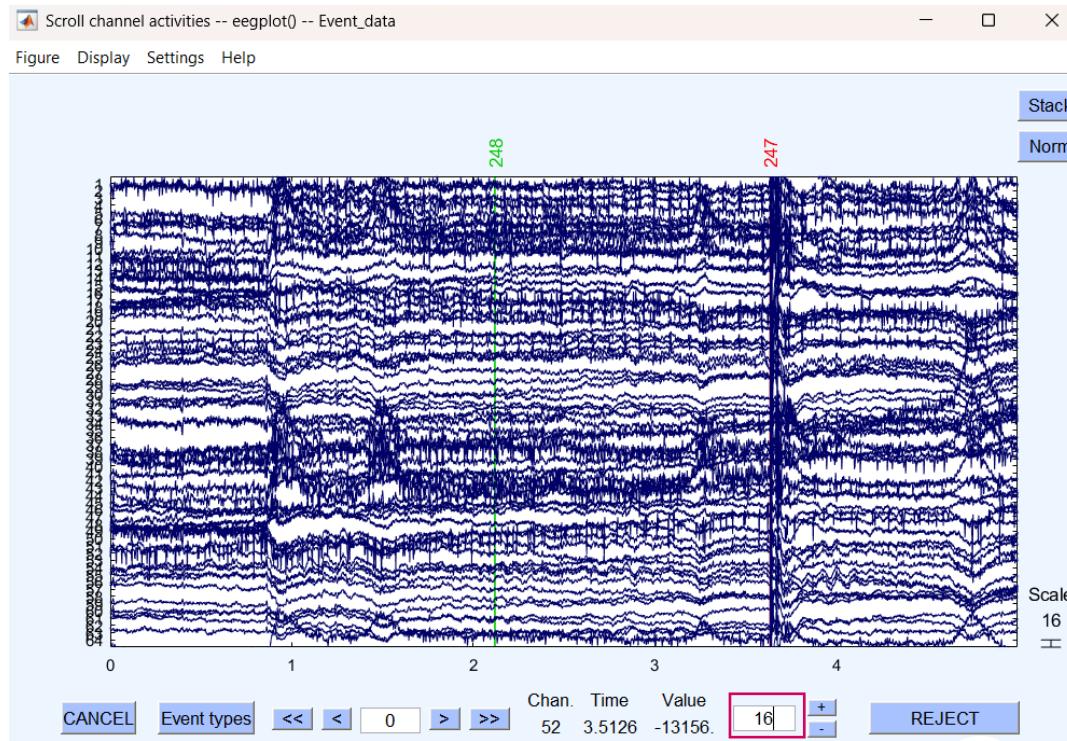
# EEGLAB

## Plot channel data



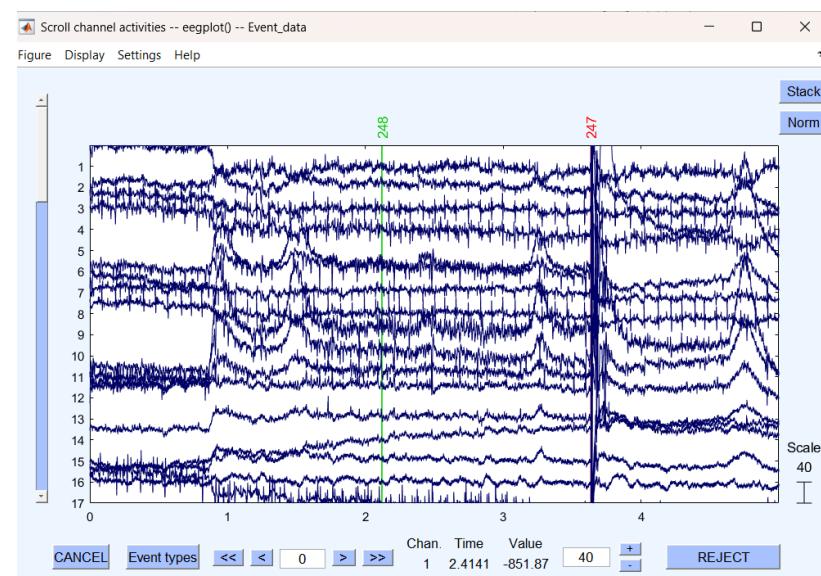
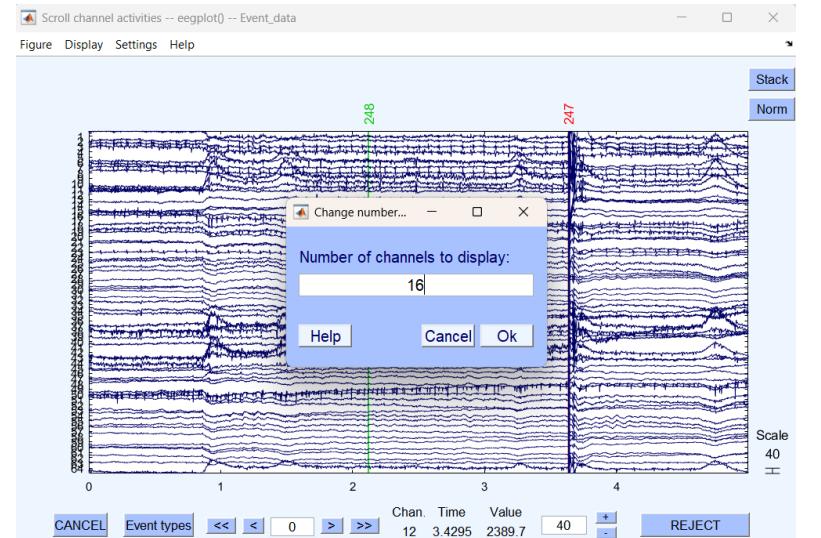
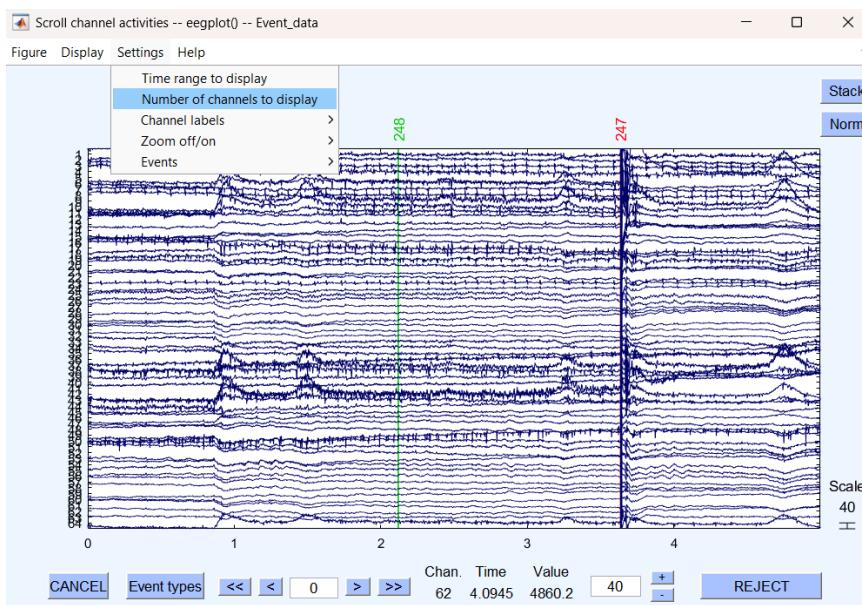
# EEGLAB

## Plot channel data



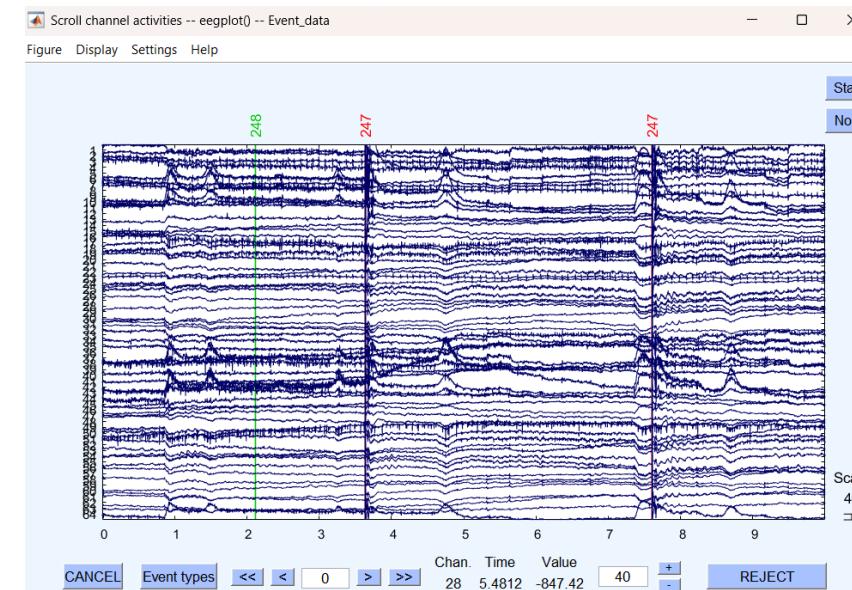
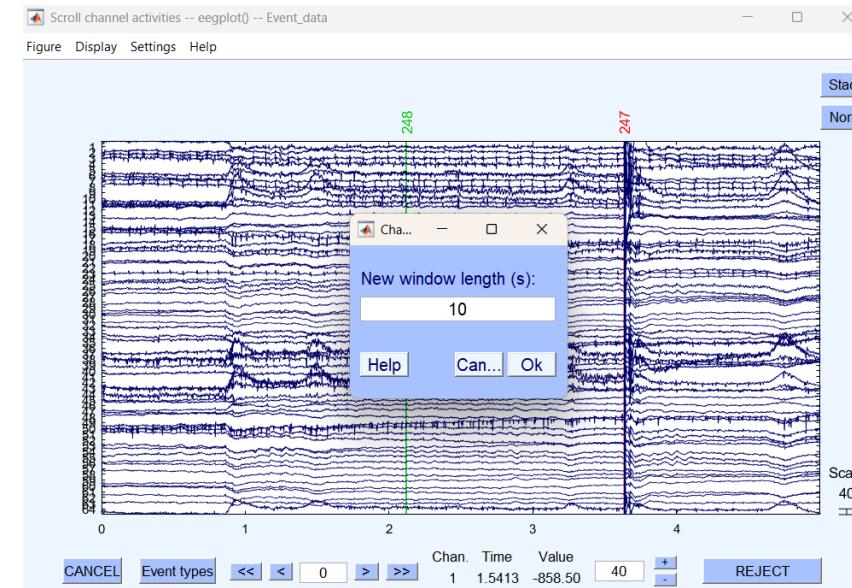
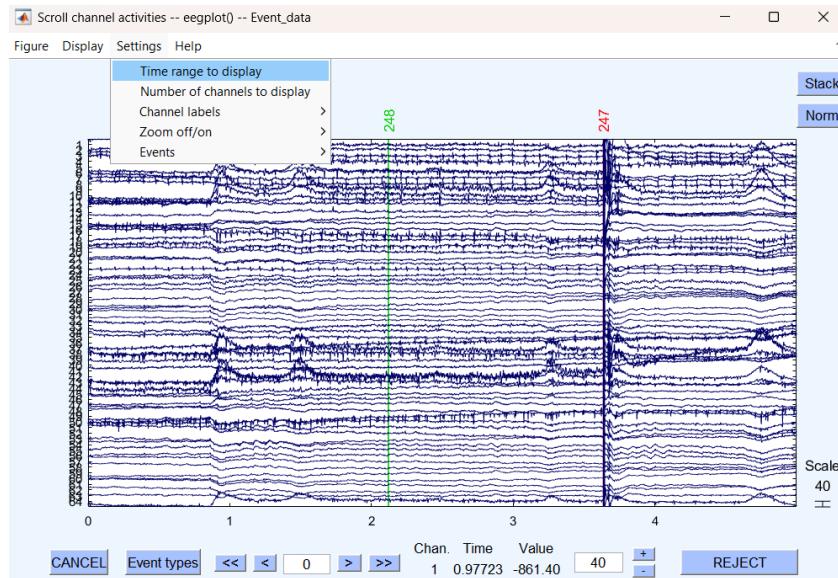
# EEGLAB

Plot channel data



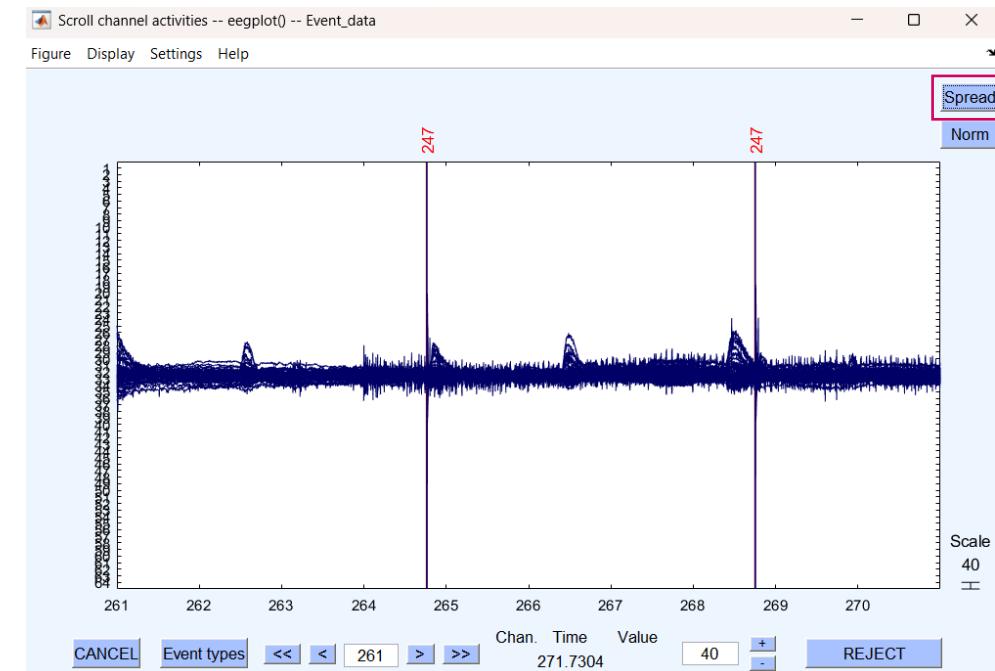
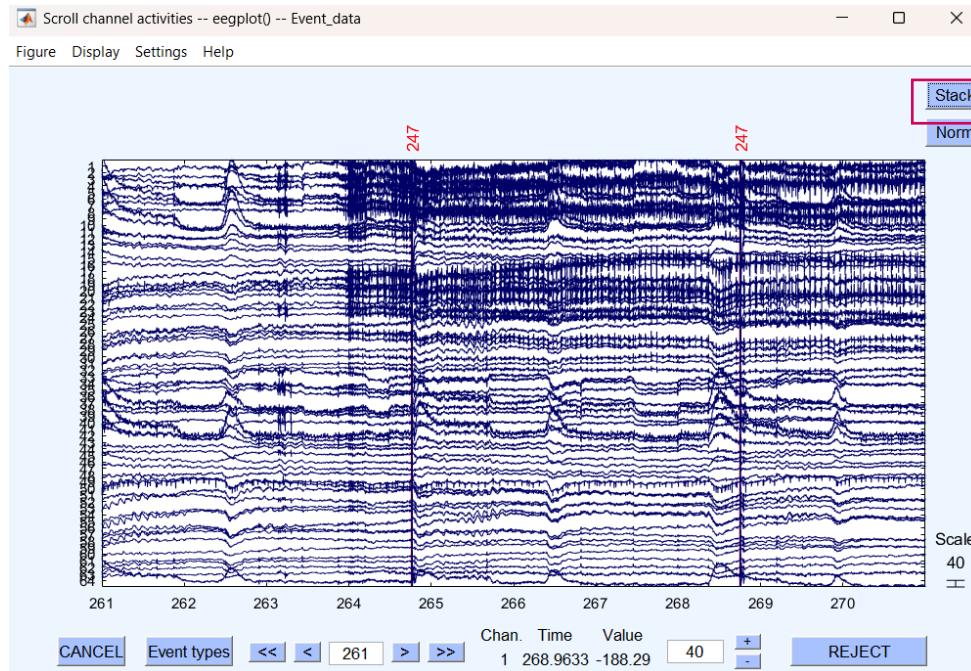
# EEGLAB

