Evaluating ICA components

Plot 1

Component ERP

Plot 2

Component spectral power

Plot 3

Component ERP images

Plot 4

Component ERSP

Plot 5

Component cross coherence

Exercise...

Evaluating ICA components

Plot 1

Component ERP

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Component spectral power

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Component ERP images

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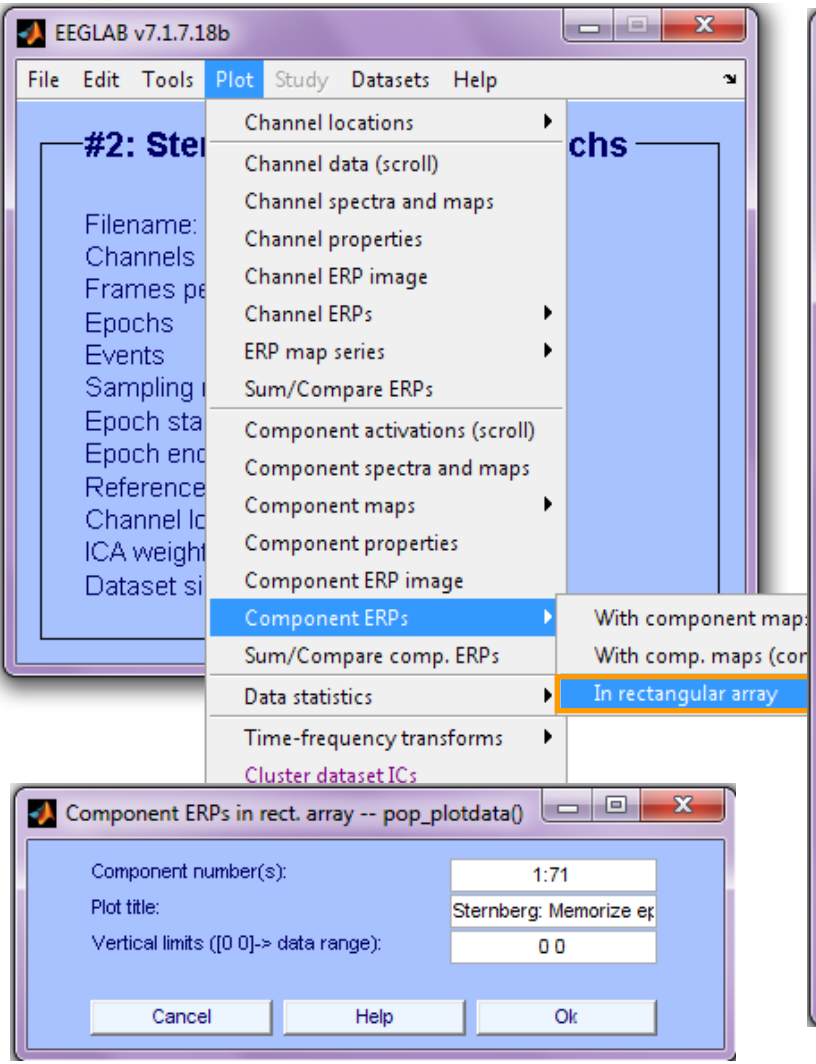
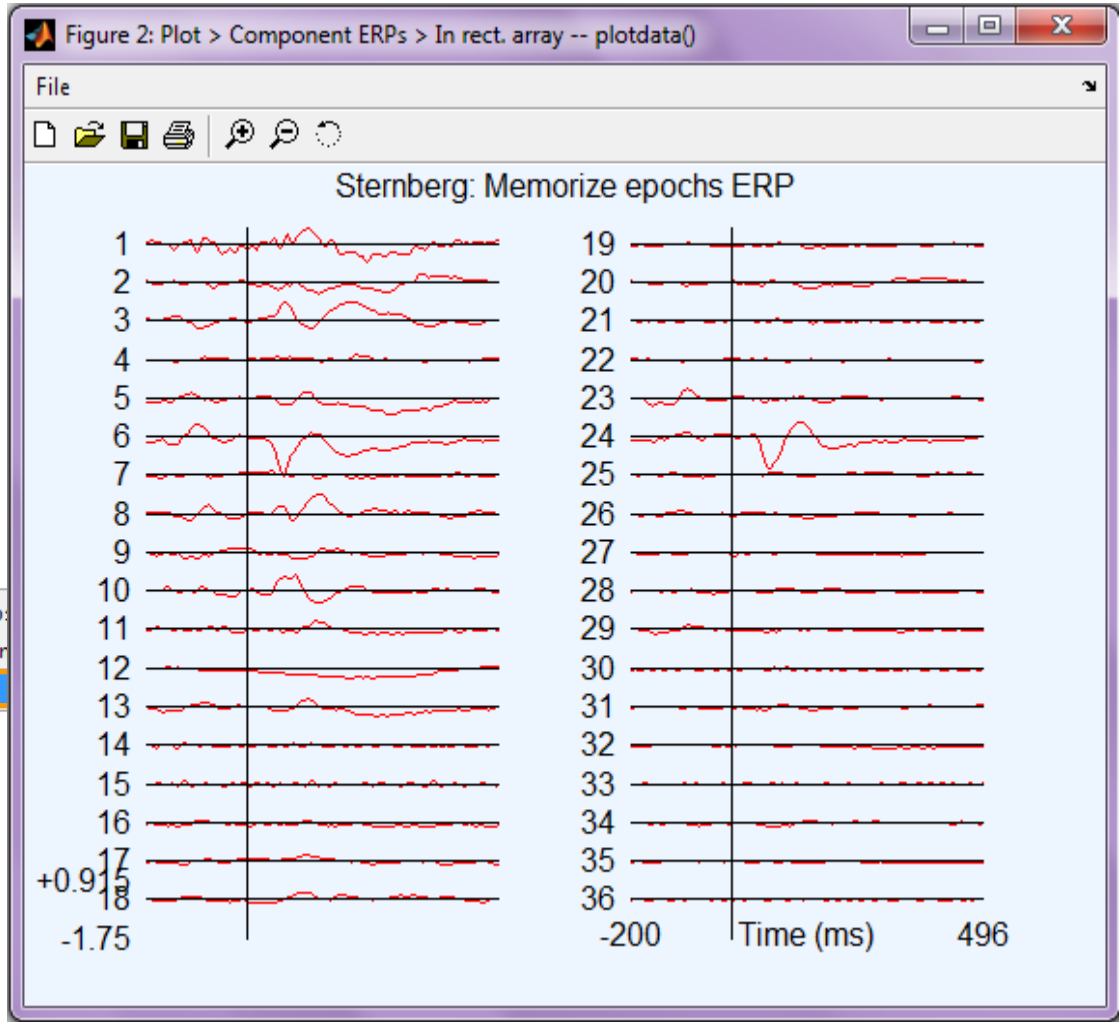
Plot 5

Component cross coherence

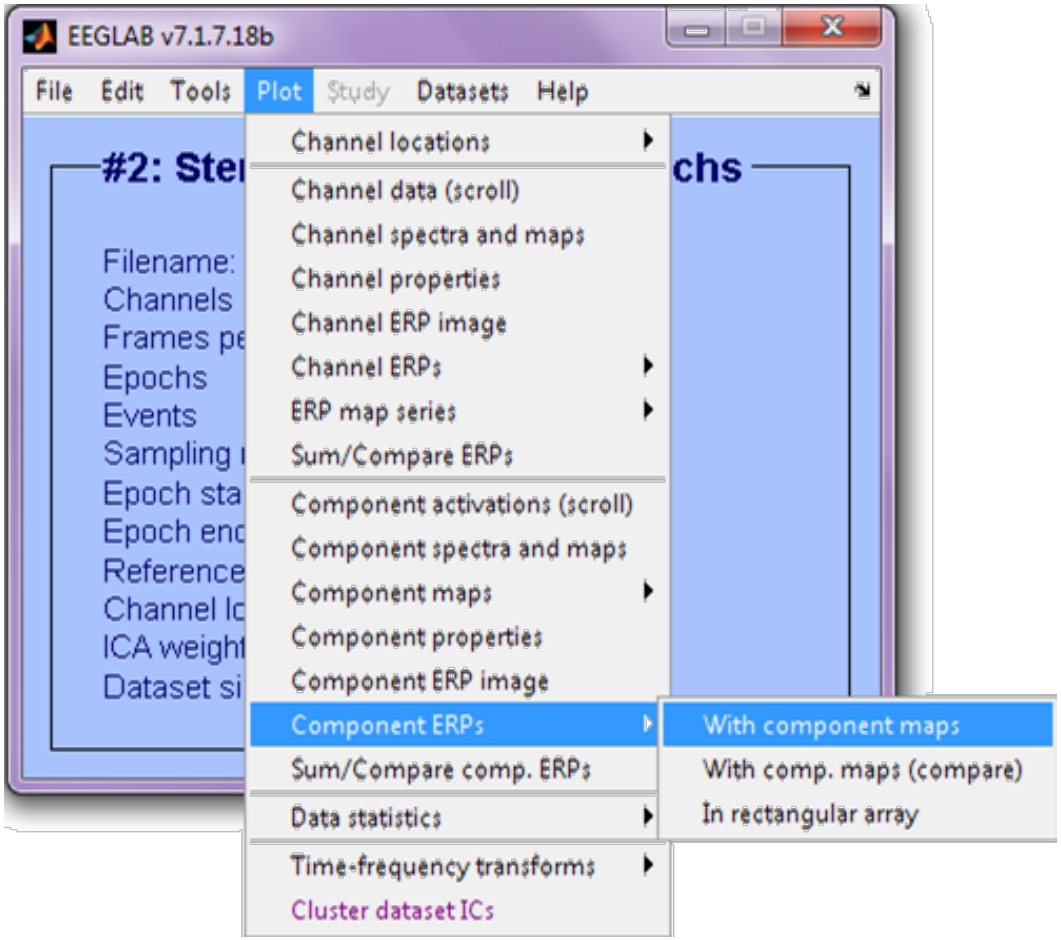
Exercise...