## Plot channel data



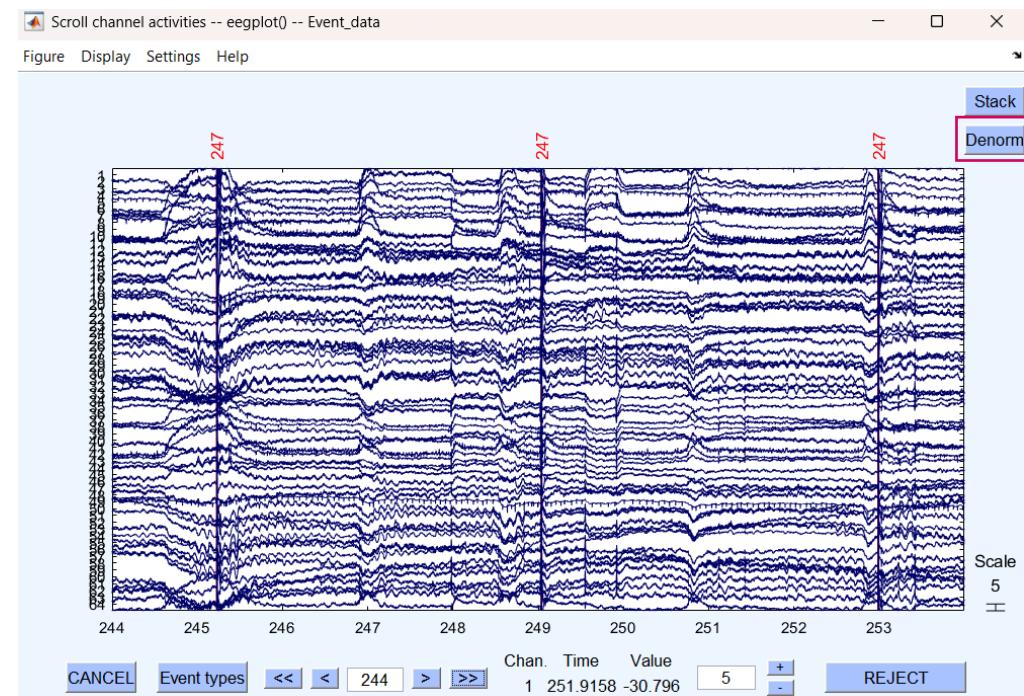
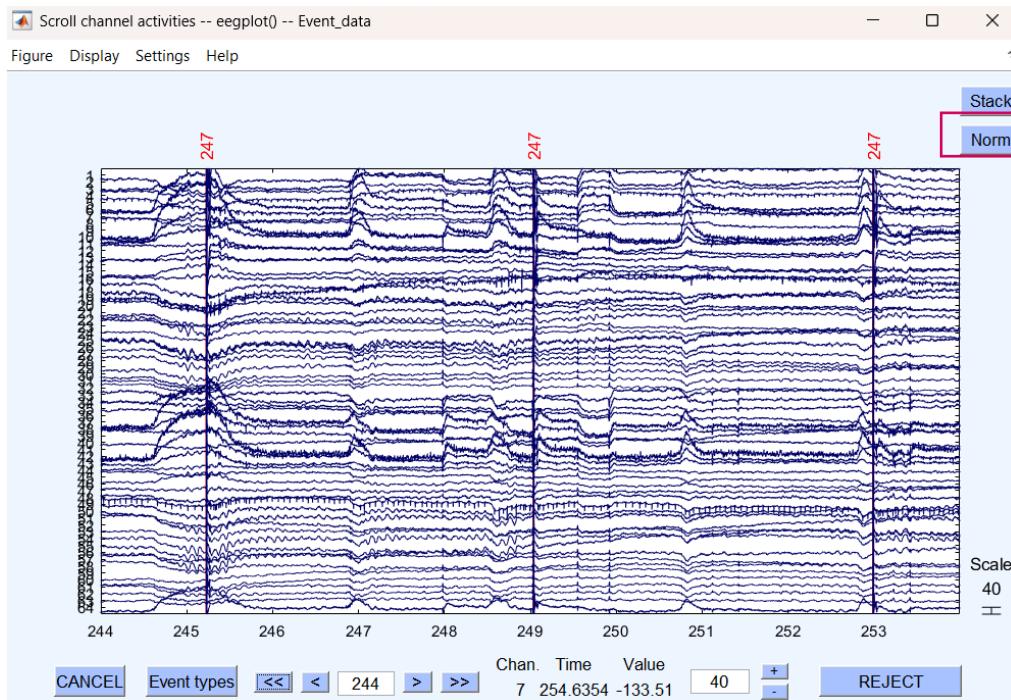
# EEGLAB

## Plot channel data



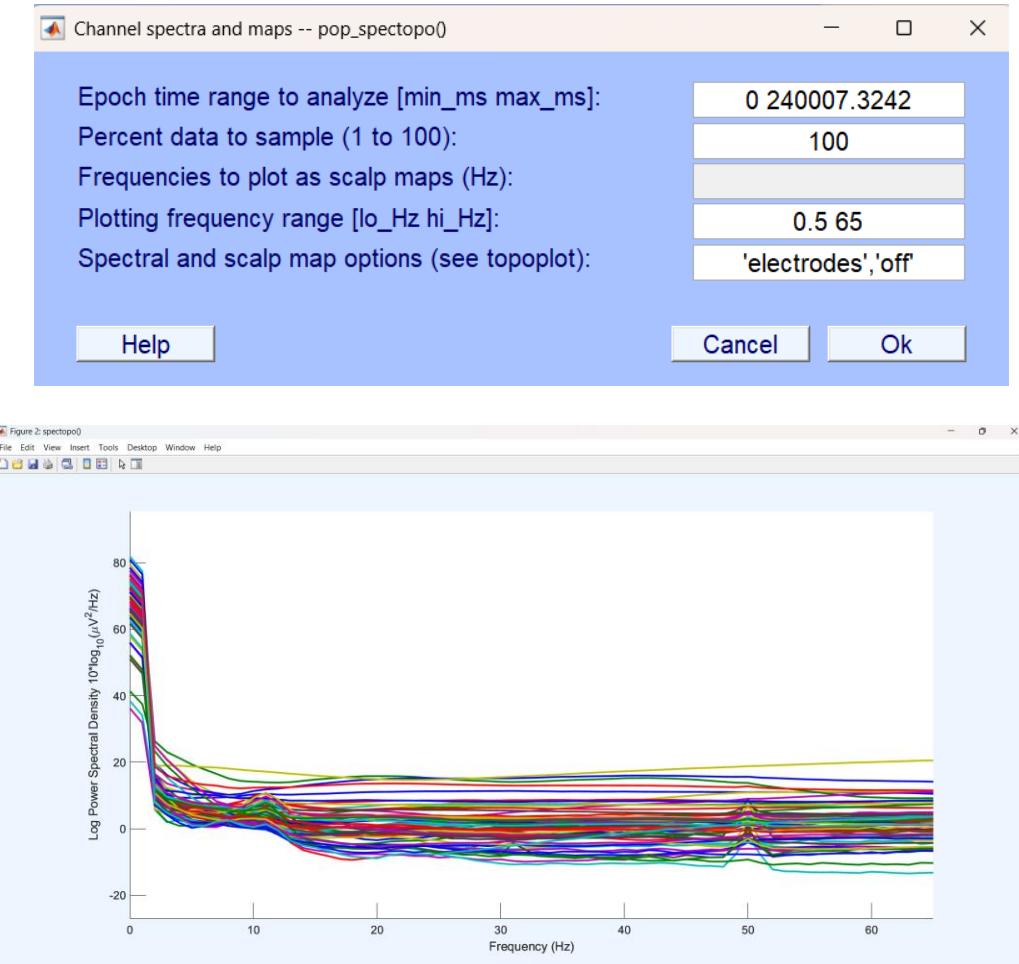
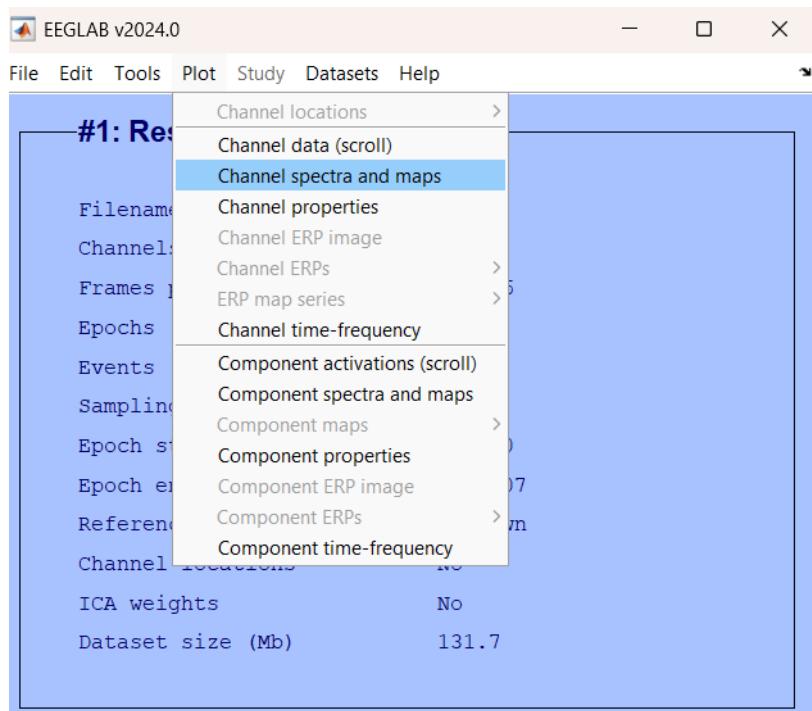
# EEGLAB

## Plot channel data



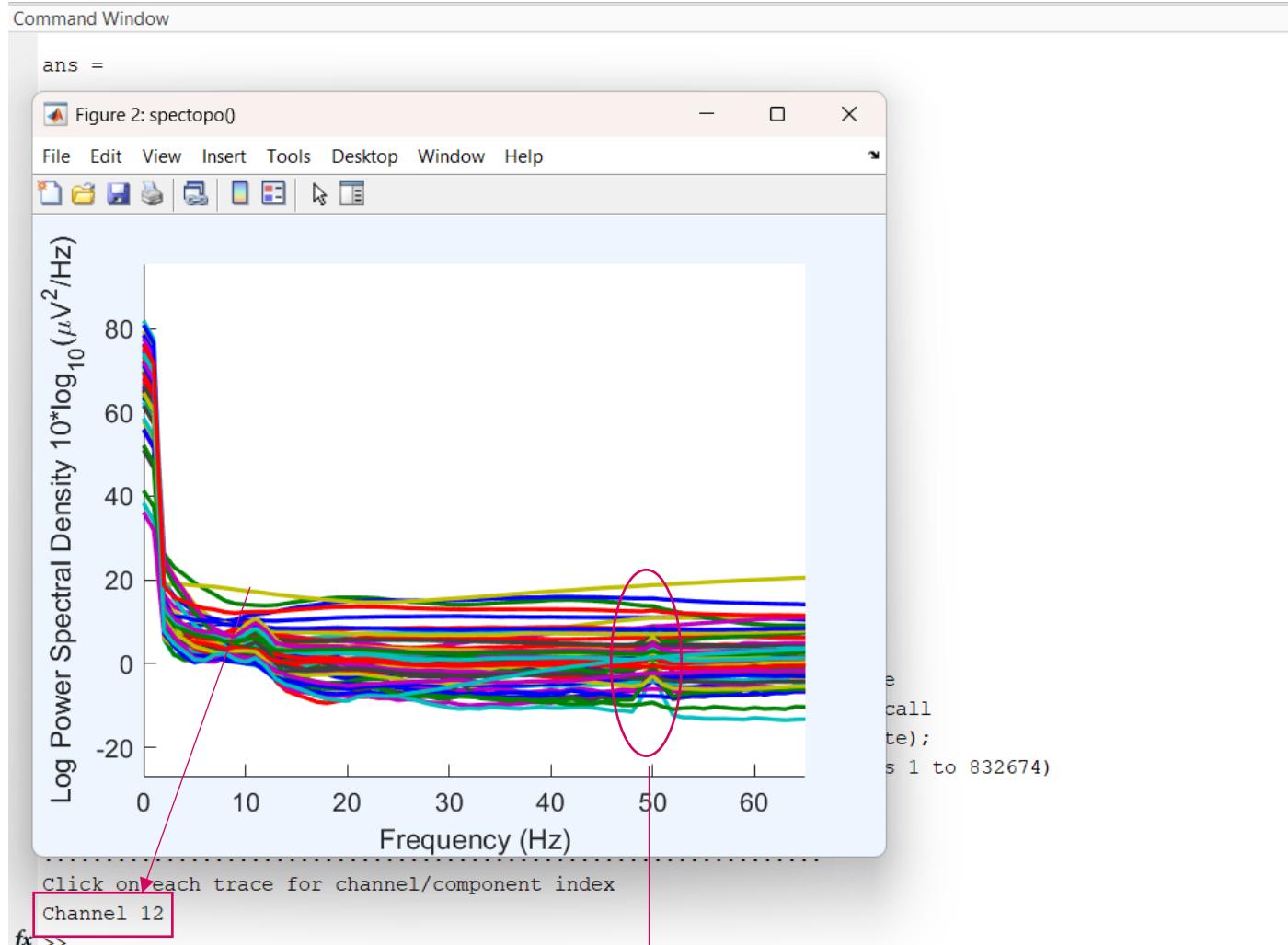
# EEGLAB

## Plot channel spectra and maps



# EEGLAB

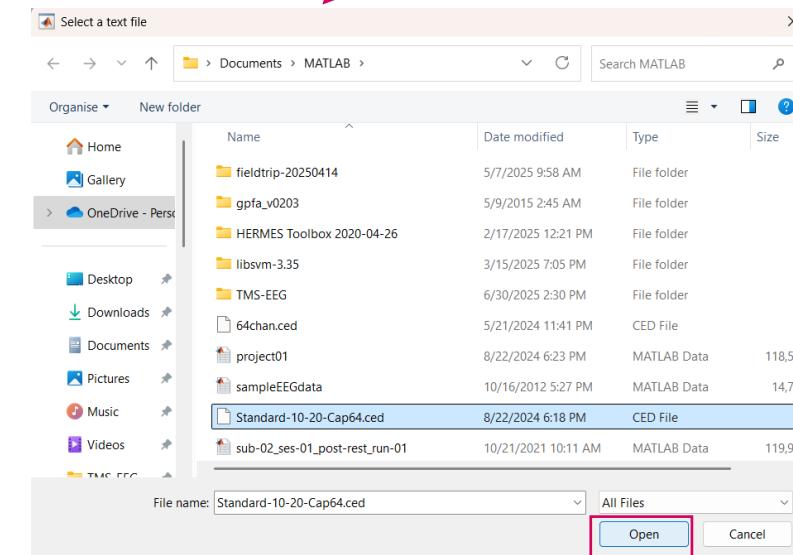
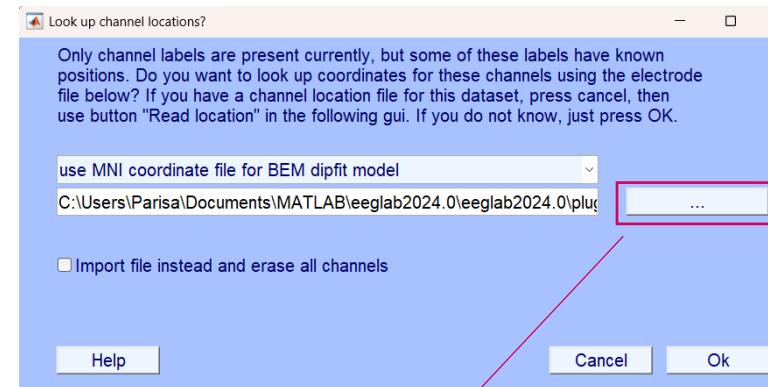
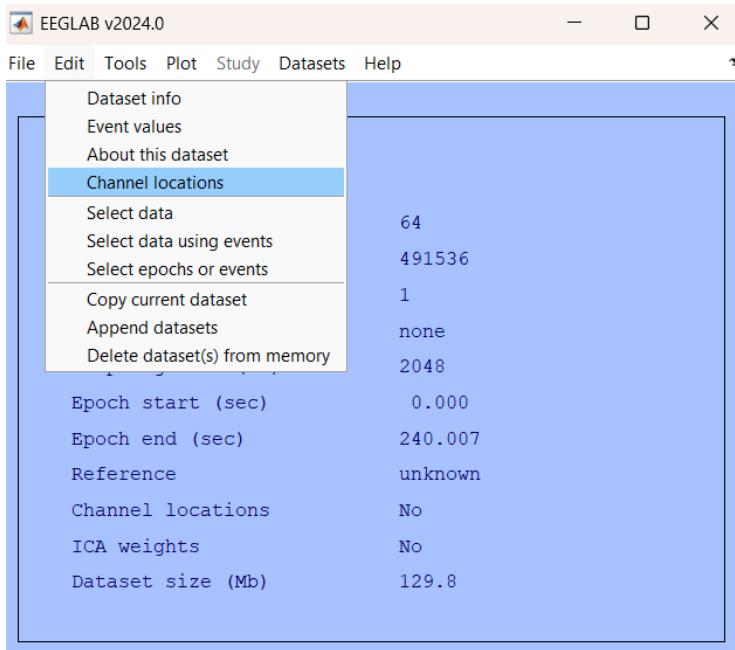
Plot channel spectra  
and maps