Component ERPs

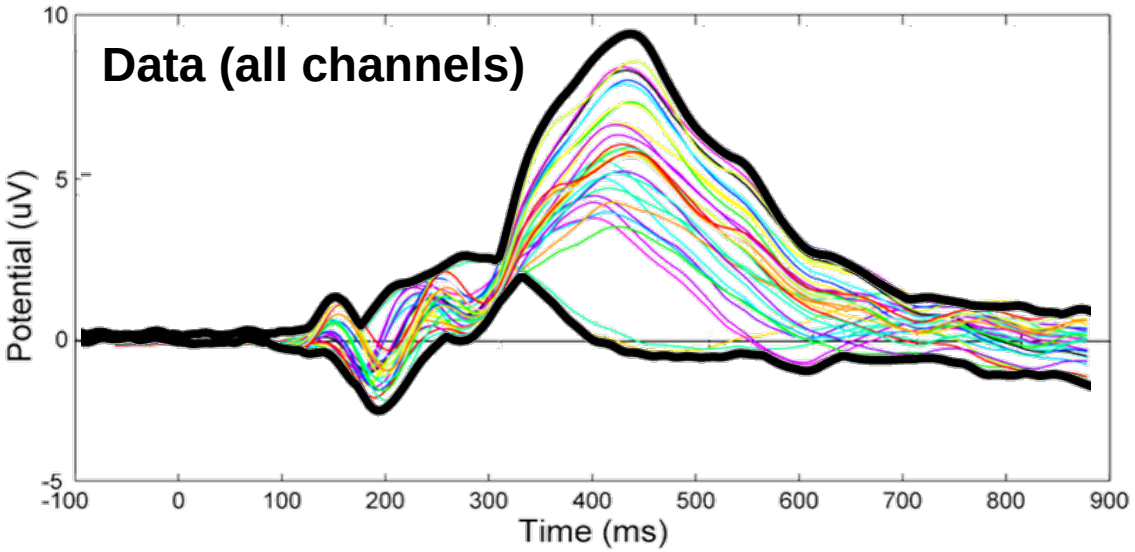


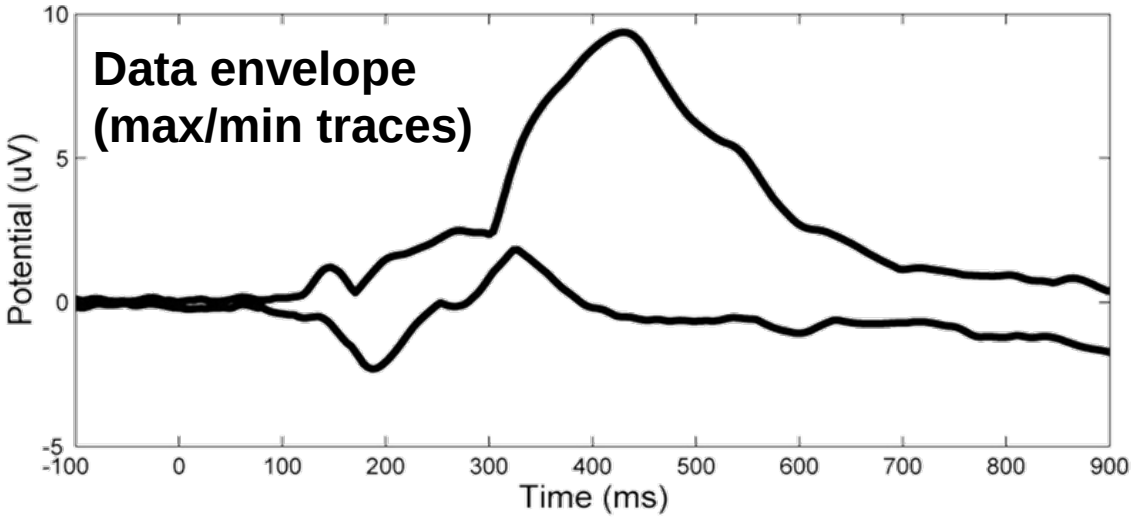


Component ERP envelope

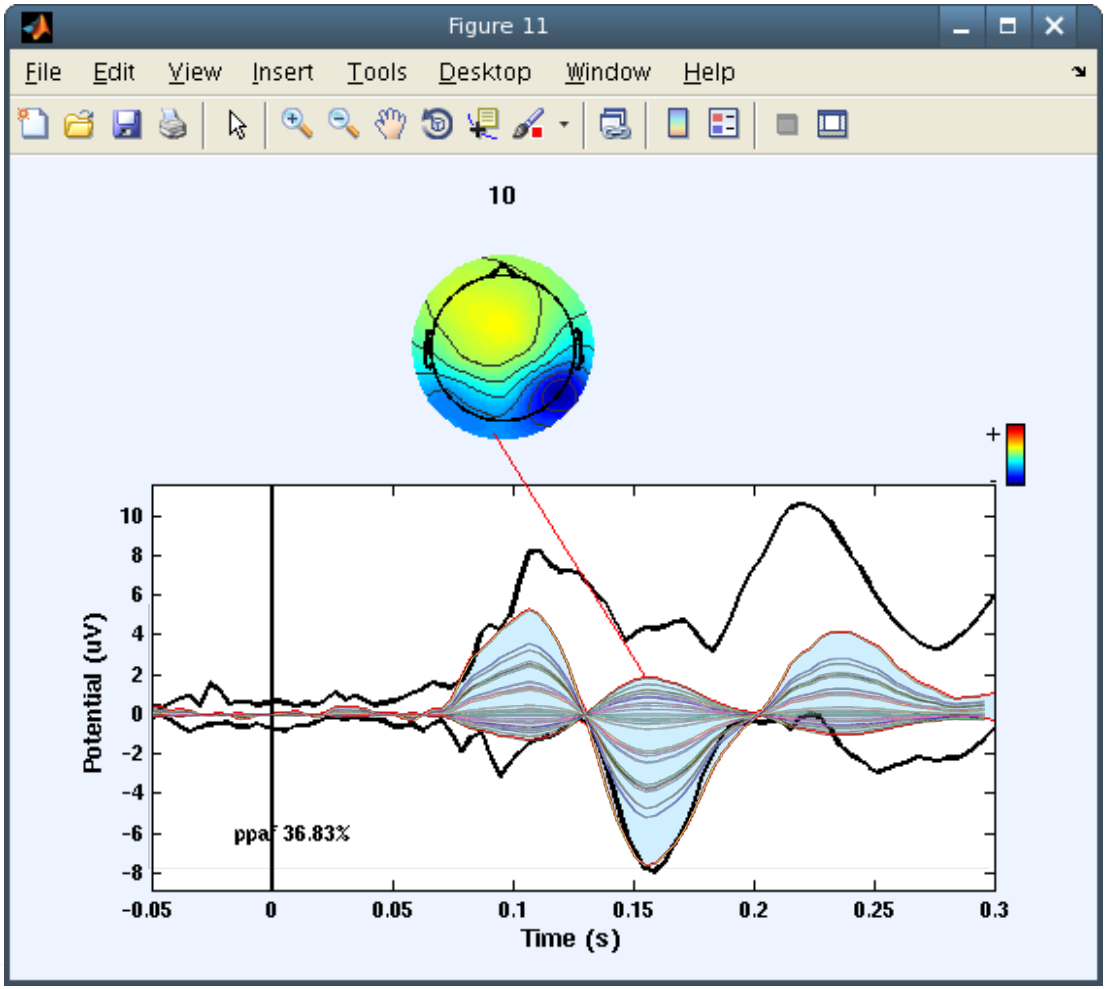


Definition: The data envelope

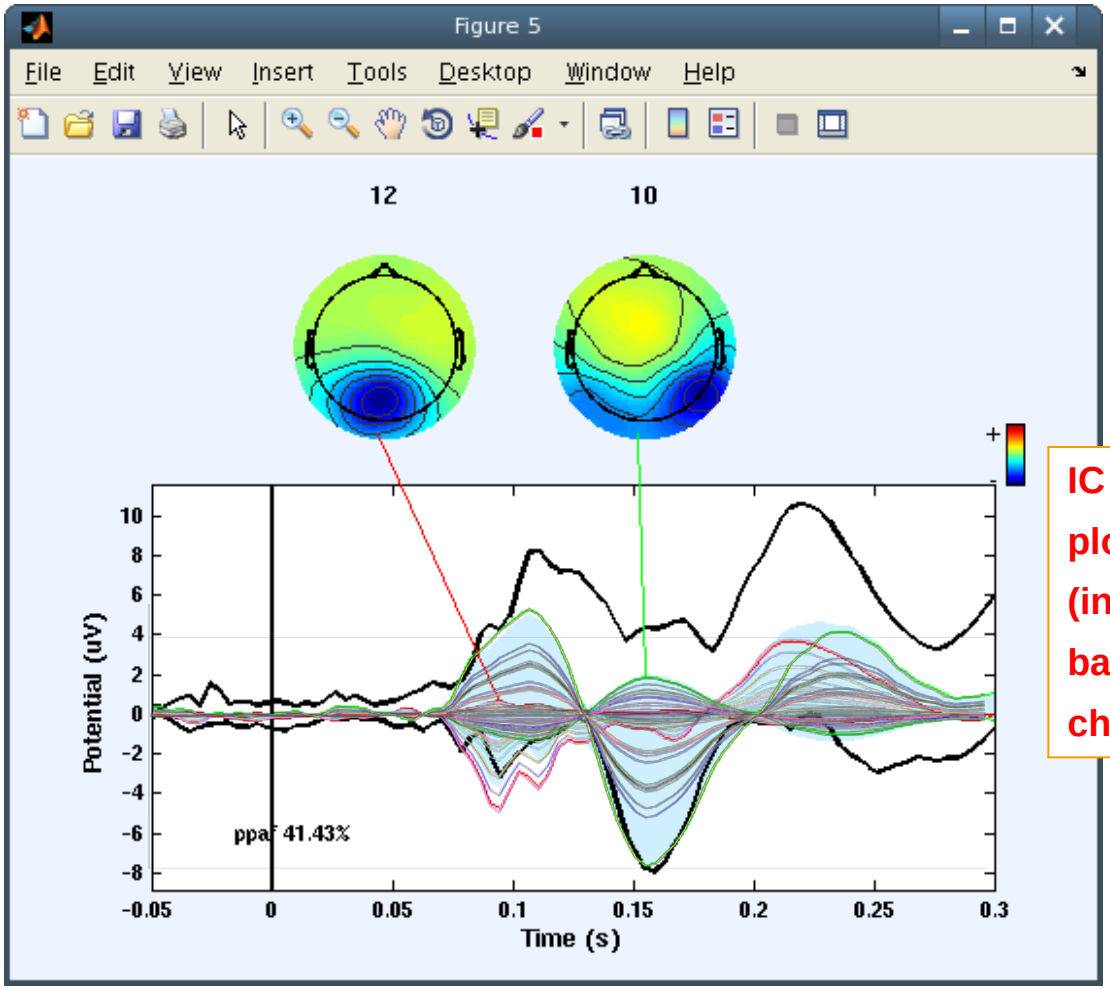




IC back-projection envelope

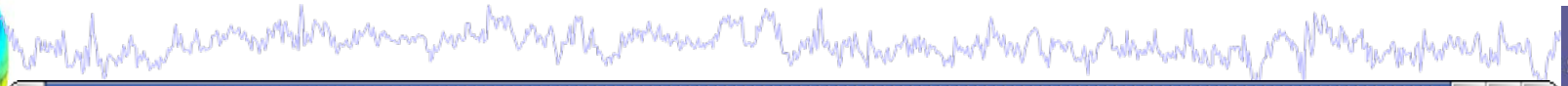


IC back-projection envelope



IC envelopes plotted for simplicity (instead of all back-projected channels)

IC contributions to ERP envelope



Plot component and ERP envelopes -- pop_envtopo()

Enter time range (in ms) to plot: -100 1000
Enter time range (in ms) to rank component contributions: 0 600
Number of largest contributing components to plot (1-20): 6
Else plot these component numbers only (<21) (Ex: 2:4,7):
Component numbers to remove from data before plotting:
Plot title: ERP components of faces_4 epochs
Optional topoplot() and spectopo() arguments: 'electrodes','off'

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File Edit Tools Plot Study Datasets Help

#2: Ste chs

Filename:
Channels
Frames pe
Epochs
Events
Sampling
Epoch sta
Epoch enc
Reference
Channel lc
ICA weight
Dataset si

Channel locations
Channel data (scroll)
Channel spectra and maps
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

With component maps
With comp. maps (comp
In rectangular array

Figure 3

File Edit View Insert Tools Desktop Window Help

Largest ERP components of faces_4 epochs

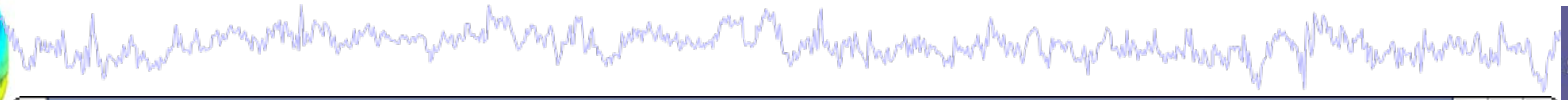
3 2 5 6 1 4

Potential (uV)
15 10 5 0 -5 -10

0 0.2 0.4 0.6 0.8 1

Time (s)

Component contribution to the dataset ERP



Swartz Center for Computational Neuroscience

Plot component and ERP envelopes -- pop_envtopo()

Enter time range (in ms) to plot:	-100 1000
Enter time range (in ms) to rank component contributions:	0 600
Number of largest contributing components to plot (1-20):	6
Else plot these component numbers only (<21) (Ex: 2:4,7):	
Component numbers to remove from data before plotting:	2, 4, 7, 9, 12, 17,18,25
Plot title:	ERP components of faces_4 epochs
Optional topoplot() and spectopo() arguments:	'electrodes','off'

Cancel

Artifact Components

EEGLAB v6.0b

File Edit Tools Plot Study Datasets Help

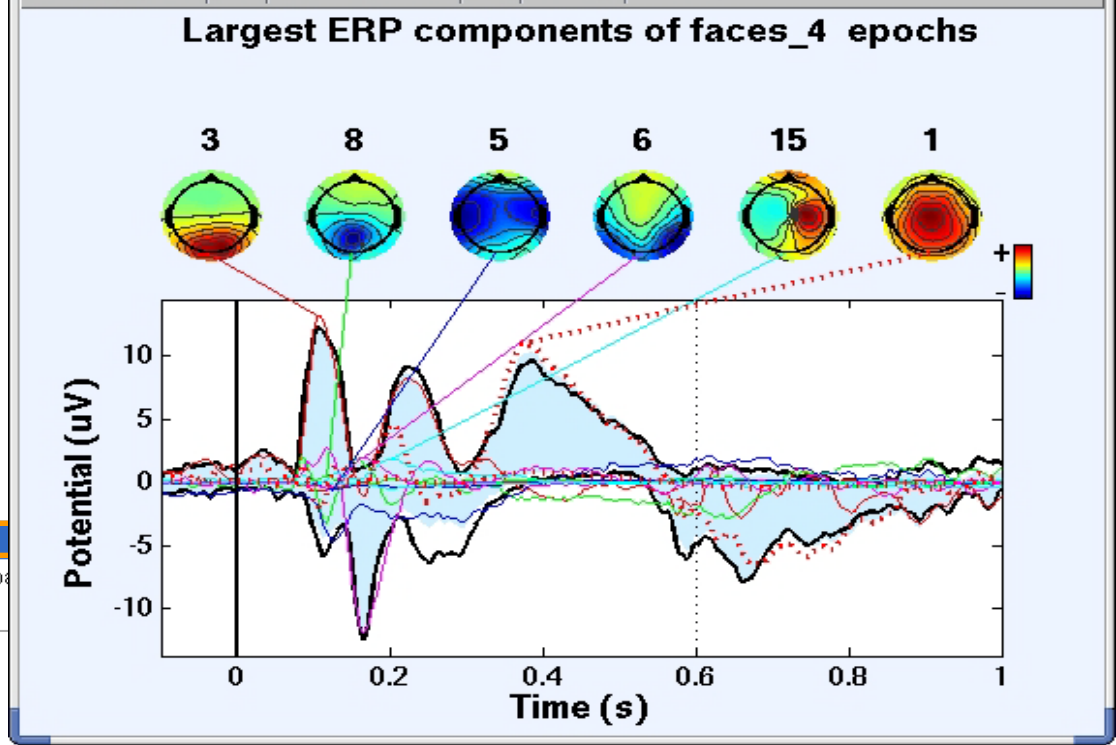
#1: faces

Filename: ...
Channels pe
Frames per e
Epochs
Events
Sampling rat
Epoch start (
Epoch end (s
Average refe
Channel loca
ICA weights
Dataset size