To see the number of a  
specific channel, left-click on it

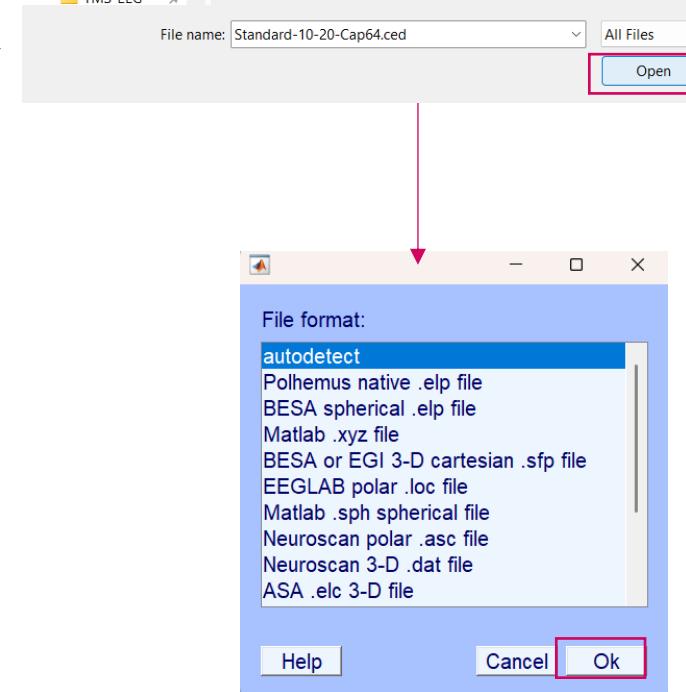
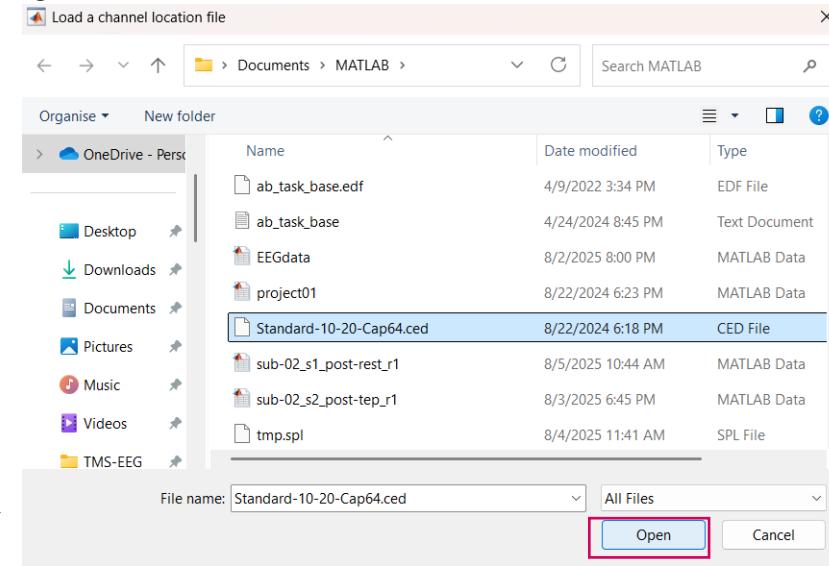
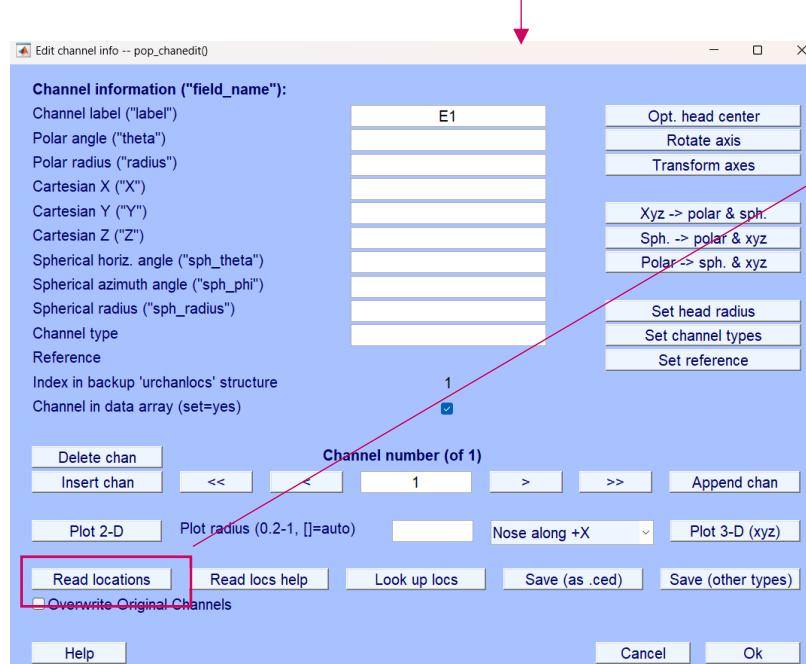
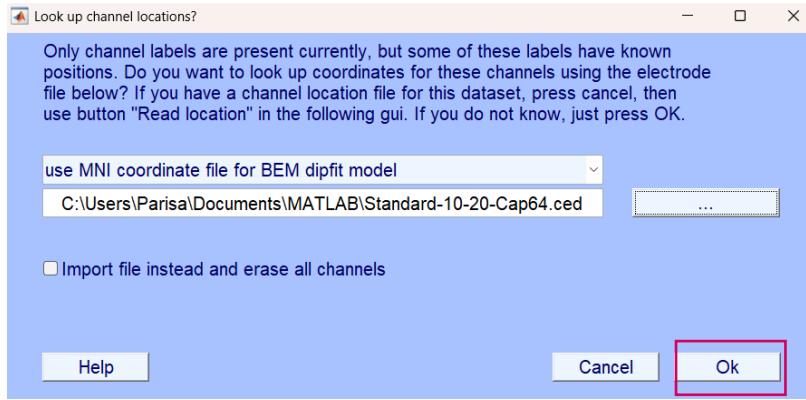
# EEGLAB

## Channel locations



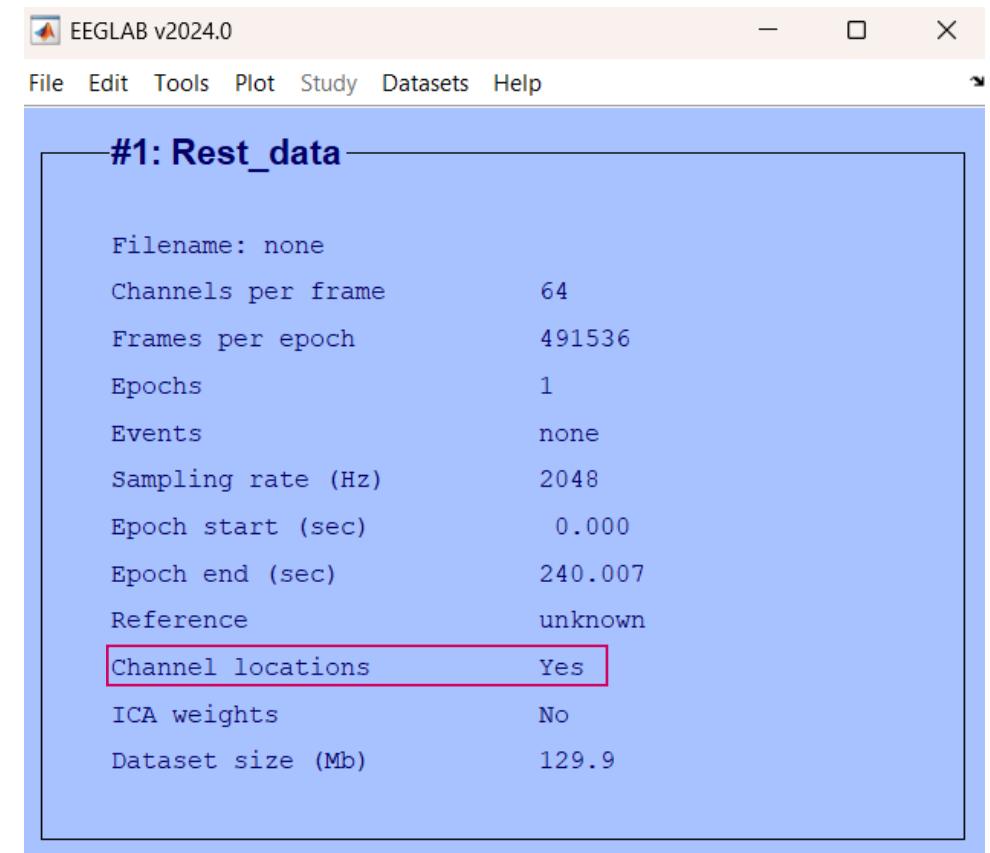
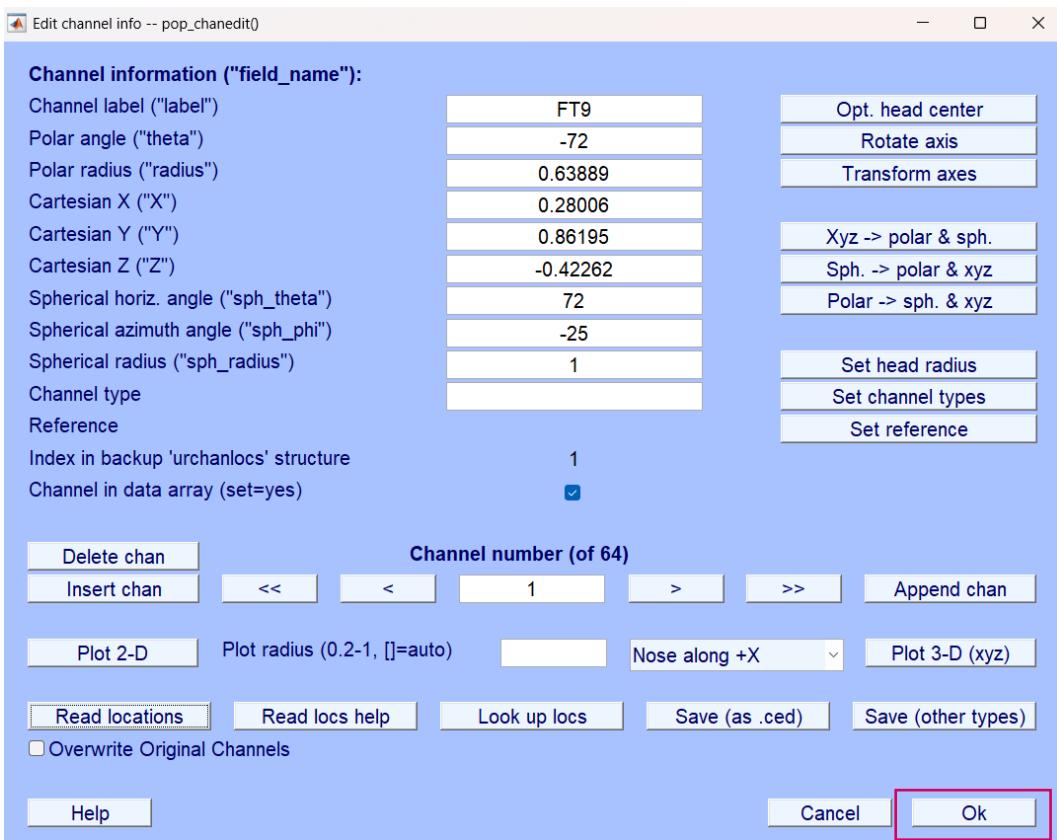
# EEGLAB

## Channel locations



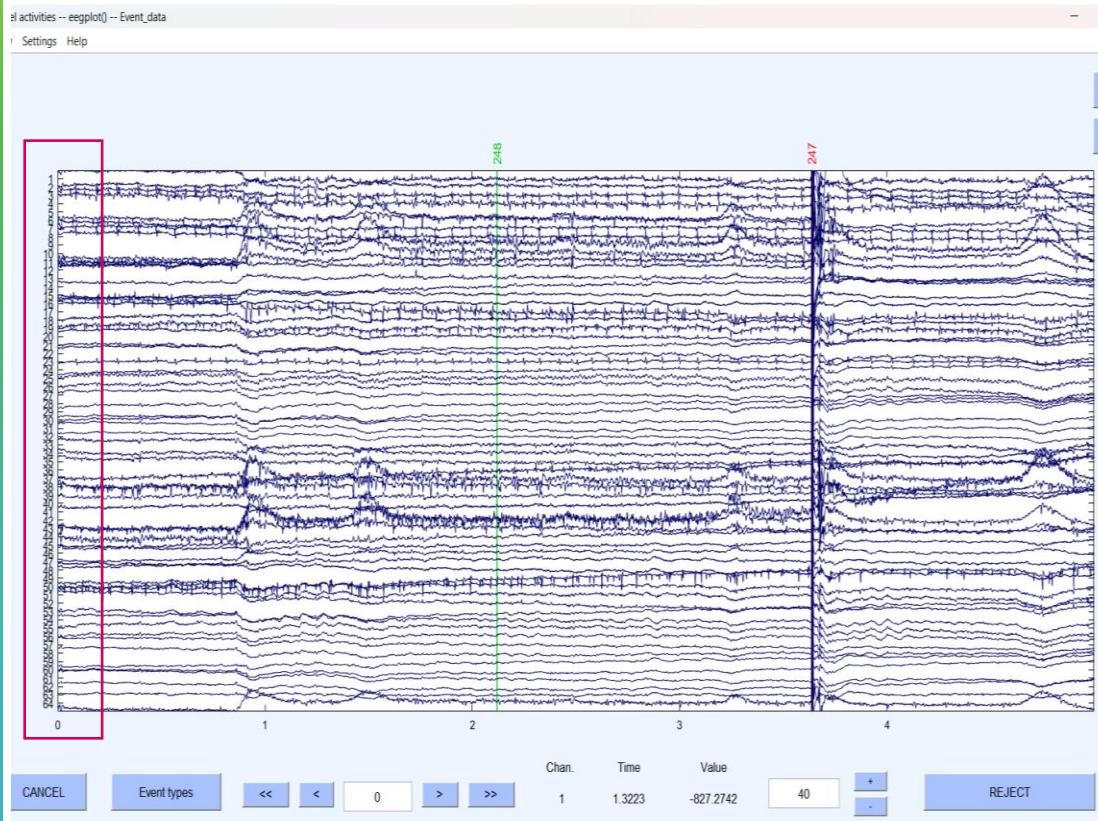
# EEGLAB

## Channel locations

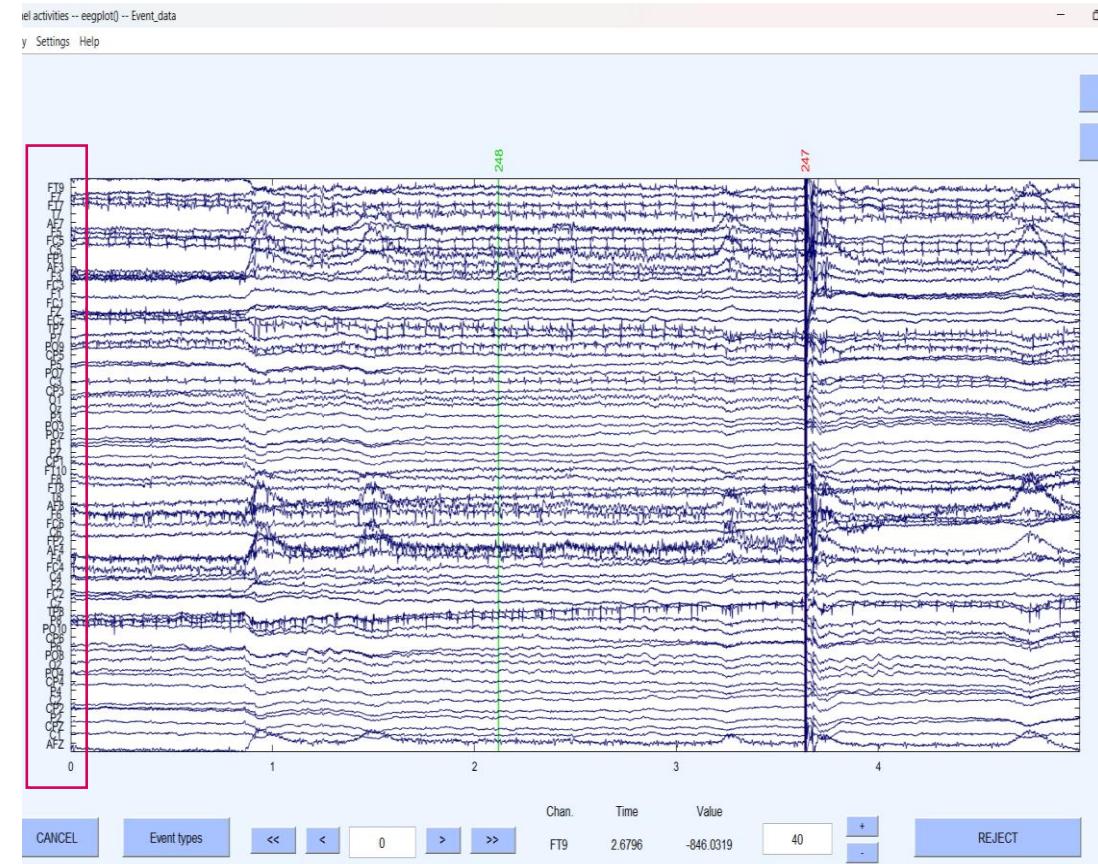


# EEGLAB

## Channel locations



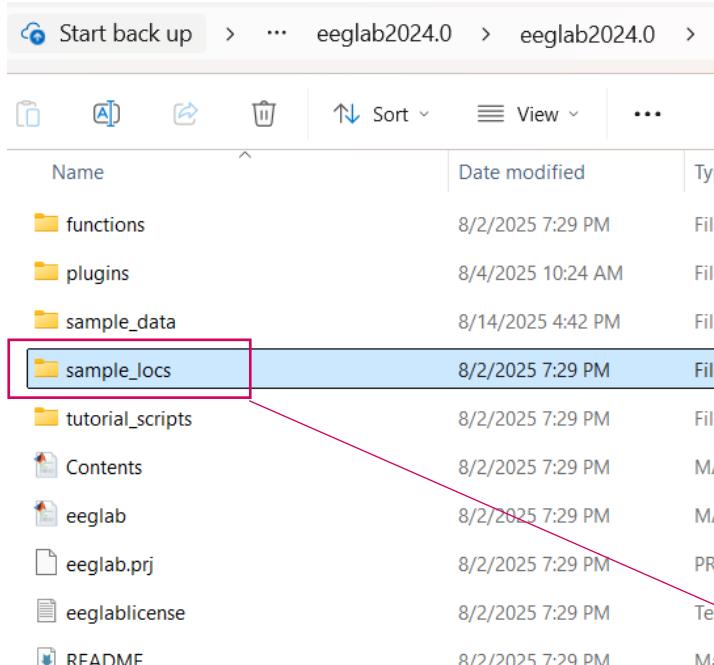
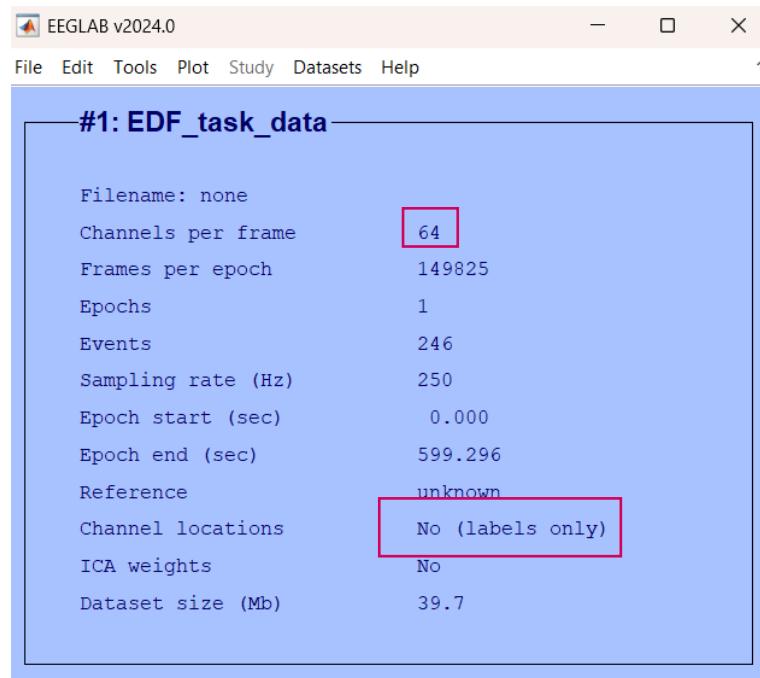
Before importing channel locations



After importing channel locations

# EEGLAB

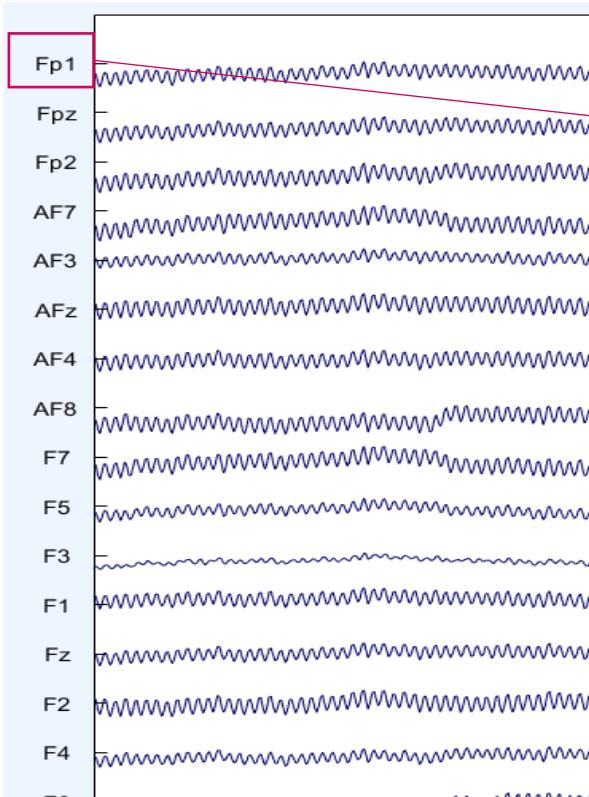
## Creating Channel locations



GSN129.stp	8/2/2025
GSN256.sfp	8/2/2025
GSN257.sfp	8/2/2025
GSN-HydroCel-32.sfp	8/2/2025
GSN-HydroCel-257.sfp	8/2/2025
Standard-10-10-Cap33.ced	8/2/2025
Standard-10-10-Cap33.locs	8/2/2025
Standard-10-10-Cap47.ced	8/2/2025
Standard-10-10-Cap47.locs	8/2/2025
Standard-10-20-Cap19.ced	8/2/2025
Standard-10-20-Cap19.locs	8/2/2025
Standard-10-20-Cap25.ced	8/2/2025
Standard-10-20-Cap25.locs	8/2/2025
Standard-10-20-Cap81.ced	8/2/2025
Standard-10-20-Cap81.locs	8/2/2025

# EEGLAB

## Creating Channel locations



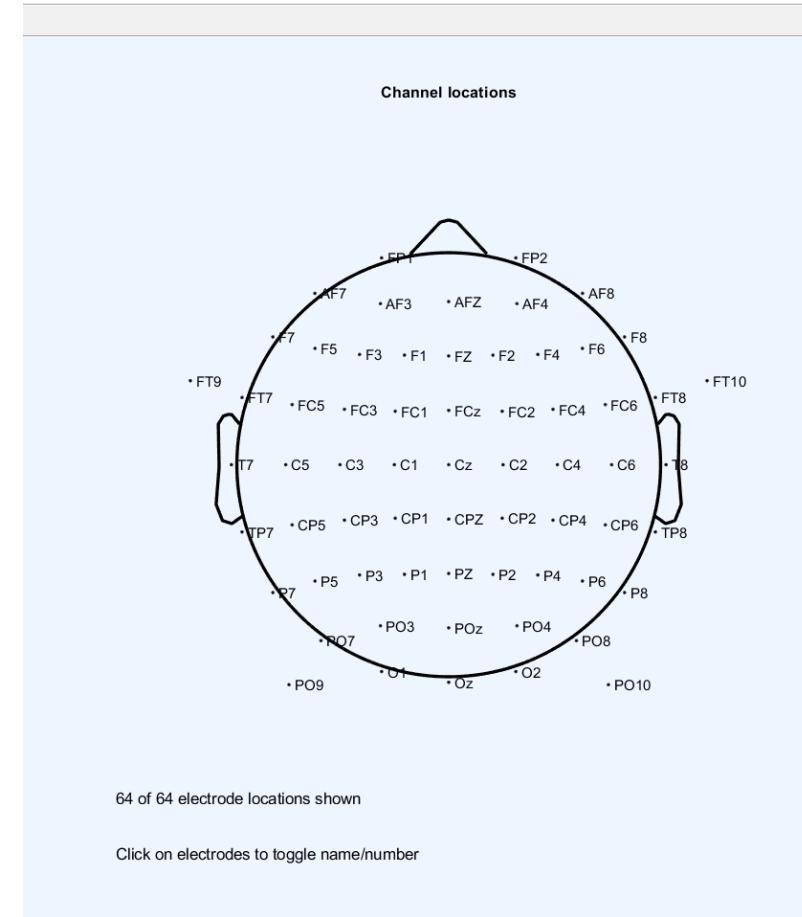
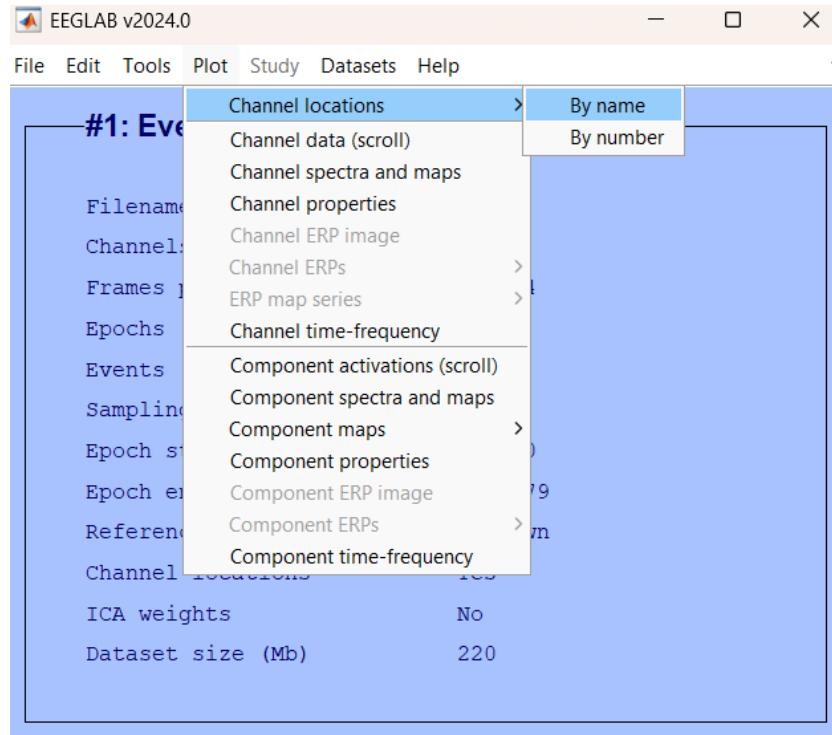
EEG data channel labels

Number	labels	theta	radius	X	Y	Z	sph_theta	sph_phi	sph_radius
1	FP1	-18	0.511	0.95	0.309	-0.0349	18	-2	1
2	FPZ	0	0.511	0.999	-0	-0.0349	-0	-2	1
3	FP2	18	0.511	0.95	-0.309	-0.0349	-18	-2	1
4	Nz	0	0.622	0.927	-0	-0.375	-0	-22	1
5	AF9	-43	0.639	0.663	0.618	-0.423	43	-25	1
6	AF7	-38	0.511	0.788	0.615	-0.0349	38	-2	1
7	AF3	-23	0.411	0.885	0.376	0.276	23	16	1
8	AFZ	0	0.383	0.934	-0	0.358	-0	21	1
9	AF4	23	0.411	0.885	-0.376	0.276	-23	16	1
10	AF8	38	0.511	0.788	-0.615	-0.0349	-38	-2	1
11	AF10	43	0.639	0.663	-0.618	-0.423	-43	-25	1
12	F9	-55	0.639	0.52	0.742	-0.423	55	-25	1
13	F7	-54	0.511	0.587	0.809	-0.0349	54	-2	1
14	F5	-49	0.417	0.634	0.729	0.259	49	15	1
15	F3	-39	0.333	0.673	0.545	0.5	39	30	1
16	F1	-22	0.278	0.71	0.287	0.643	22	40	1
17	FZ	0	0.256	0.719	-0	0.695	-0	44	1
18	F2	22	0.278	0.71	-0.287	0.643	-22	40	1
19	F4	39	0.333	0.673	-0.545	0.5	-39	30	1

Sample channel locations which needs to be rearranged according to data channels labels