- Channel locations
- Channel data (scroll)
- Channel spectra and maps
- 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 → With component maps / With comp. maps (compa / In rectangular array
- Sum/Compare comp. ERPs
- Data statistics
- Time-frequency transforms
- Average time-frequency
- Cluster dataset ICs

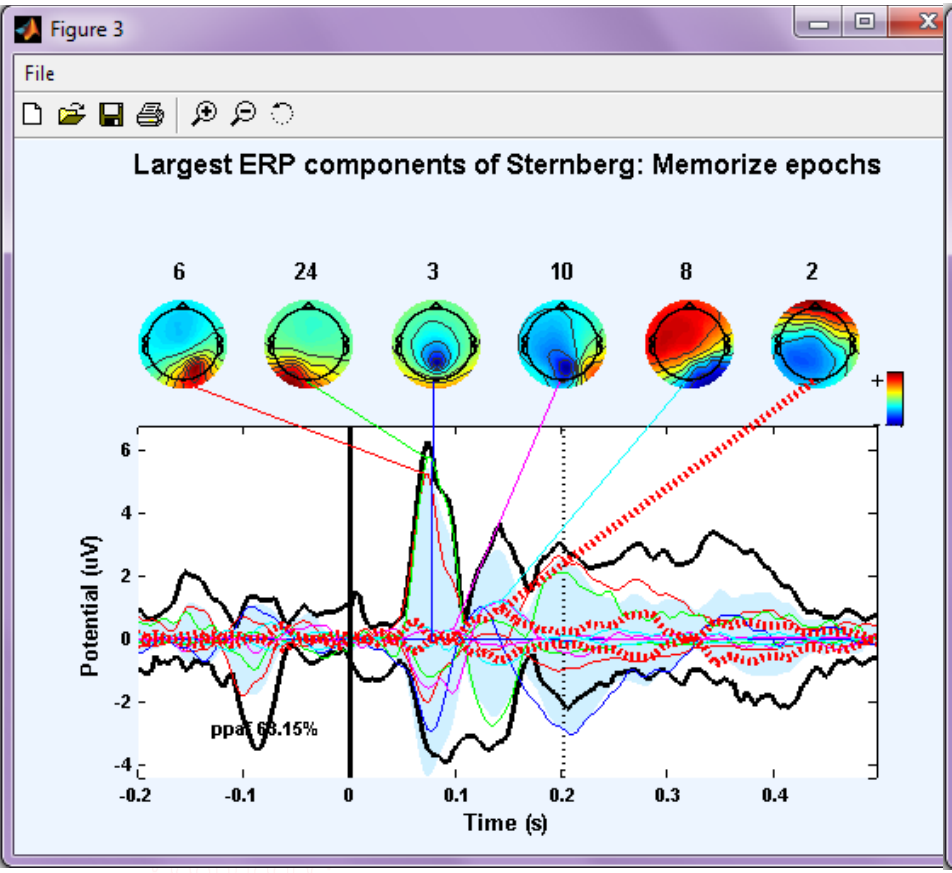
Figure 5

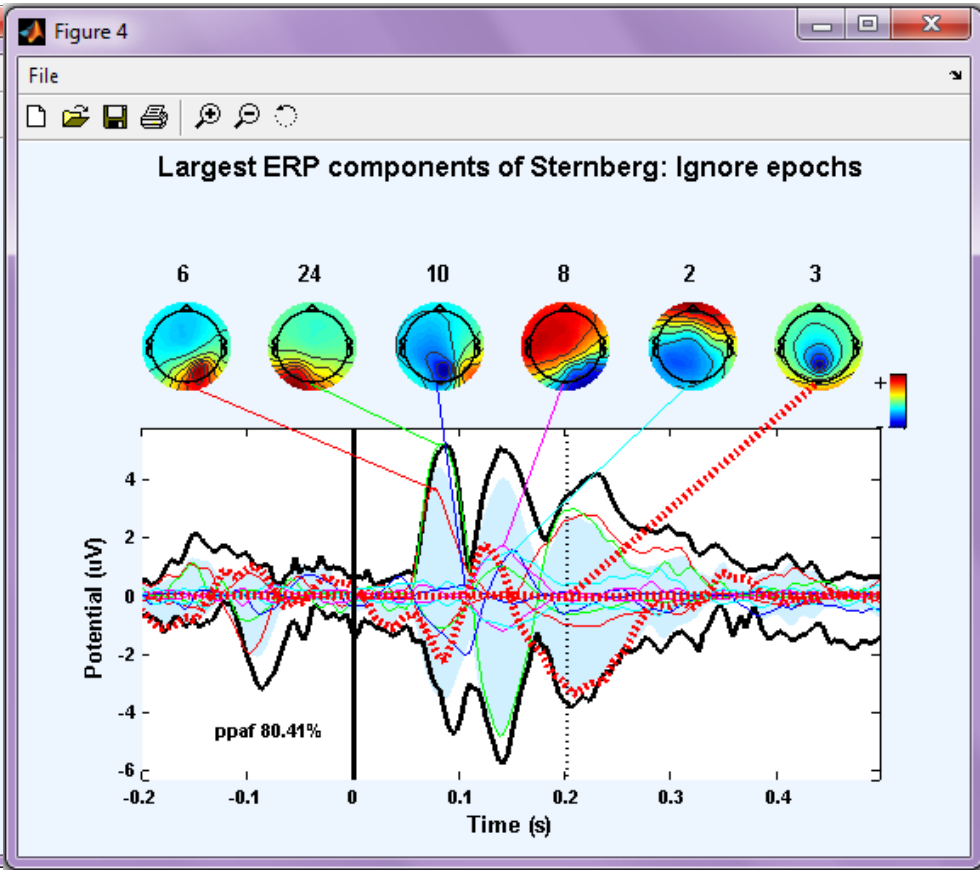
File Edit View Insert Tools Desktop Window Help



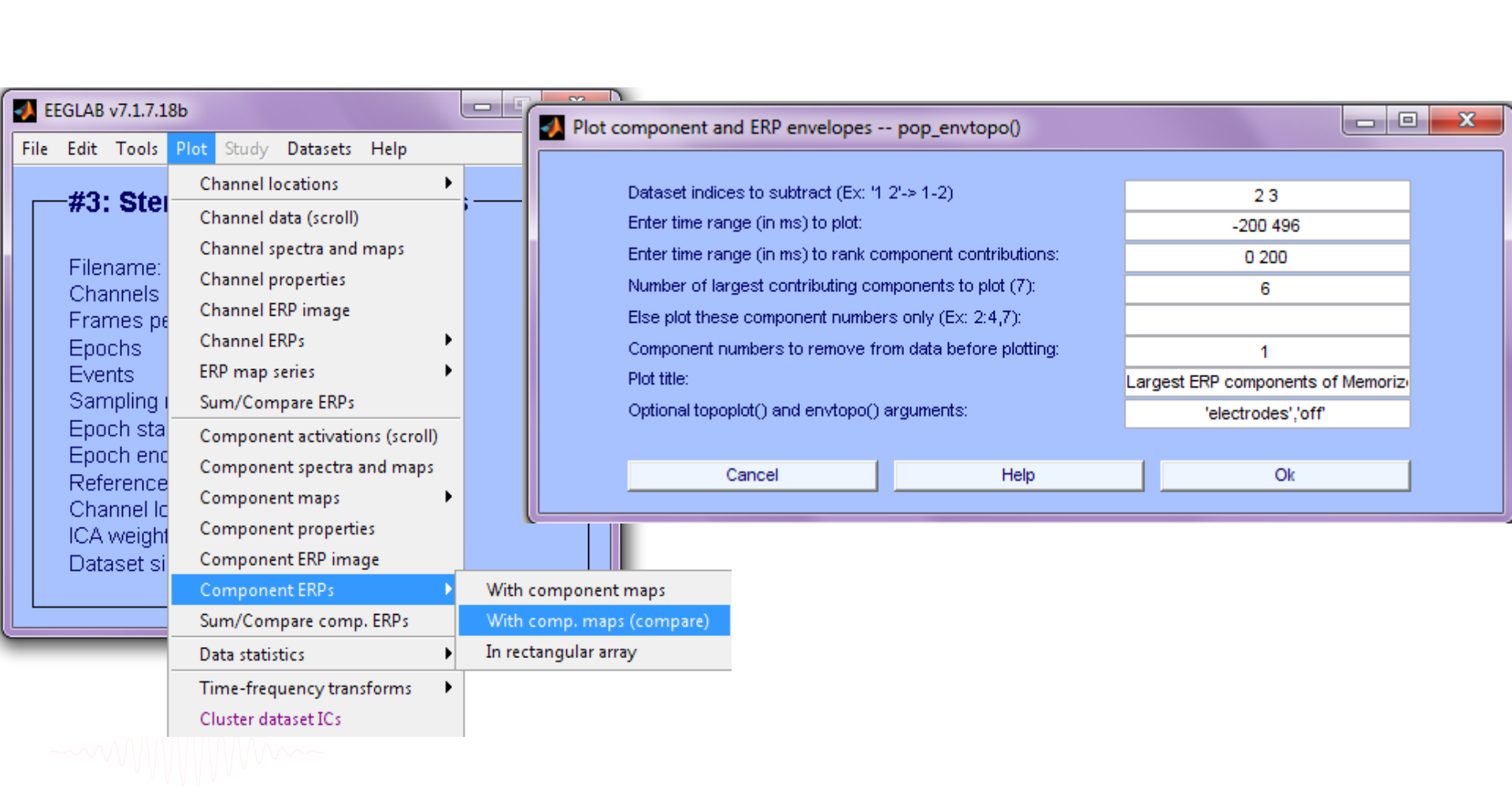
IC ERP difference

What is the IC ERP difference between these 2 conditions?