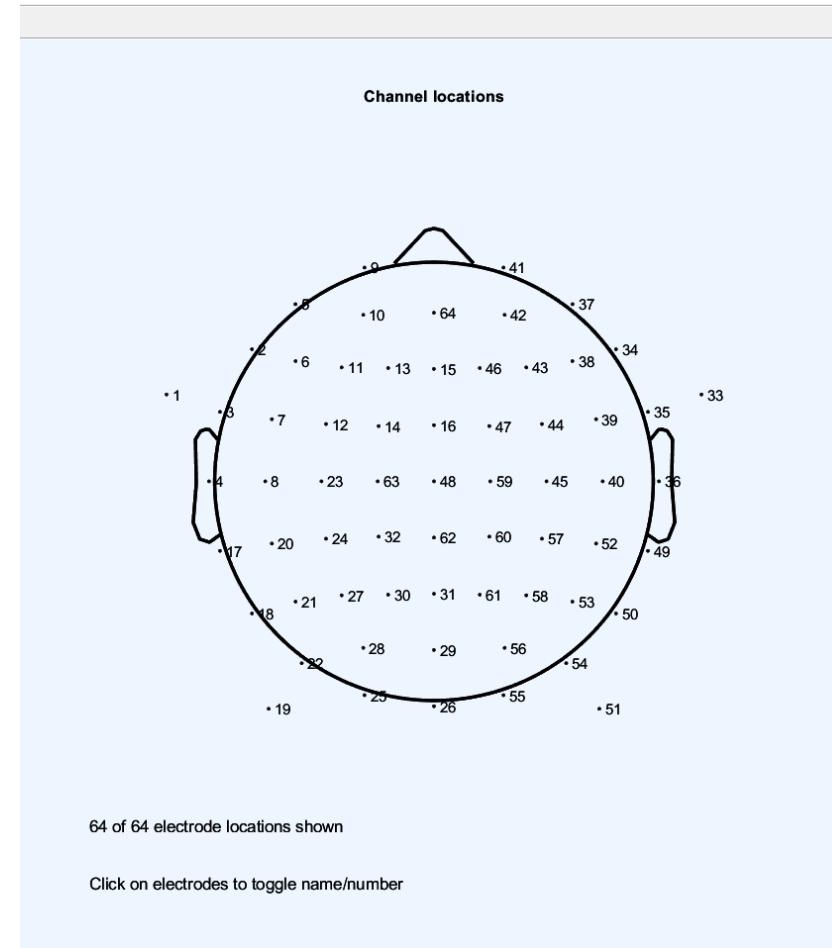
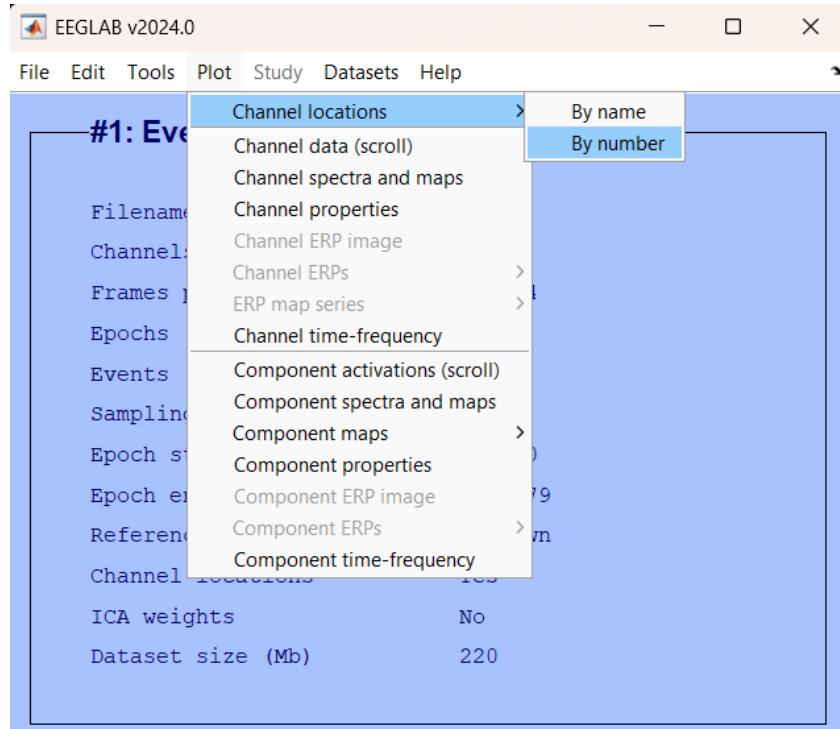
# EEGLAB

## Plot channel locations



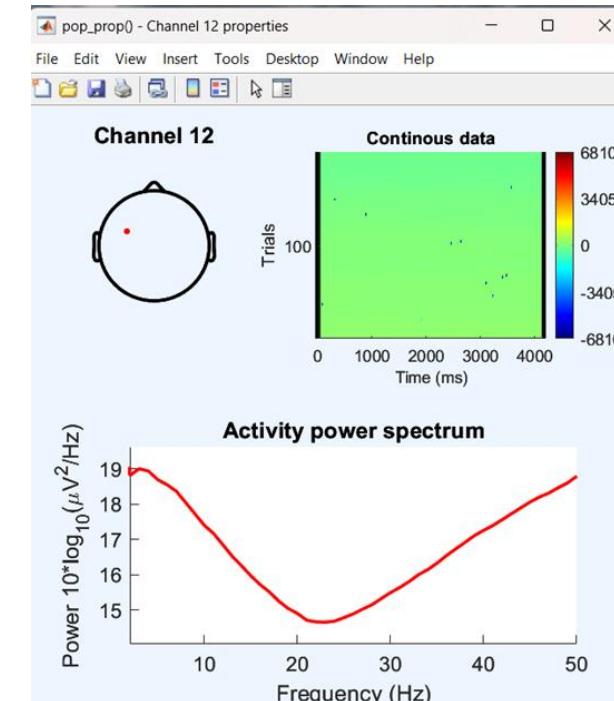
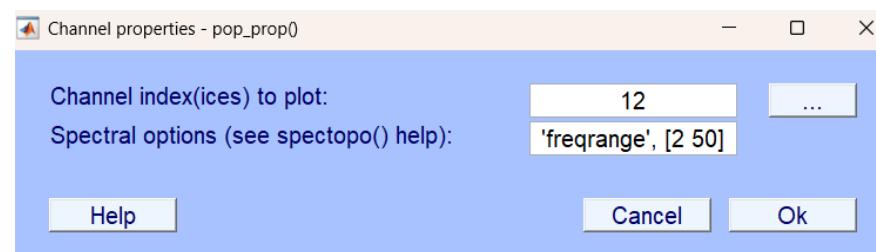
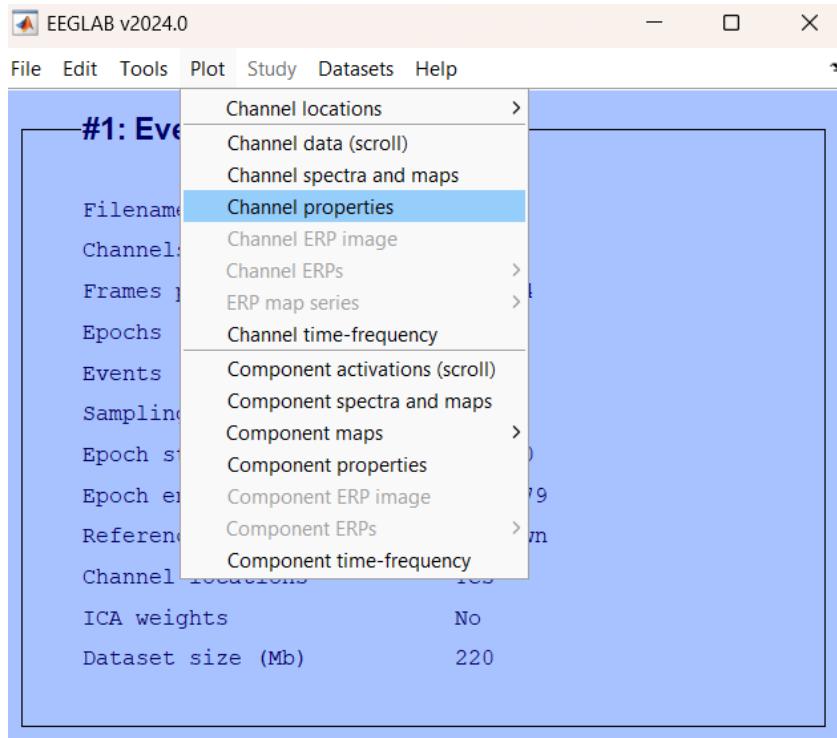
# EEGLAB

## Plot channel locations



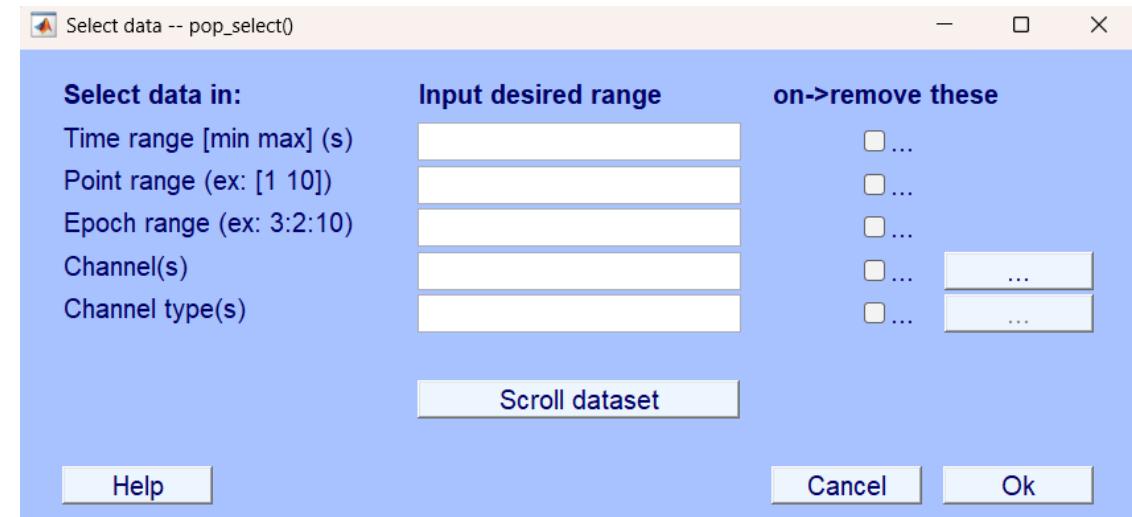
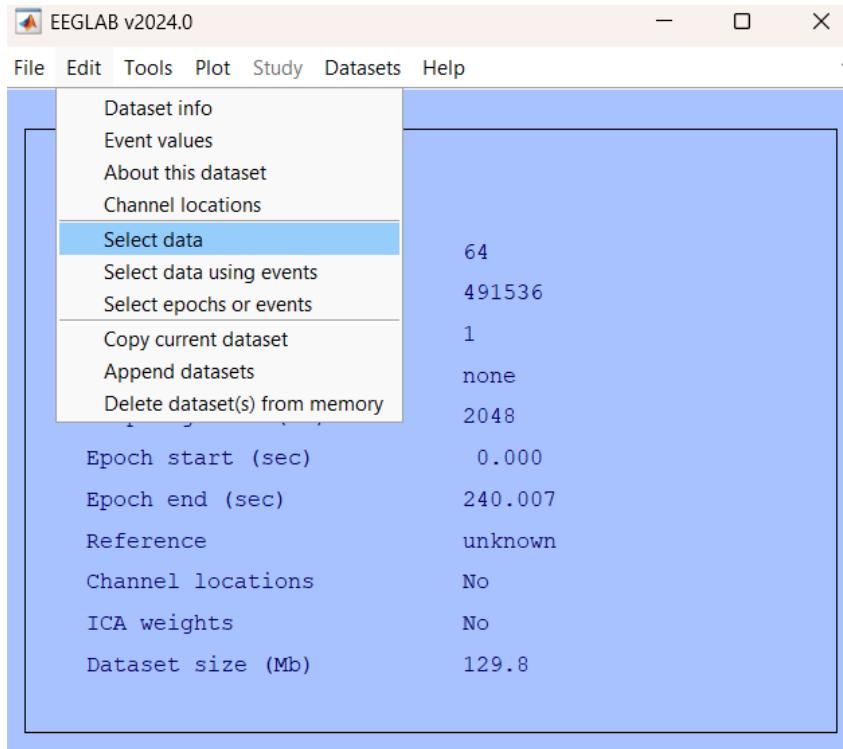
# EEGLAB

## Channel properties



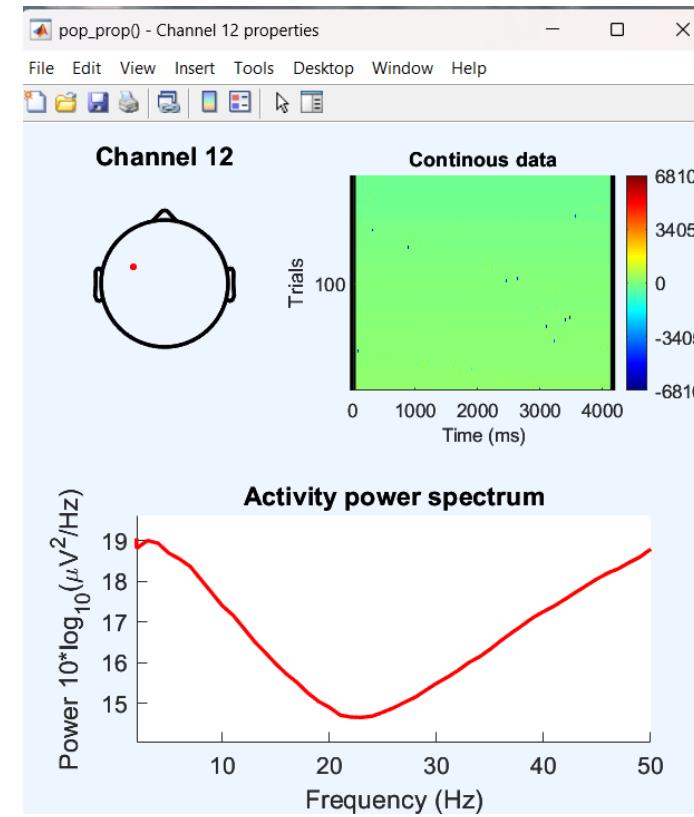
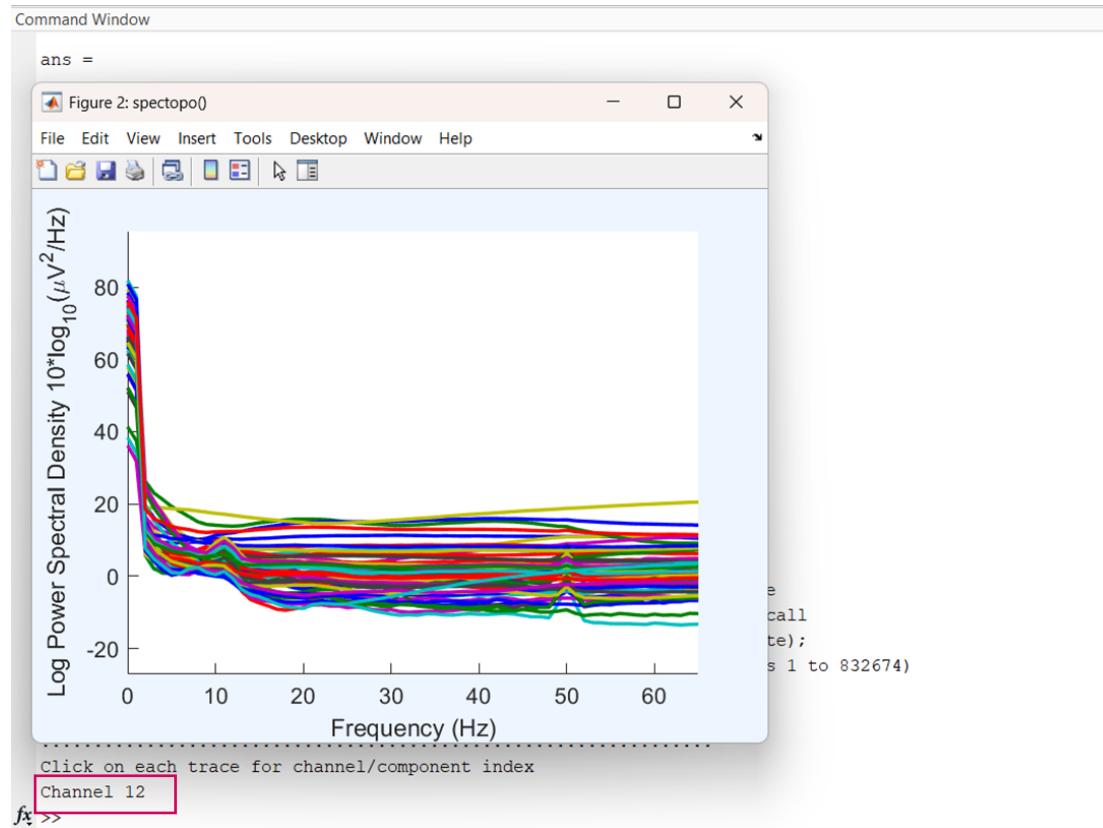
# EEGLAB