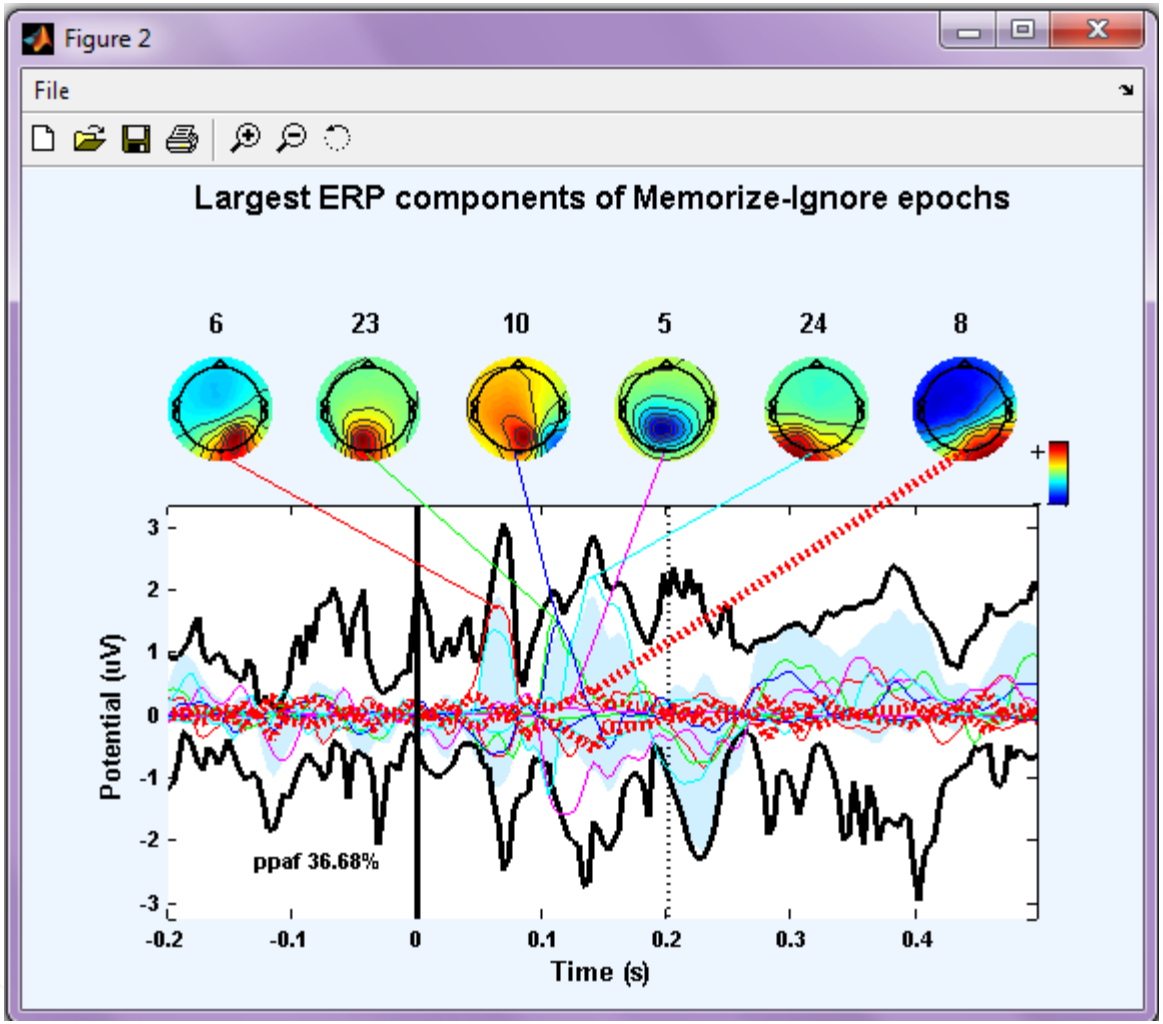




IC ERP difference



IC ERP difference



Evaluating ICA components

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Component ERP images

Plot 4

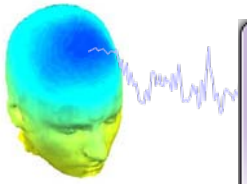
Component ERSP

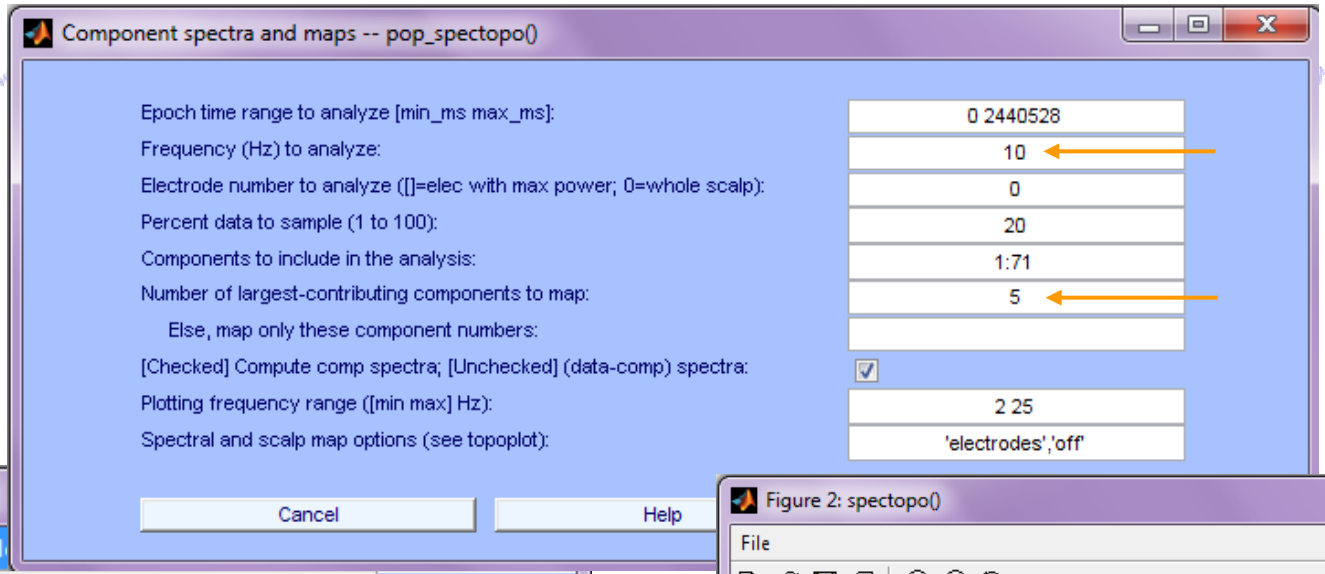
Plot 5

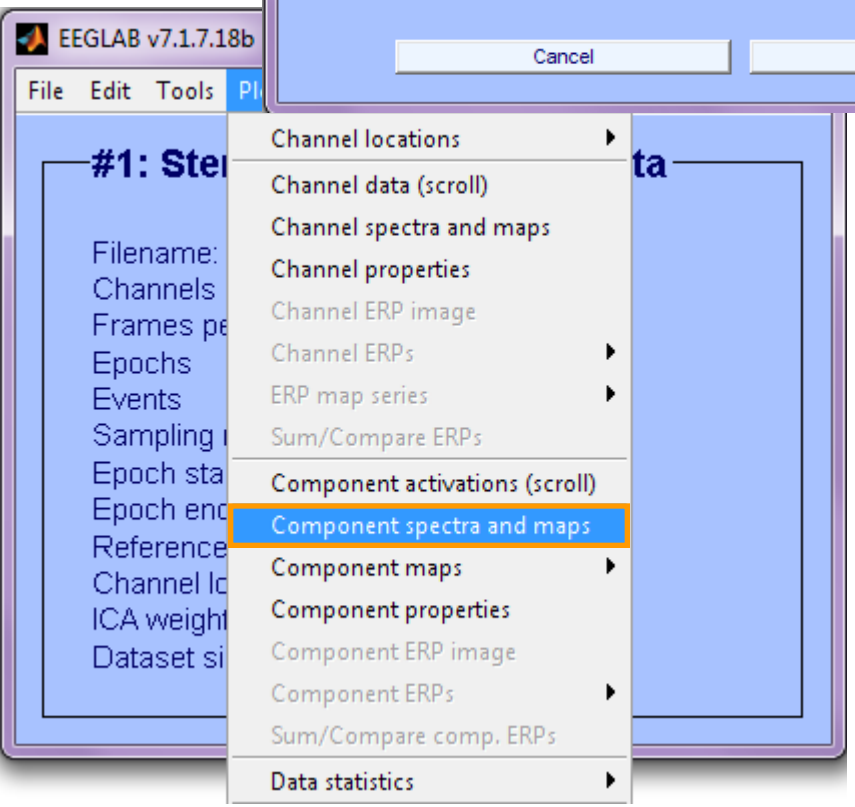
Component cross coherence

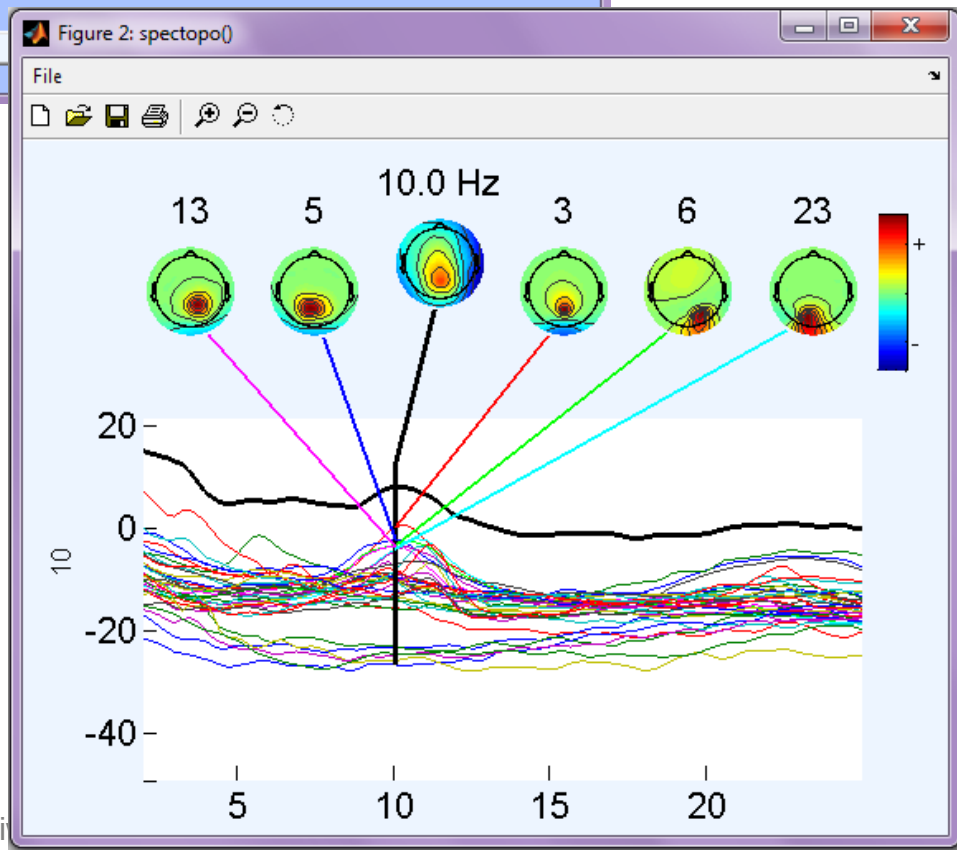
Exercise...

Plot component power

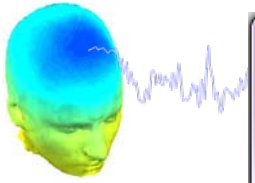








Plot component power



Component spectra and maps -- pop_spectopo()

Epoch time range to analyze [min_ms max_ms]:	0 2440528
Frequency (Hz) to analyze:	6
Electrode number to analyze ([]=elec with max power; 0=whole scalp):	0
Percent data to sample (1 to 100):	20
Components to include in the analysis:	1:71
Number of largest-contributing components to map:	5
Else, map only these component numbers:	
[Checked] Compute comp spectra; [Unchecked] (data-comp) spectra:	☑
Plotting frequency range ([min max] Hz):	2 25
Spectral and scalp map options (see topoplot):	

Cancel

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File Edit Tools Plo

#1: Ste ta

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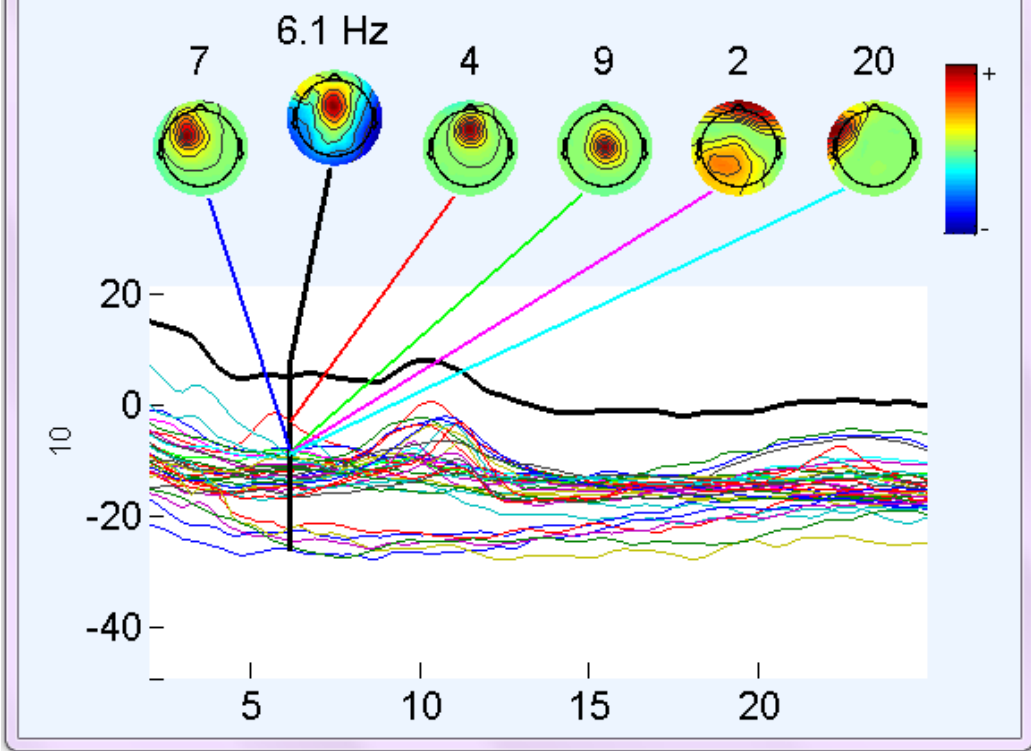
- Channel locations
- Channel data (scroll)
- Channel spectra and maps
- Channel properties
- Channel ERP image
- Channel ERPs
- ERP map series
- Sum/Compare ERPs
- Component activations (scroll)
- Component spectra and maps
- Component maps
- Component properties
- Component ERP image
- Component ERPs
- Sum/Compare comp. ERPs
- Data statistics

Figure 2: spectopo()

File



Evaluating ICA components

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Component ERP images

Plot 4

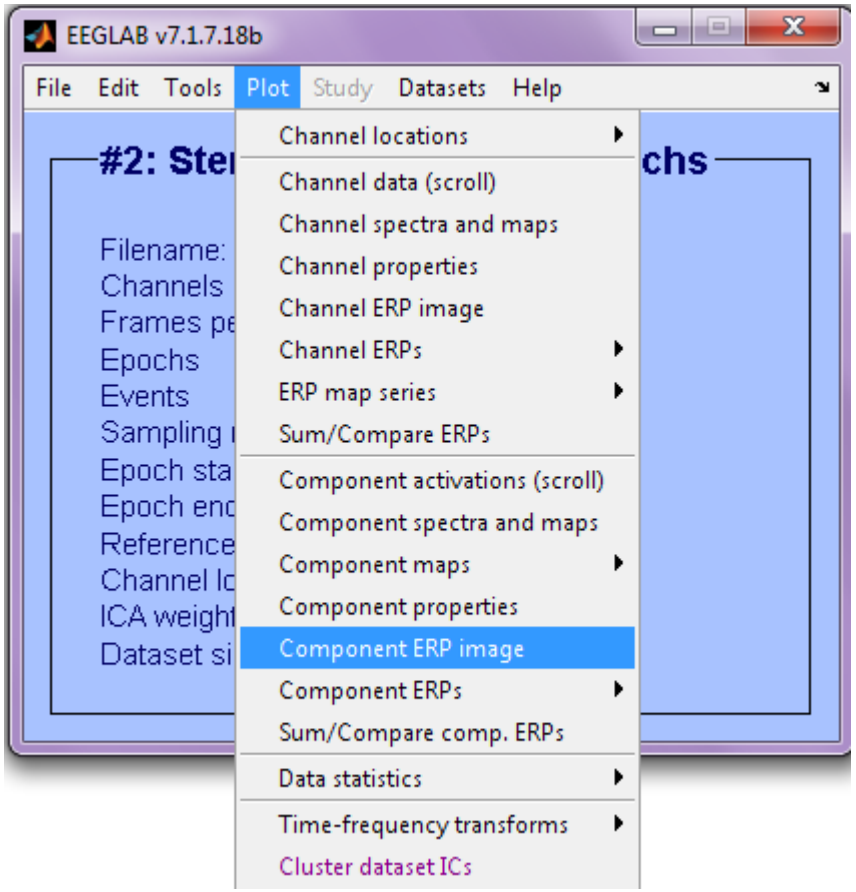
Component ERSP

Plot 5

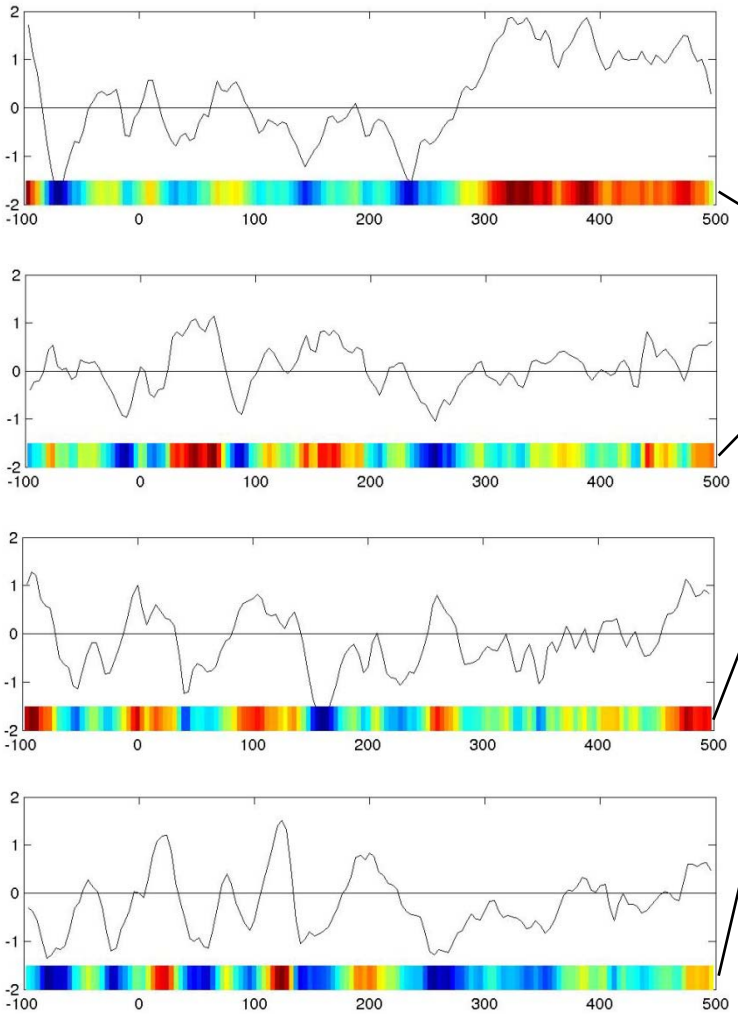
Component cross coherence

Exercise...

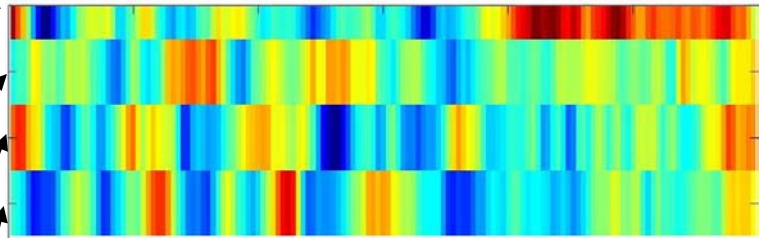
Component ERP image



ERP Image basics

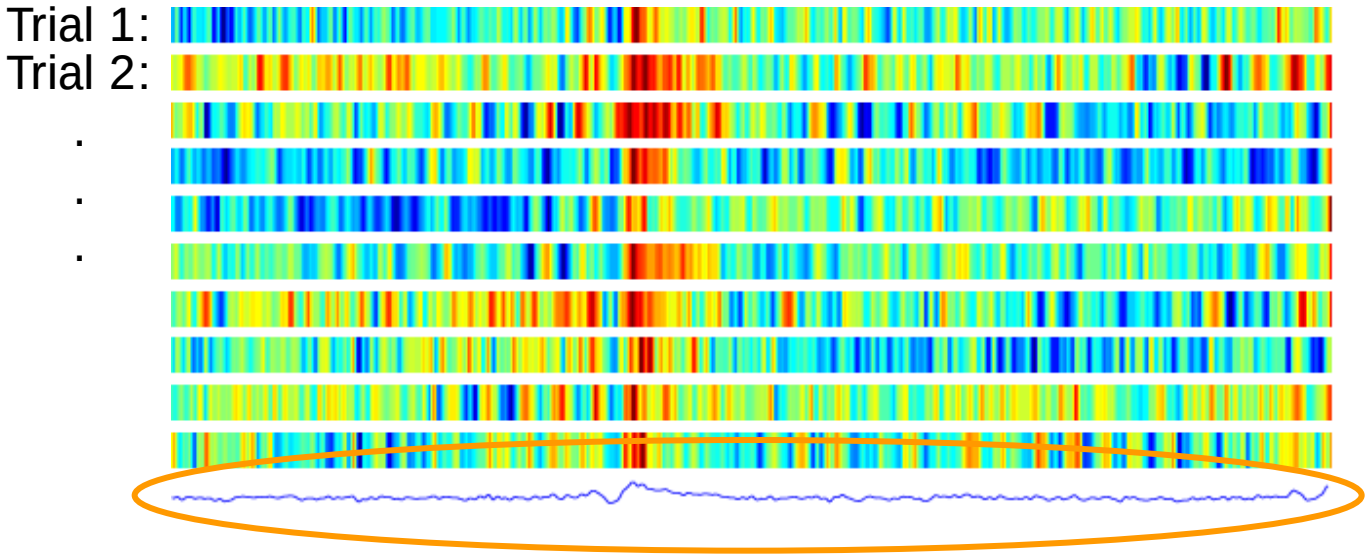


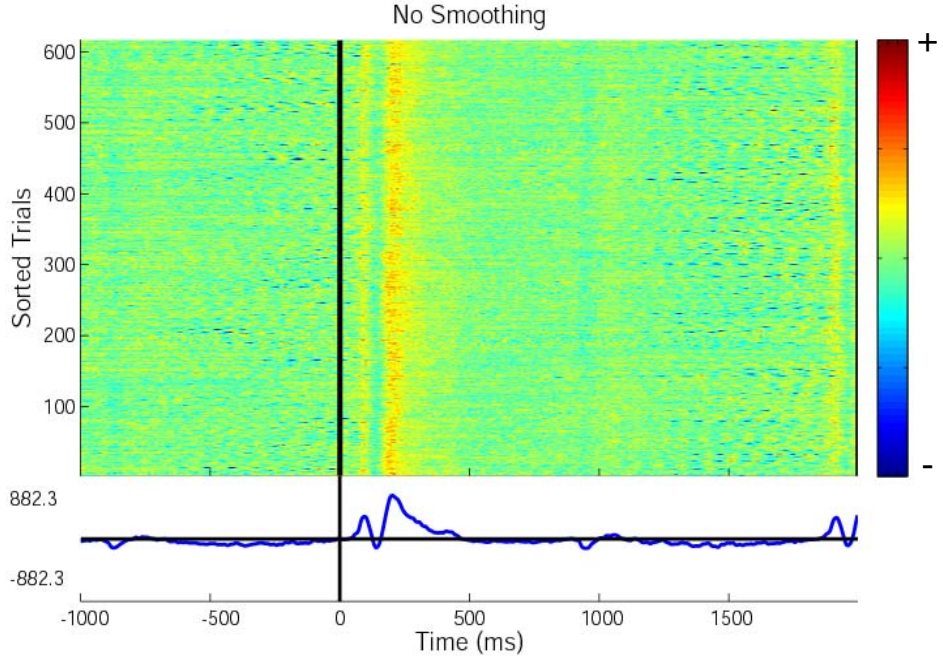
ERP Image

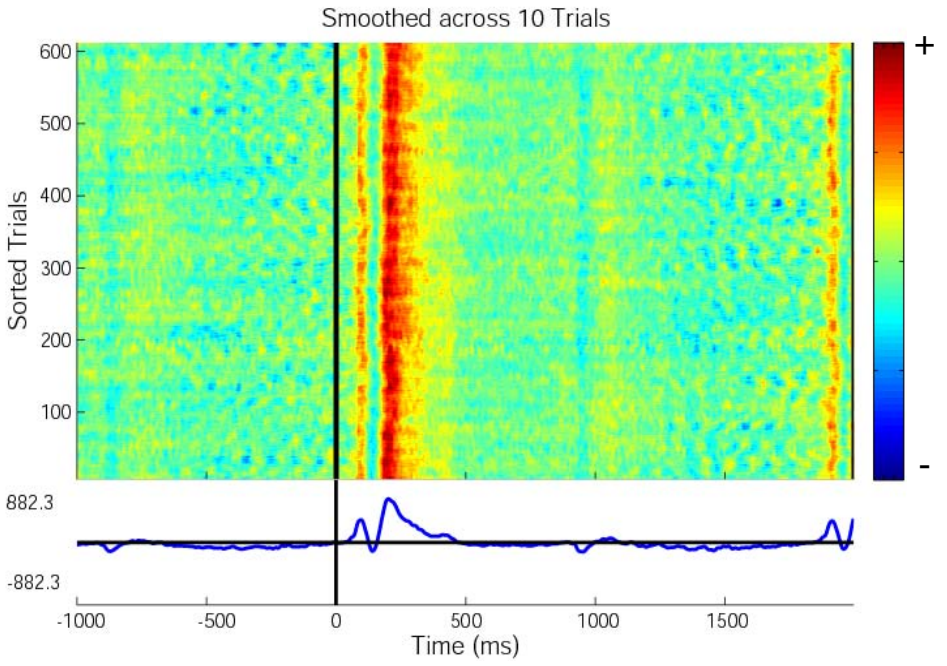


by default, sorted by time-on-task
(1st trial, 2nd trial, ...)