## Select Data (keep or remove data)



# EEGLAB

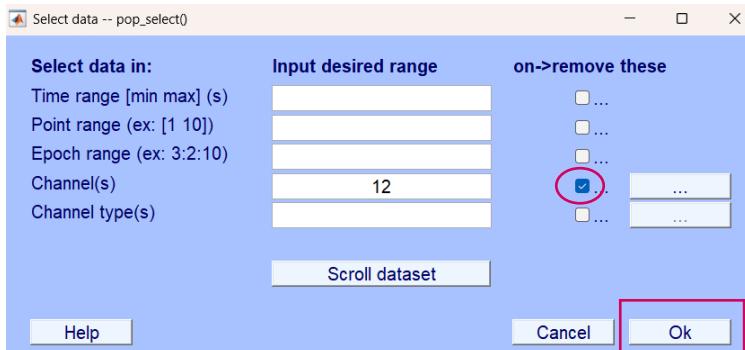
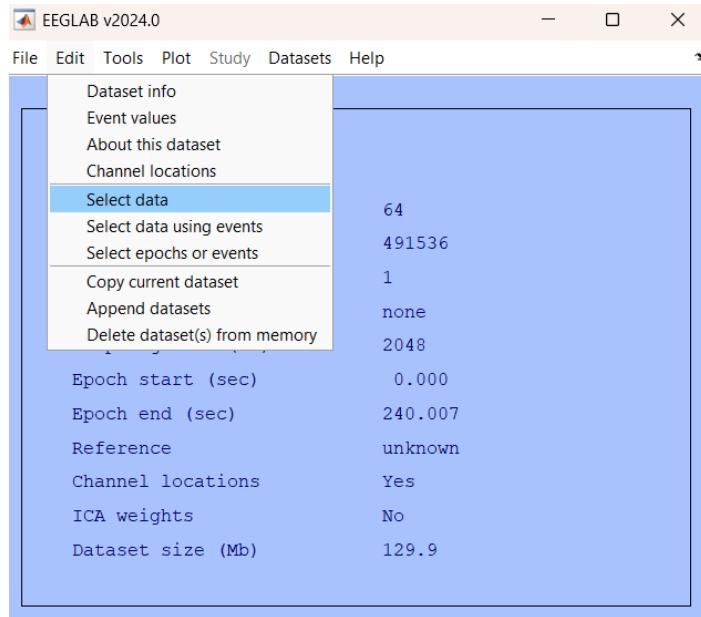
Select data- remove a bad channel



Possible bad channel

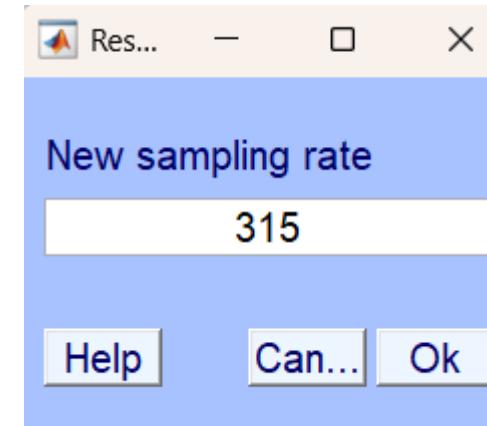
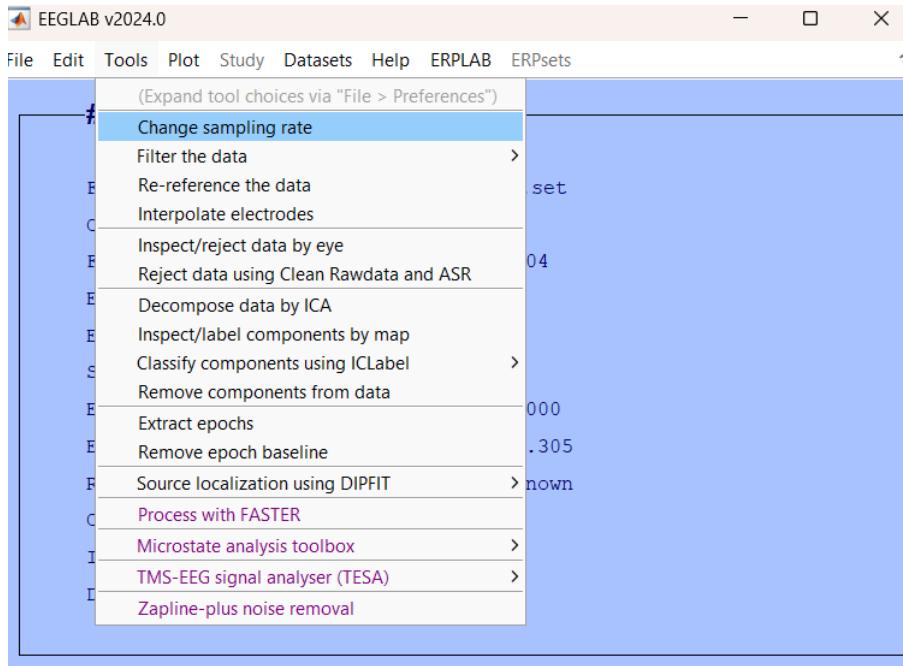
# EEGLAB

## Select data- remove a bad channel



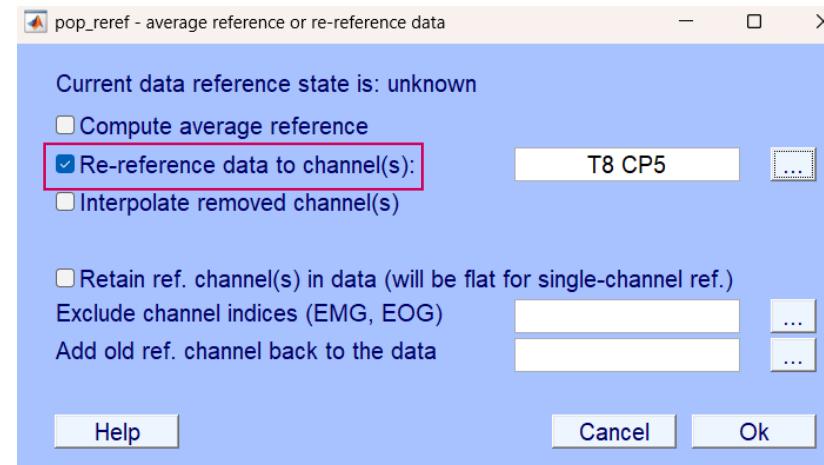
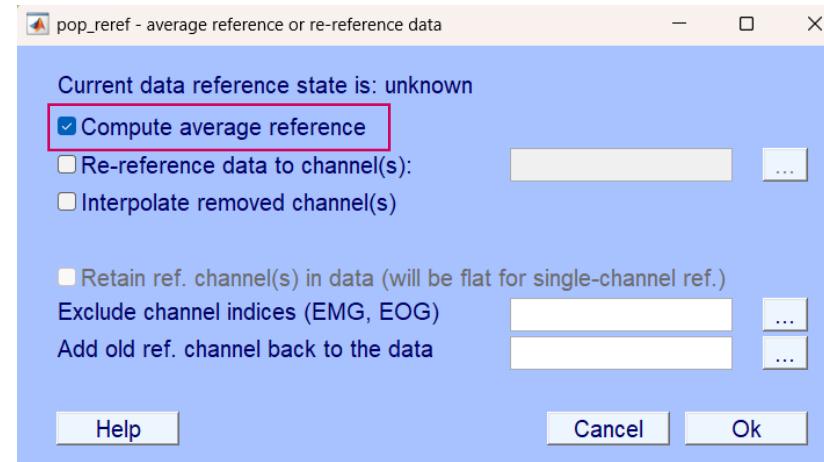
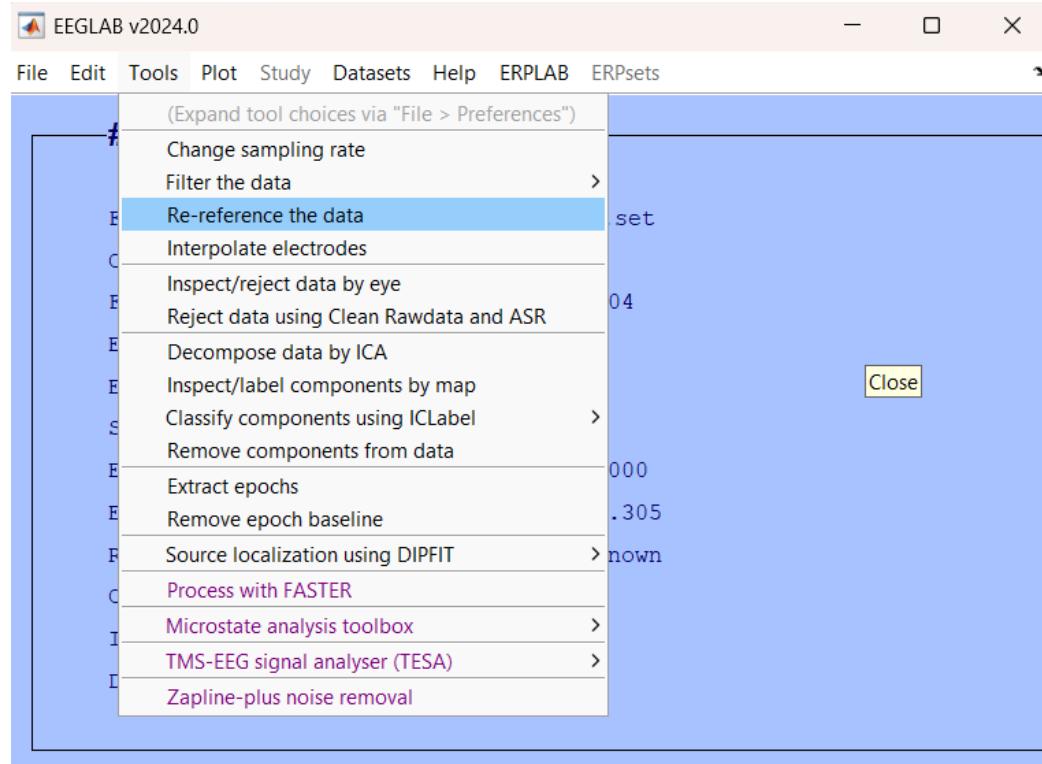
# EEGLAB

## Change sampling rate



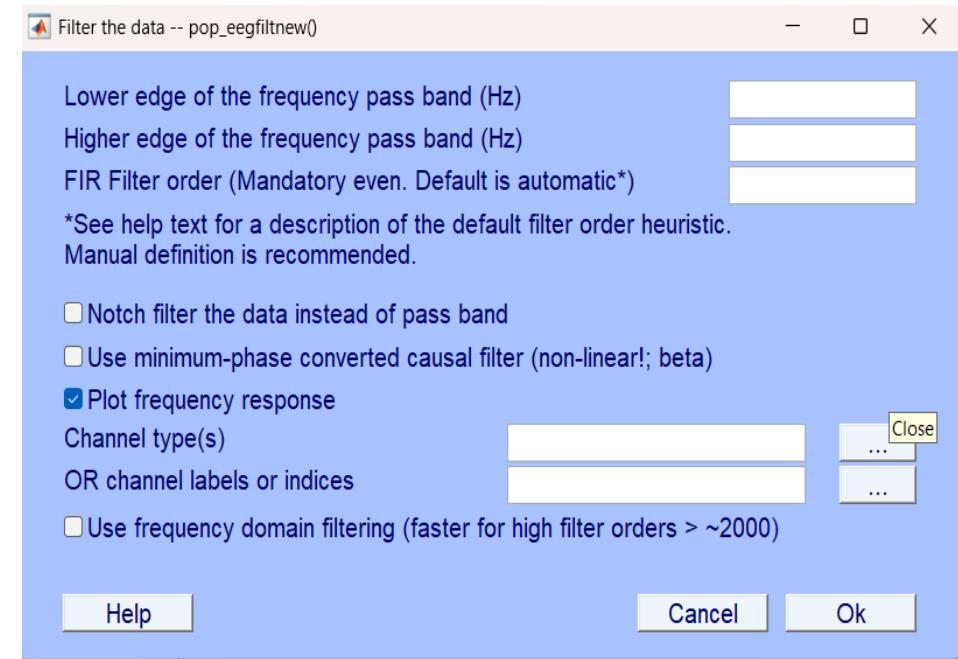
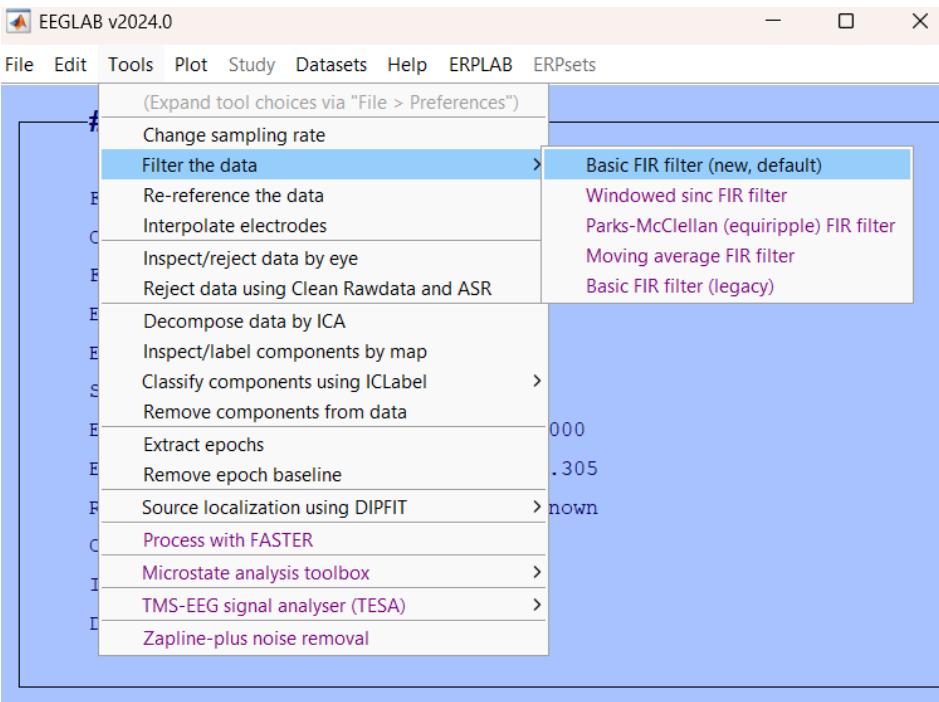
# EEGLAB

## Re-reference the data



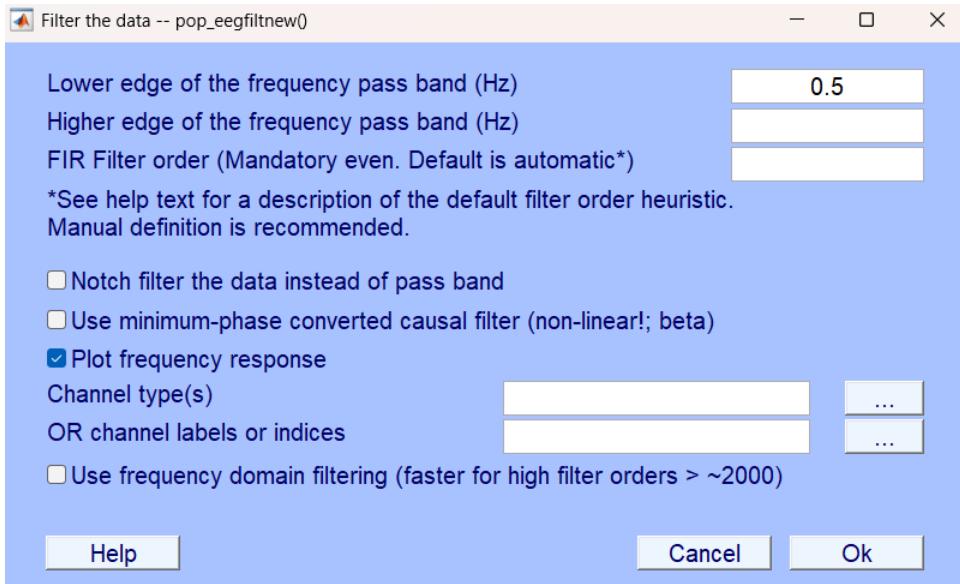
# EEGLAB

Filter the data

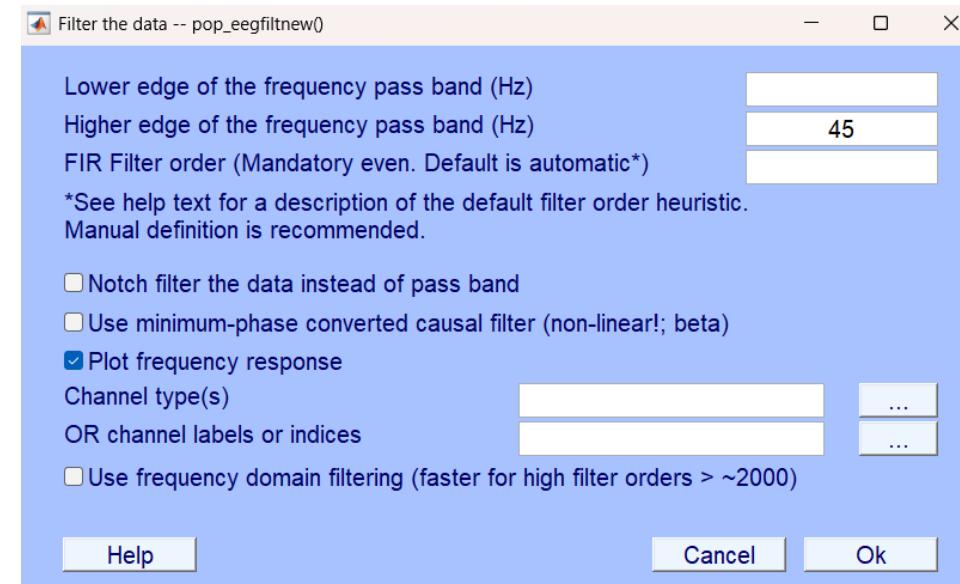


# EEGLAB

Filter the data



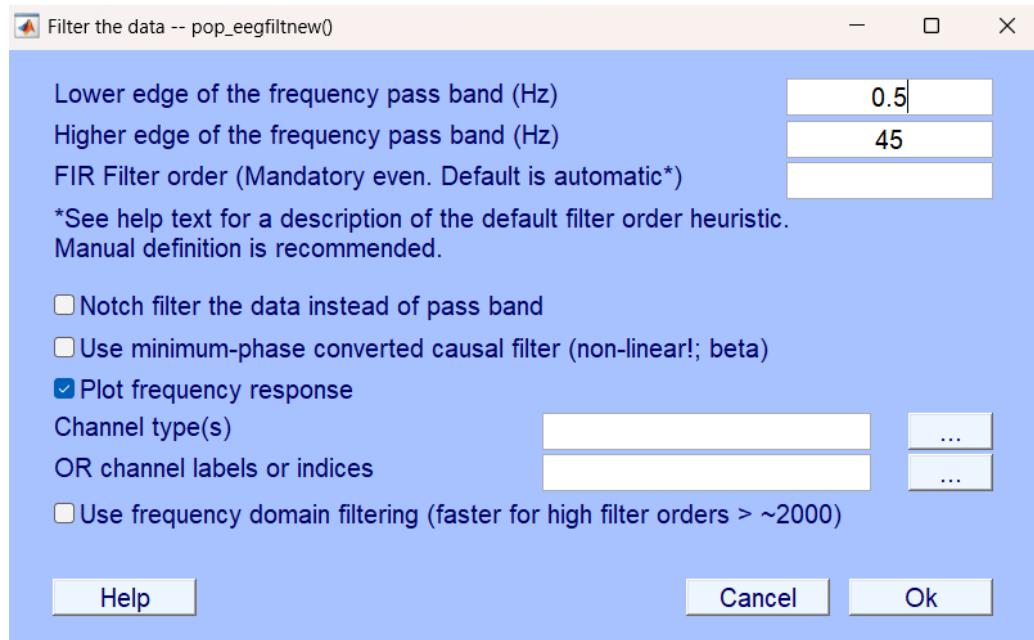
High-pass filter



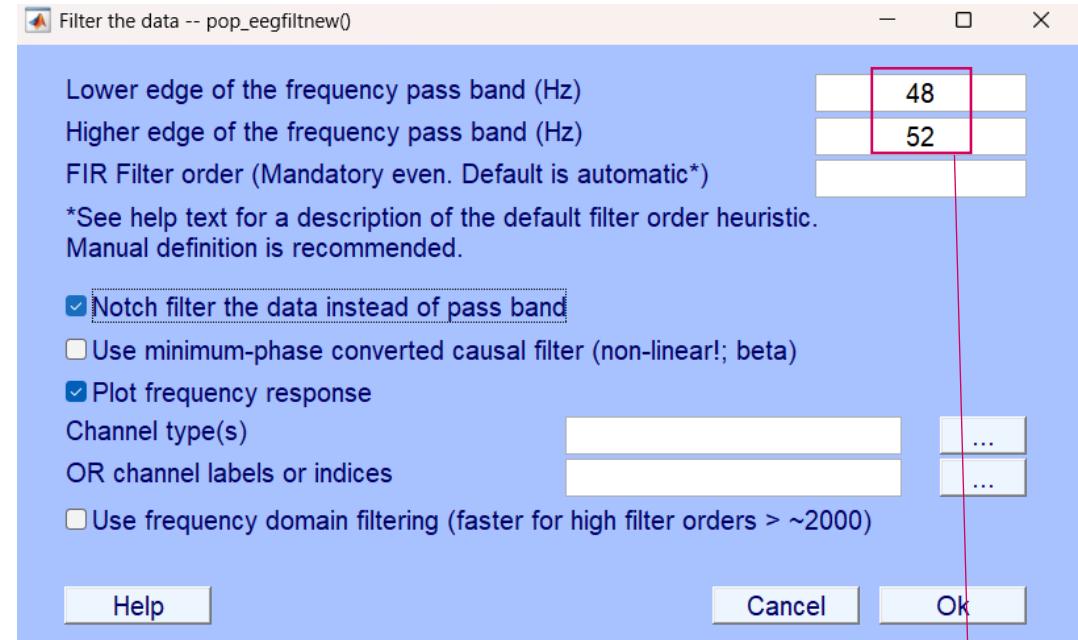
Low-pass filter

# EEGLAB

## Filter the data



band-pass filter

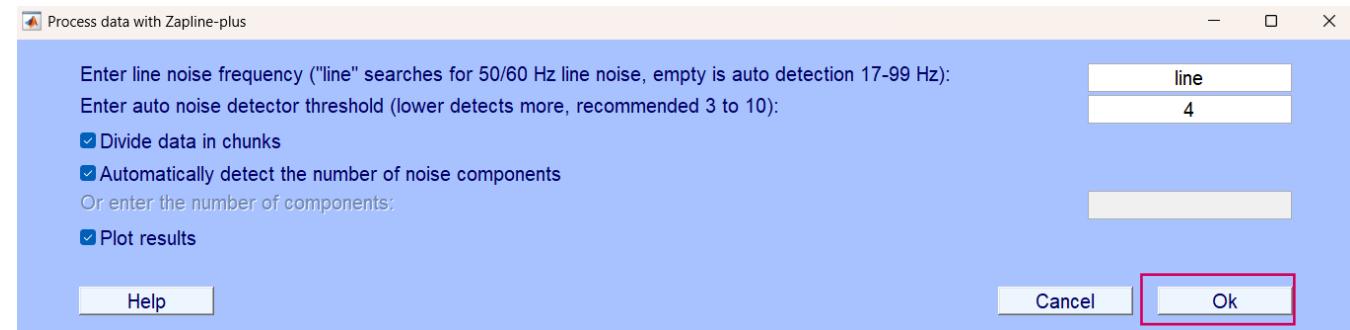
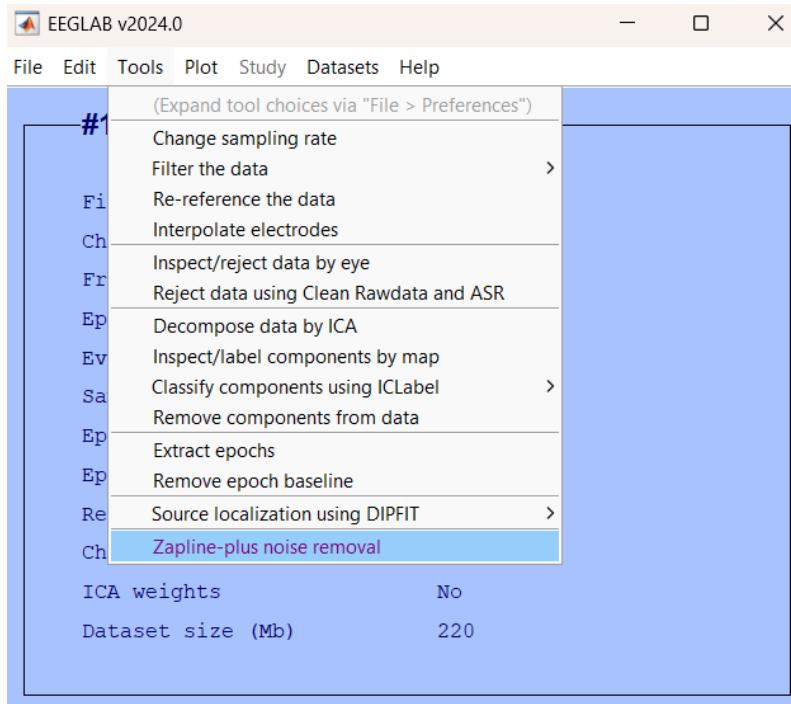


band-stop filter

Line noise

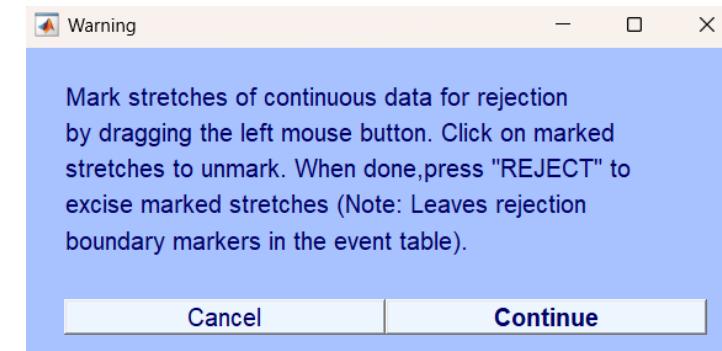
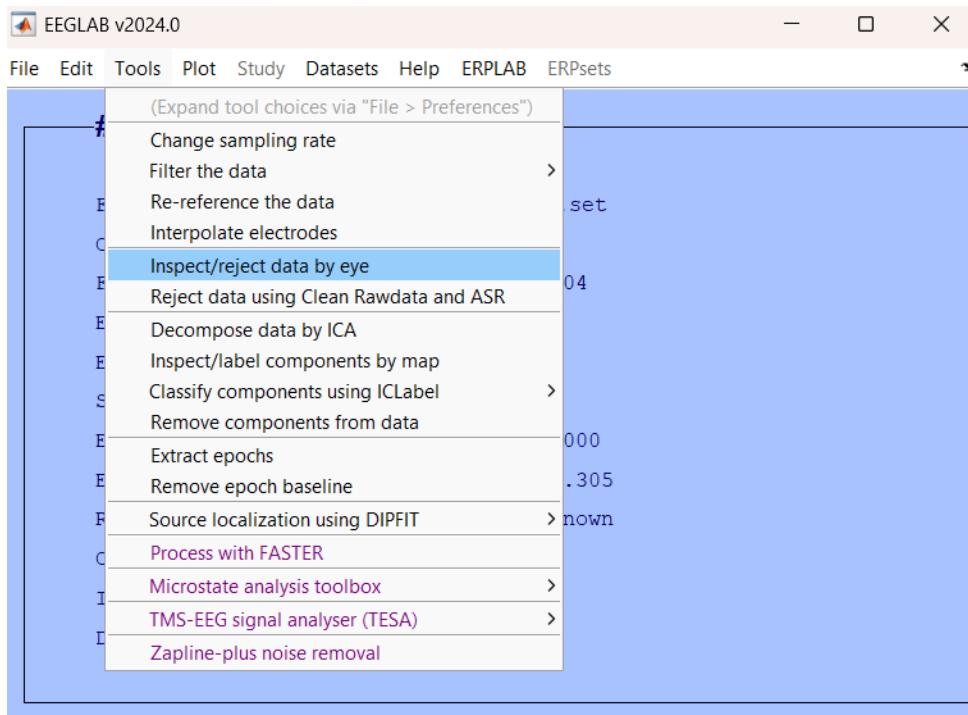
# EEGLAB