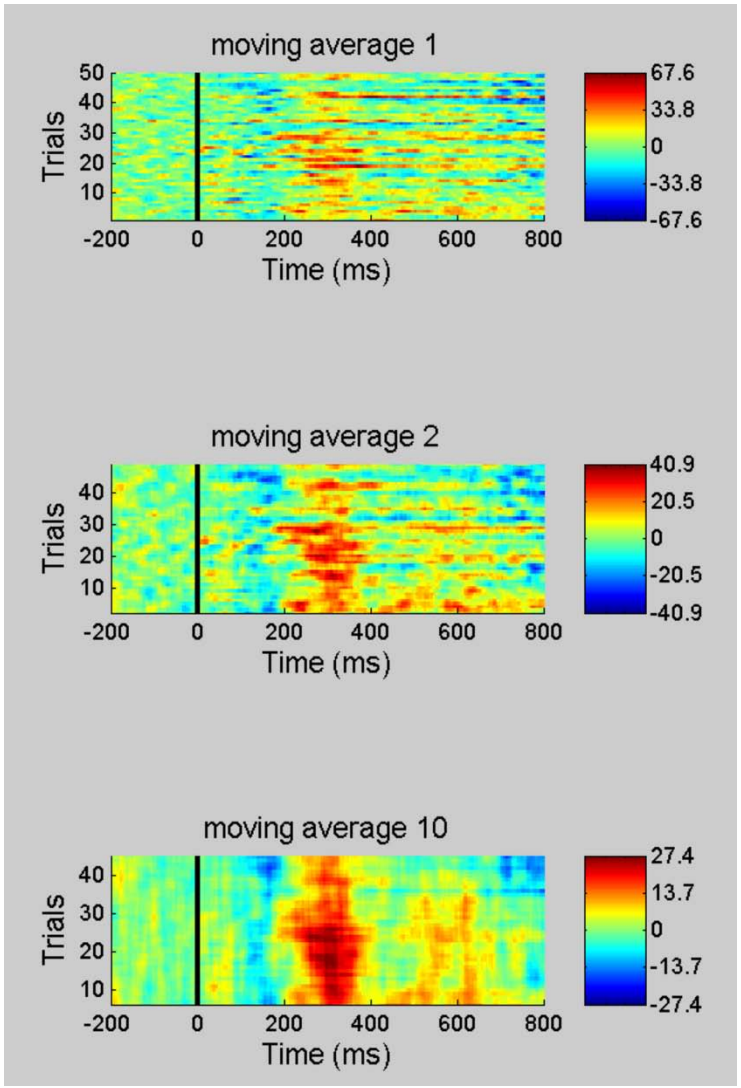
ERP Image basics



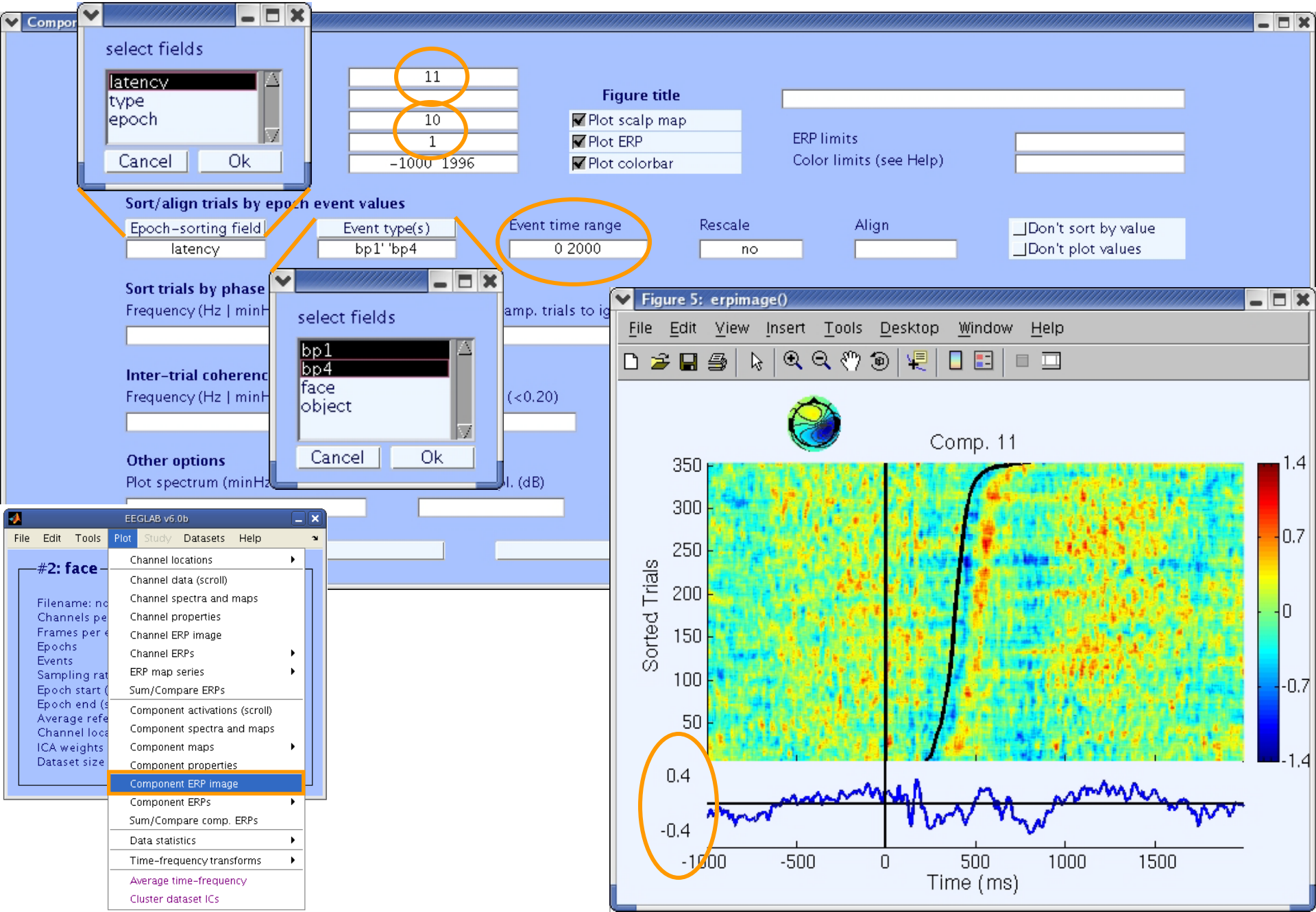




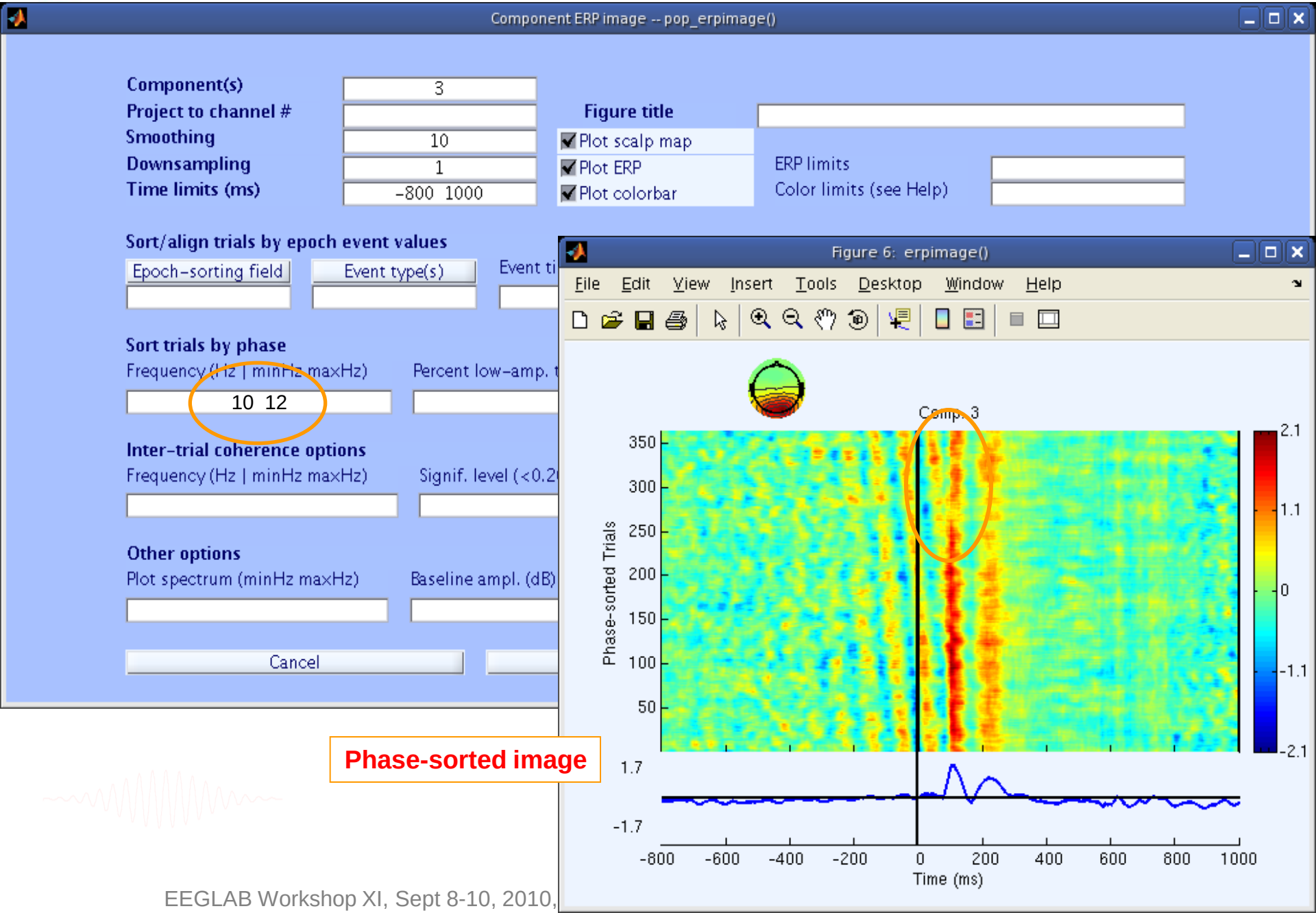
ERP Images: smoothing across trials



Component ERP Images

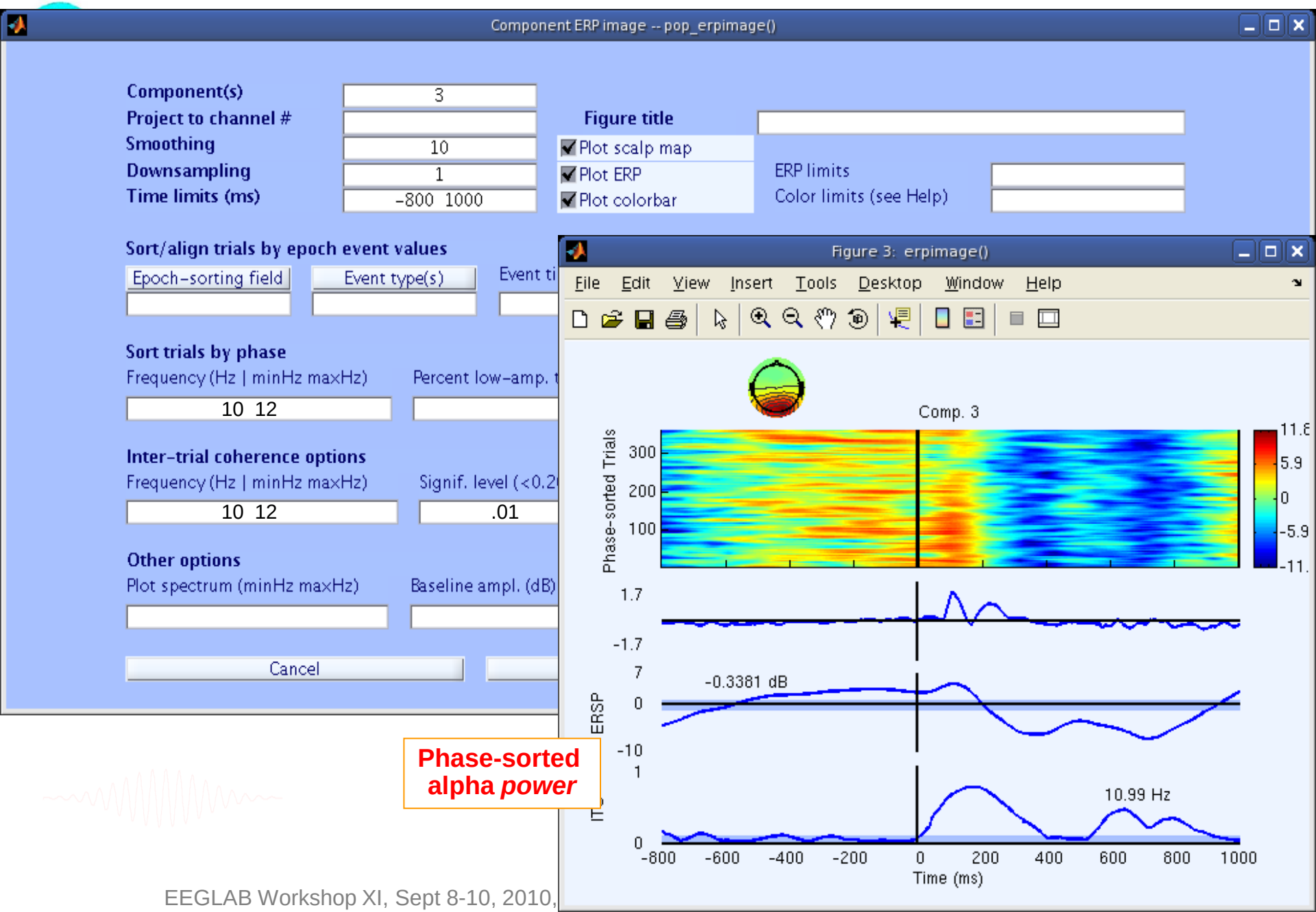


Component ERP Images



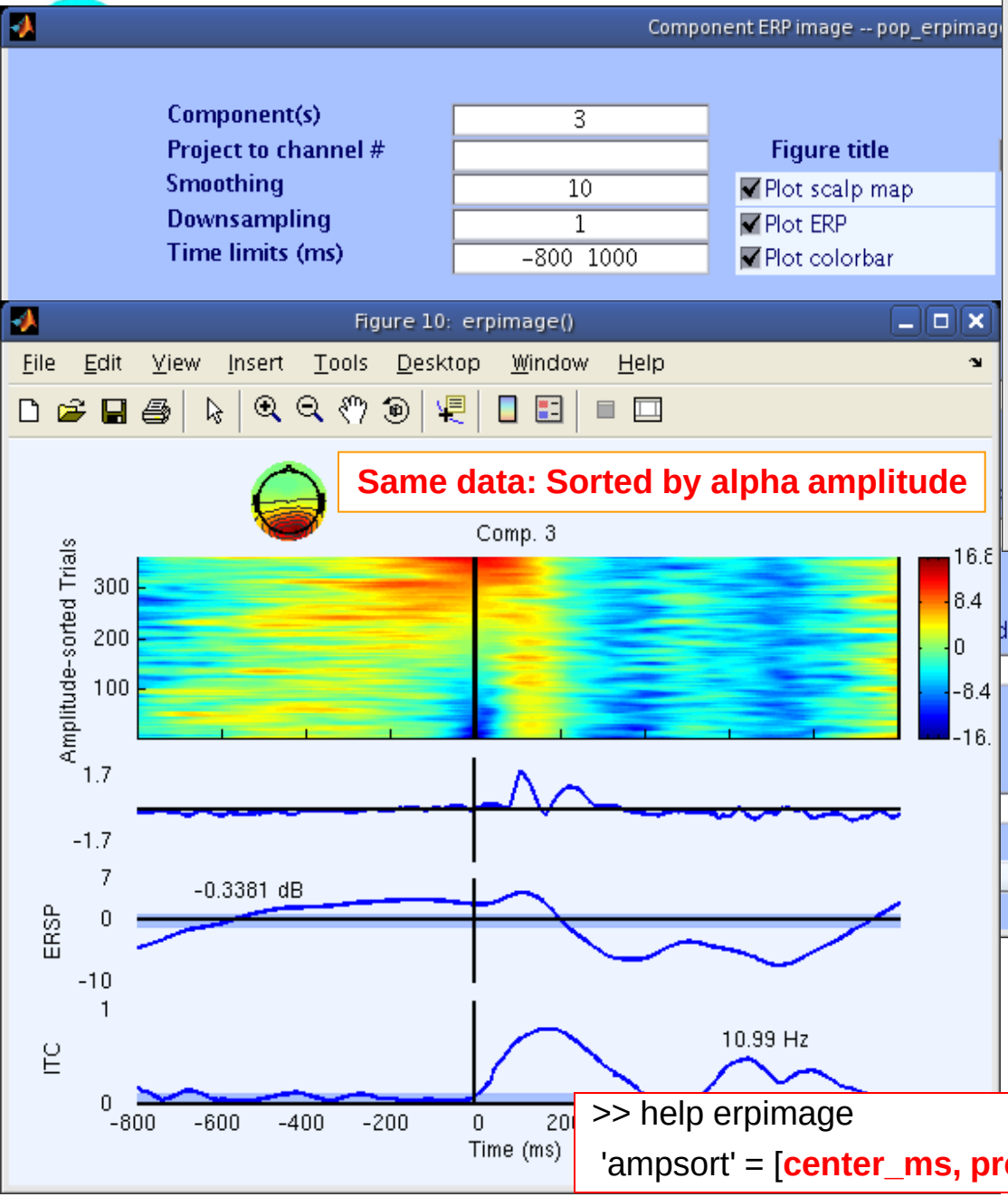
Phase-sorted image

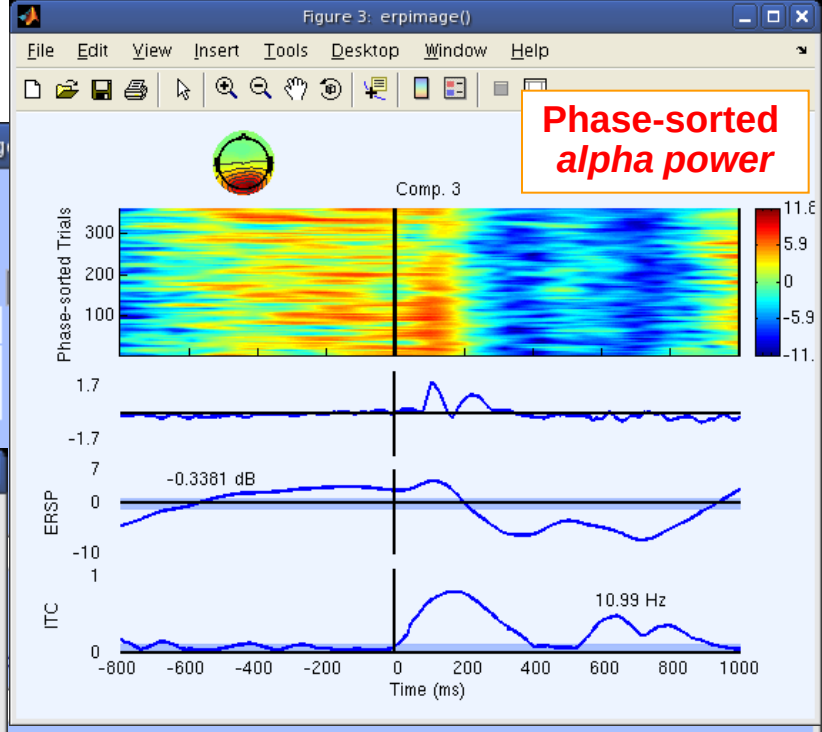
Component ERP Images

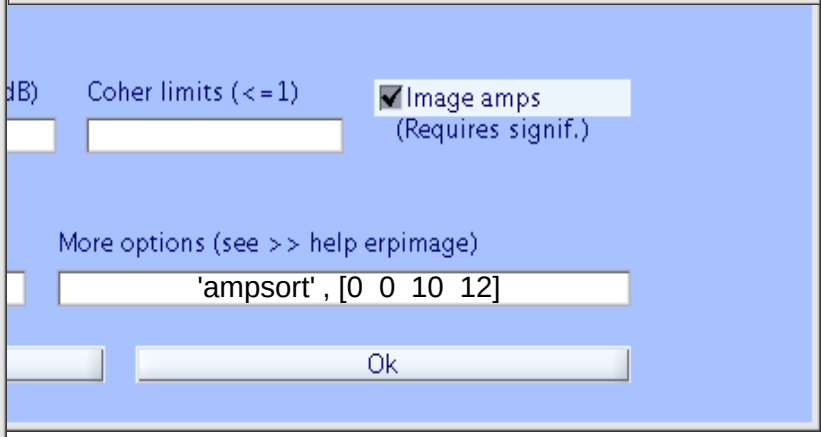


Phase-sorted alpha *power*

Component ERP



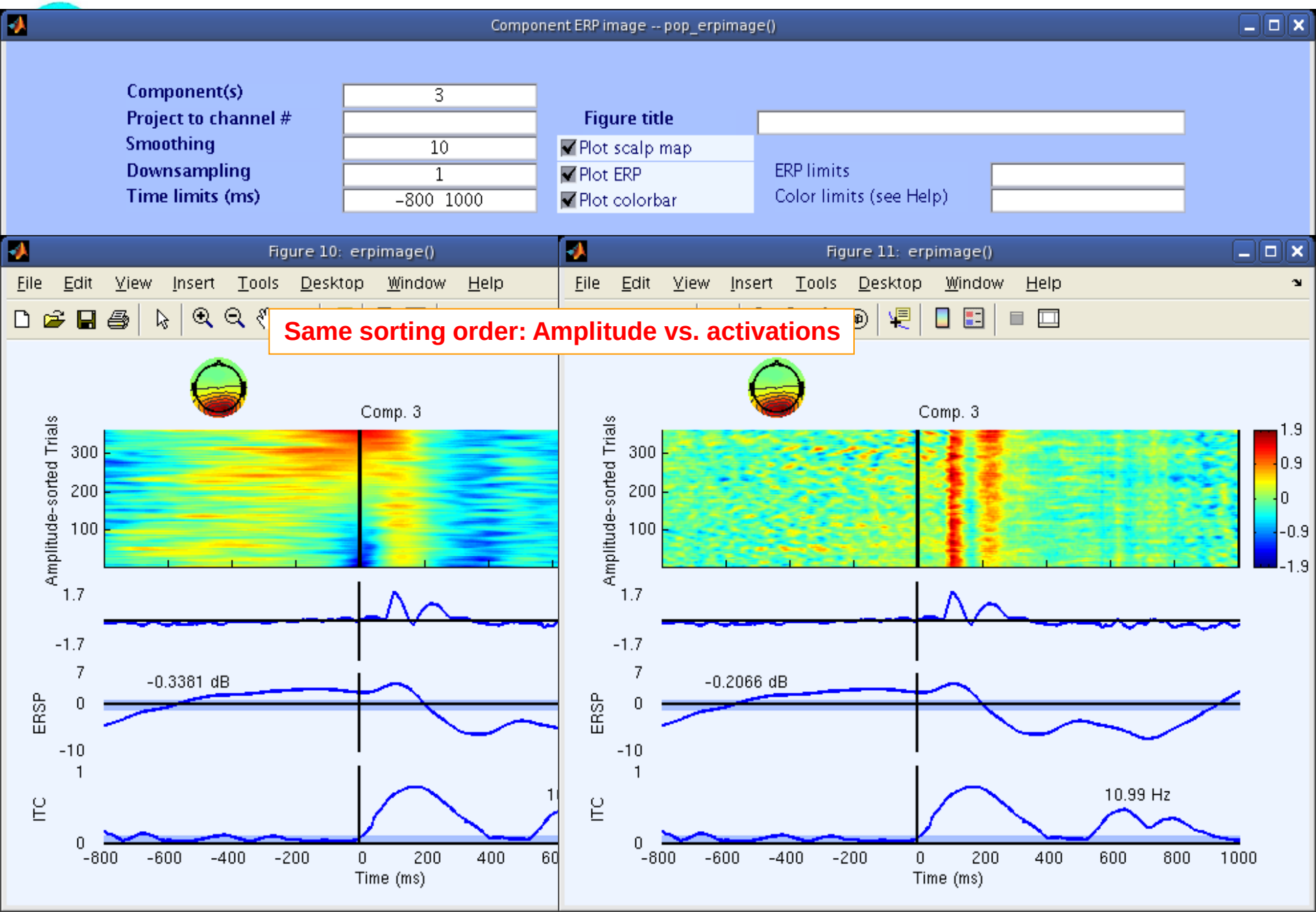




>> help erpimage

'ampsort' = [**center_ms, prcnt, freq, maxfreq**] Sort epochs by amplitude.

Component ERP Images



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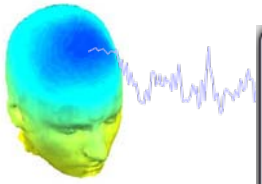
Plot 5

Component cross coherence

Exercise...

Plot IC ERSP



Plot component time frequency -- pop_newtimef()

Component number: 3
Sub epoch time limits [min max] (msec): -1000 1996
Use 200 time points
Frequency limits [min max] (Hz) or sequence:
Use limits, padding 1
Log spaced
Baseline limits [min max] (msec) (0->pre-stim.): 0
Use divisive baseline
No baseline
Wavelet cycles [min max/fact] or sequence: 3 0.5
Use limits
Use FFT
ERSP color limits [max] (min=
ITC color limits [max]
Bootstrap significance level (
Optional newtimef() argumen
Plot Event Related Spectral Po
Cancel