## Zipline plugin



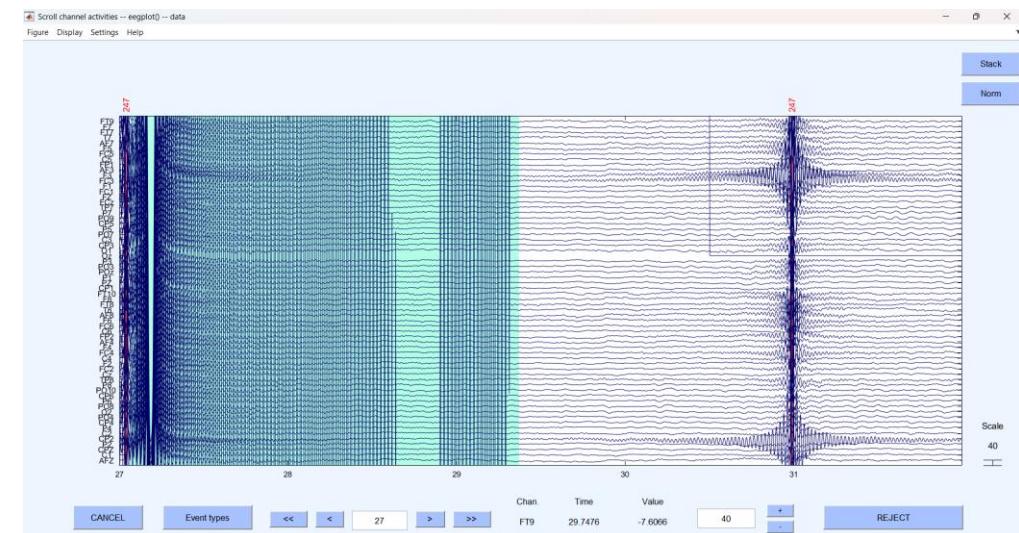
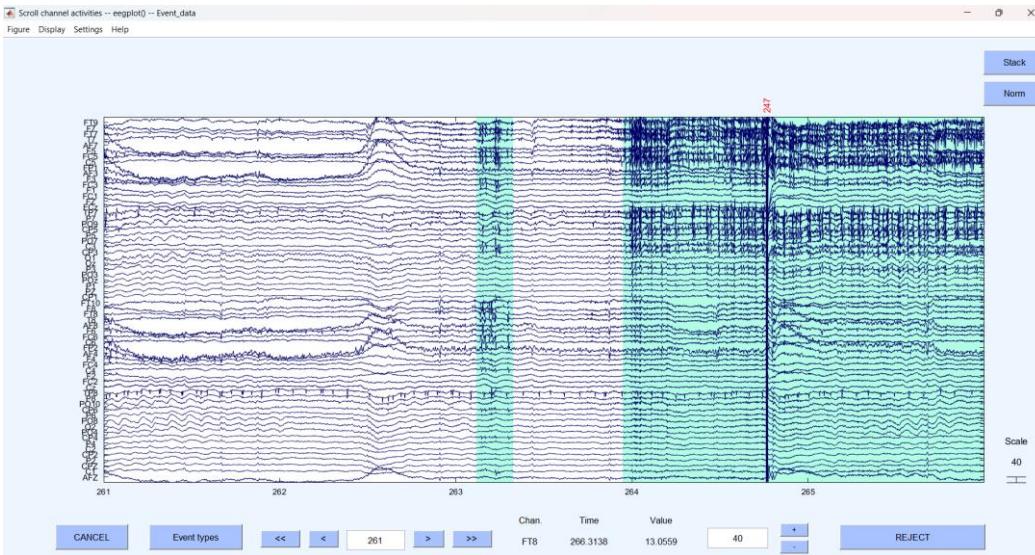
# EEGLAB

## Inspect/reject data by eye (Before ICA)



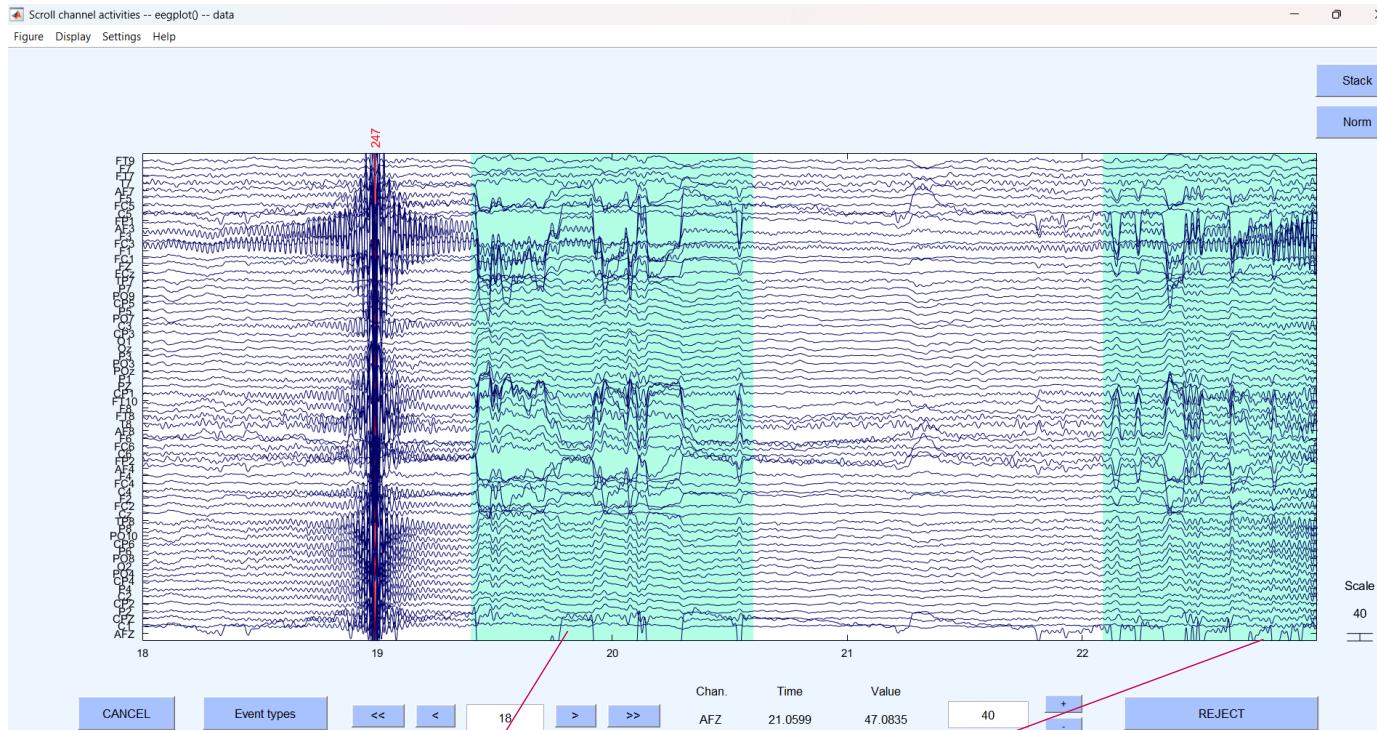
# EEGLAB

Inspect/reject data by eye (Before ICA)



# EEGLAB

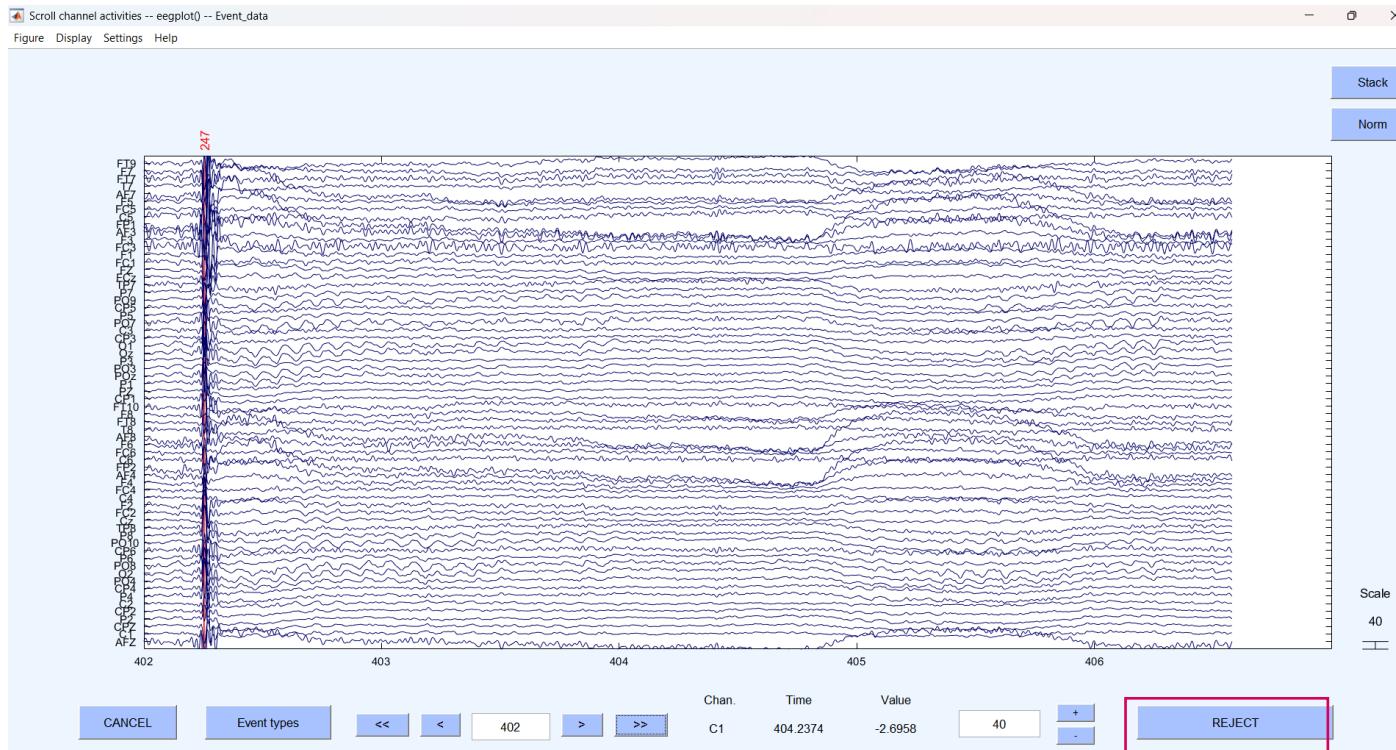
Inspect/reject data by eye (Before ICA)



Select artifacts with left click

# EEGLAB

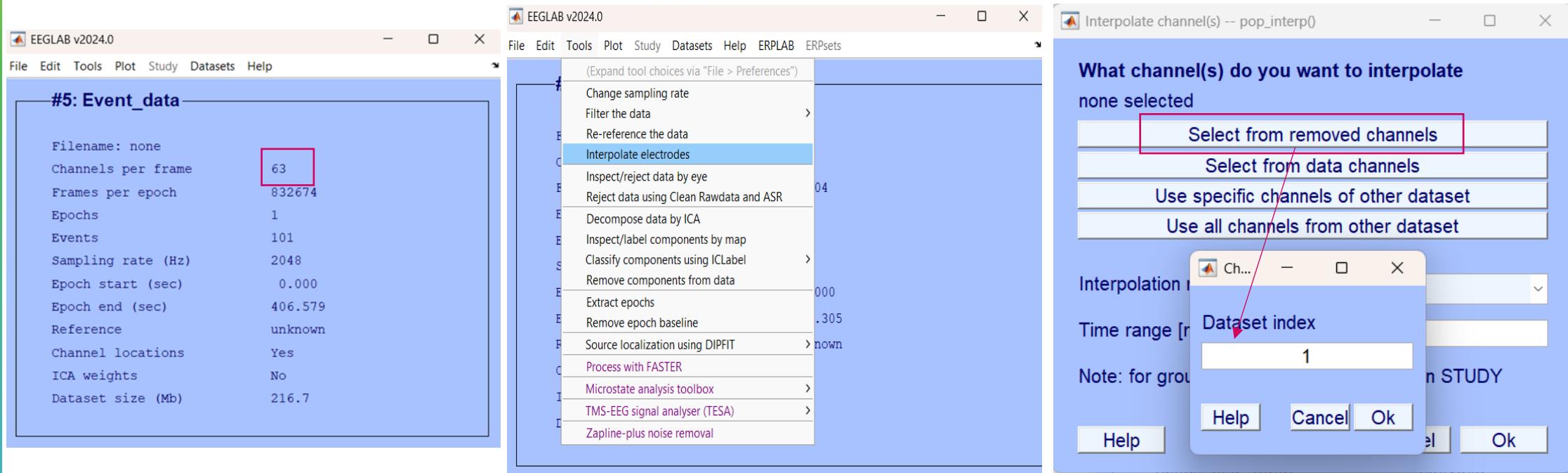
## Inspect/reject data by eye (Before ICA)



Remove artifacts with the reject button

# EEGLAB

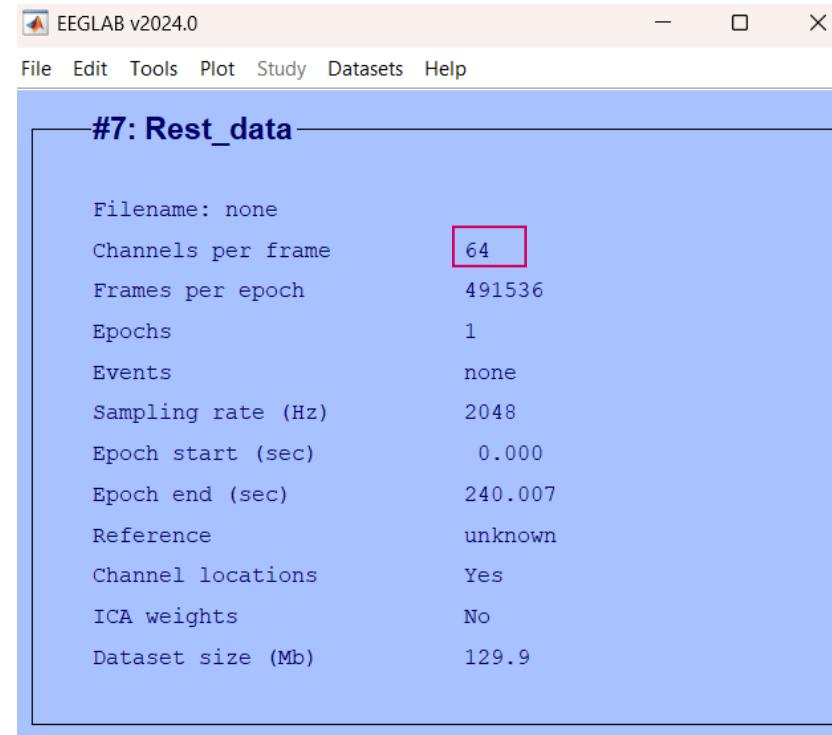
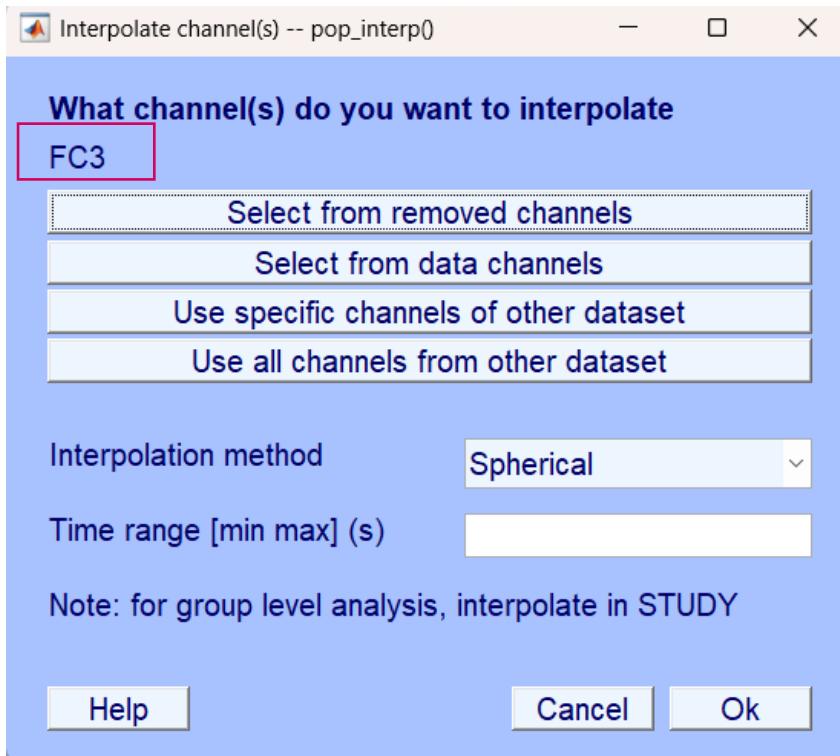
## Interpolate electrodes (After ICA & components rejection)



After removing channel(s)

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Interpolate electrodes (After ICA & components rejection)



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Save the dataset