EEGLAB v7.1.7.18b

File Edit Tools Plot

#2: Ste

Filename:
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Reference
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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 t
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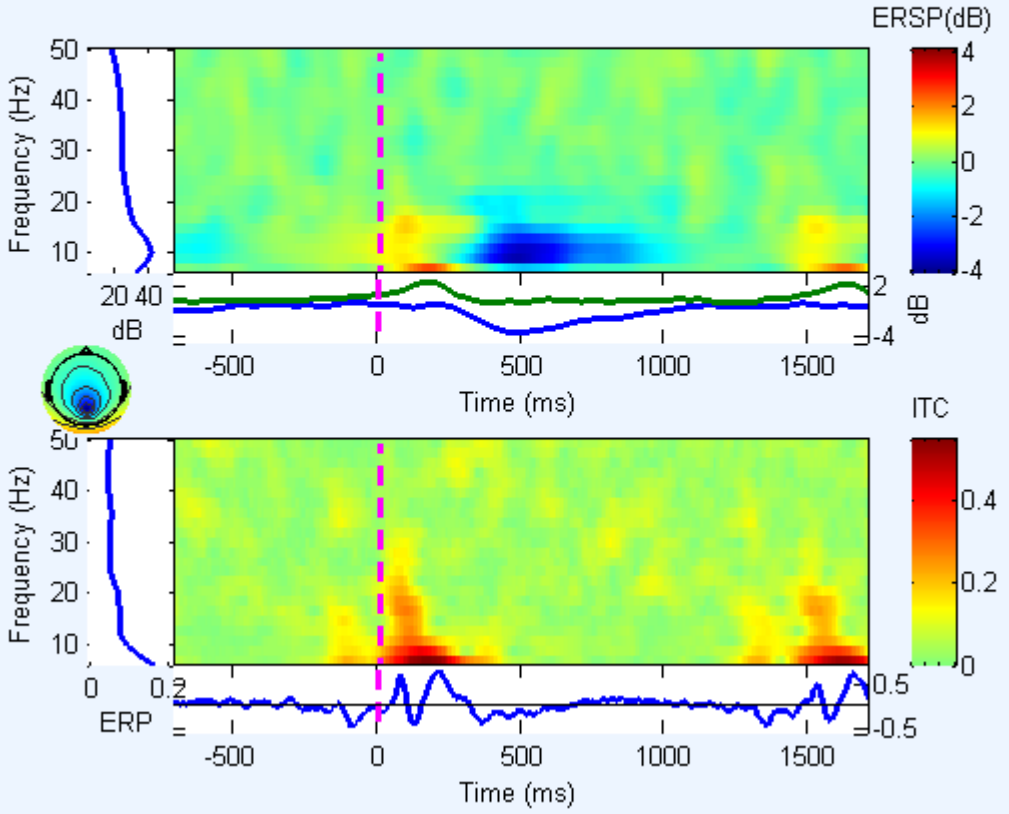
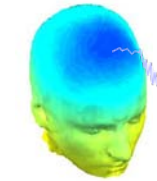
Figure 3

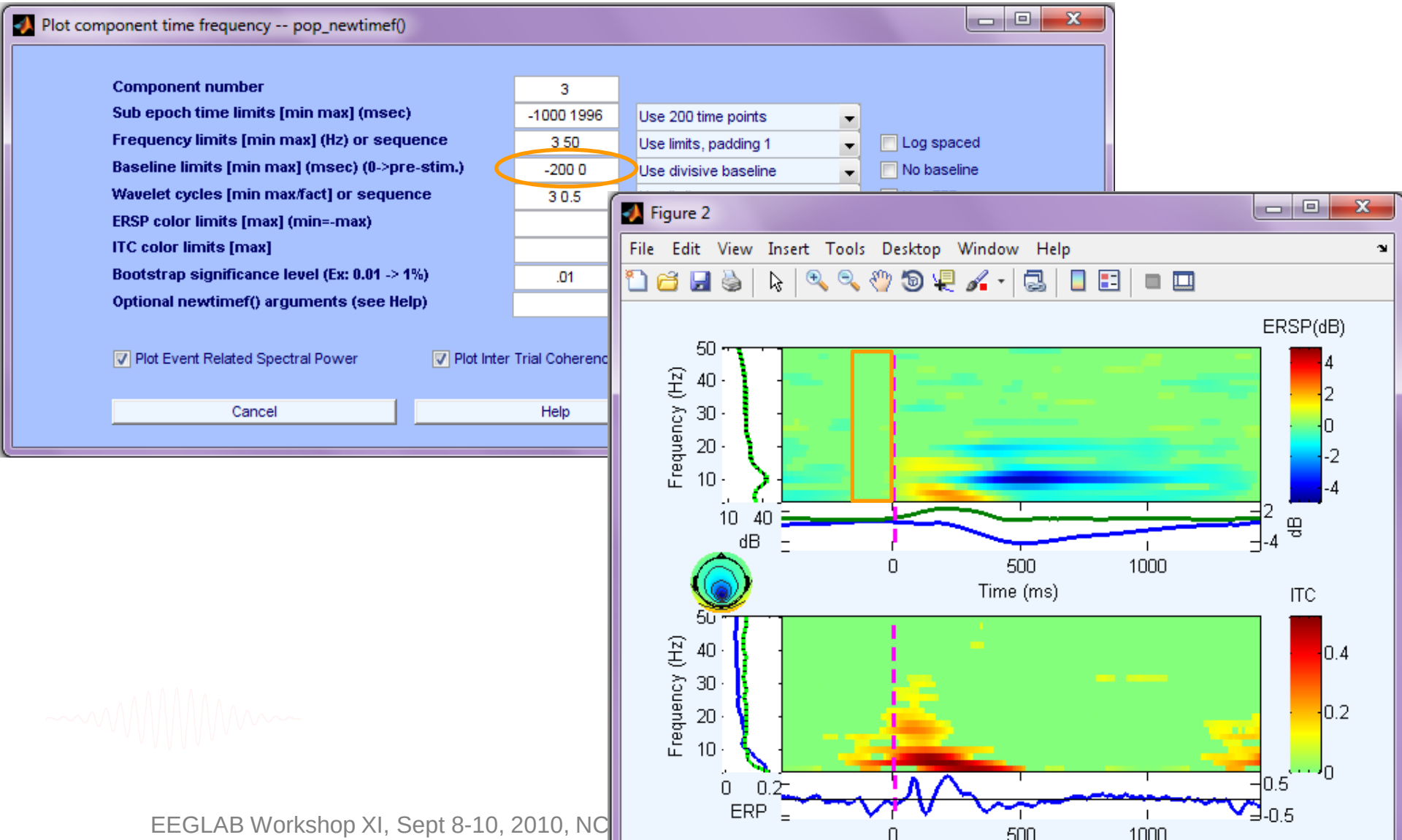
File

Time points lost at beginning and end of epoch



Plot IC ERSP




Plot component time frequency -- pop_newtimef()
Component number
3
Sub epoch time limits [min max] (msec)
-1000 1996
Use 200 time points
Frequency limits [min max] (Hz) or sequence
3 50
Use limits, padding 1
Log spaced
Baseline limits [min max] (msec) (0->pre-stim.)
-200 0
Use divisive baseline
No baseline
Wavelet cycles [min max/fact] or sequence
3 0.5
ERSP color limits [max] (min=-max)
ITC color limits [max]
Bootstrap significance level (Ex: 0.01 -> 1%)
.01
Optional newtimef() arguments (see Help)
Plot Event Related Spectral Power
Plot Inter Trial Coherenc
Cancel
Help
Figure 2
File Edit View Insert Tools Desktop Window Help
ERSP(dB)
Frequency (Hz)
Time (ms)
dB
ITC
ERP

Evaluating ICA components

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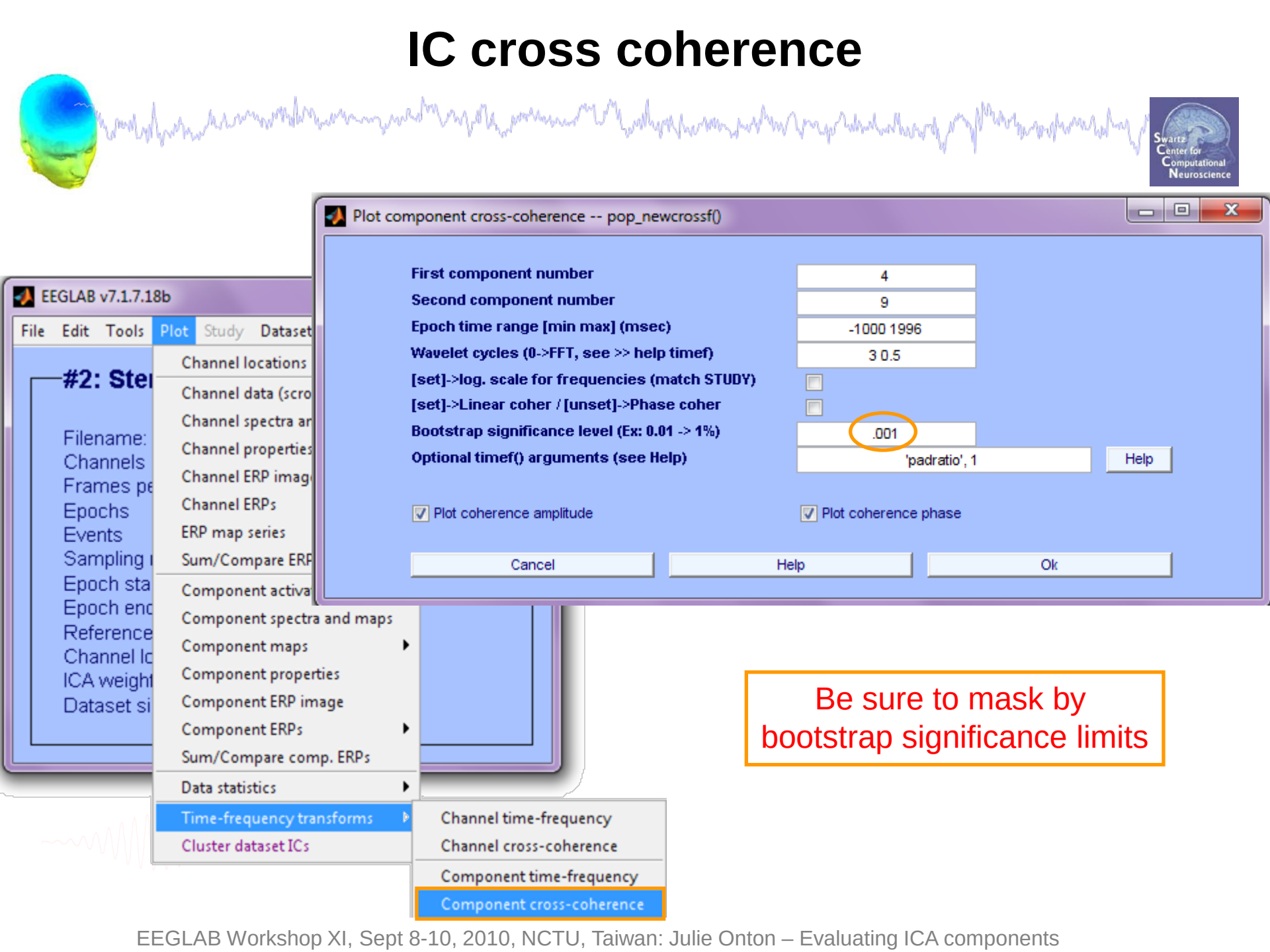
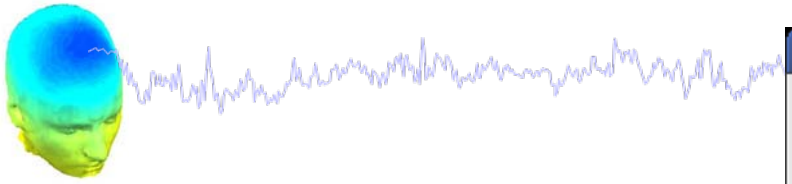
Exercise...

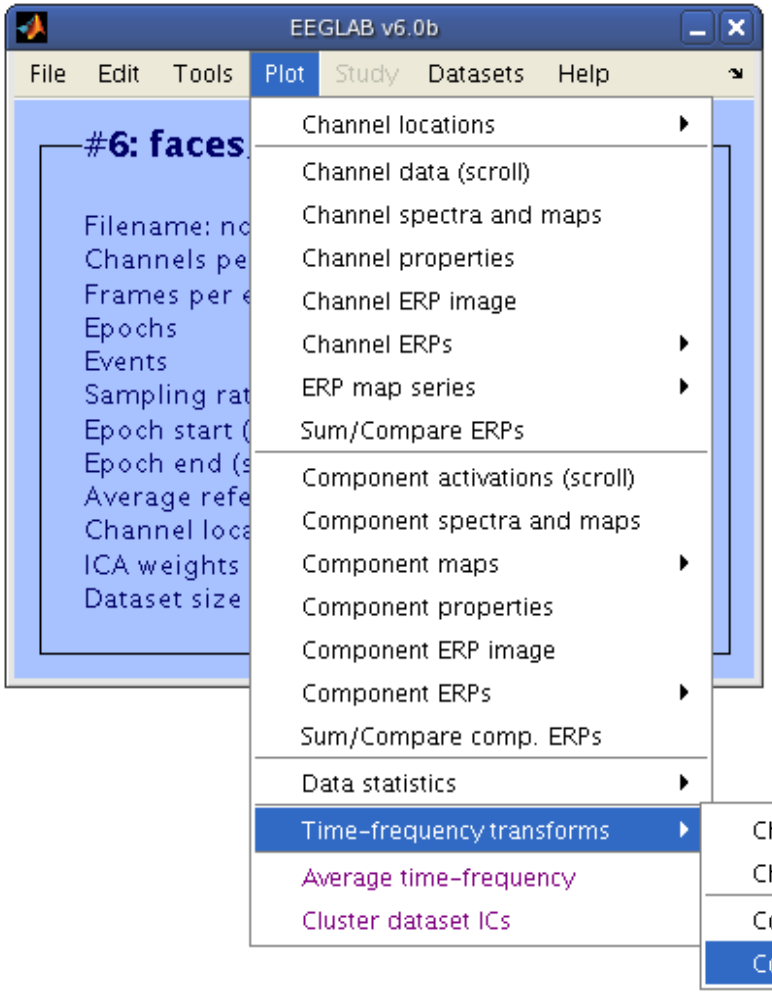
IC cross coherence

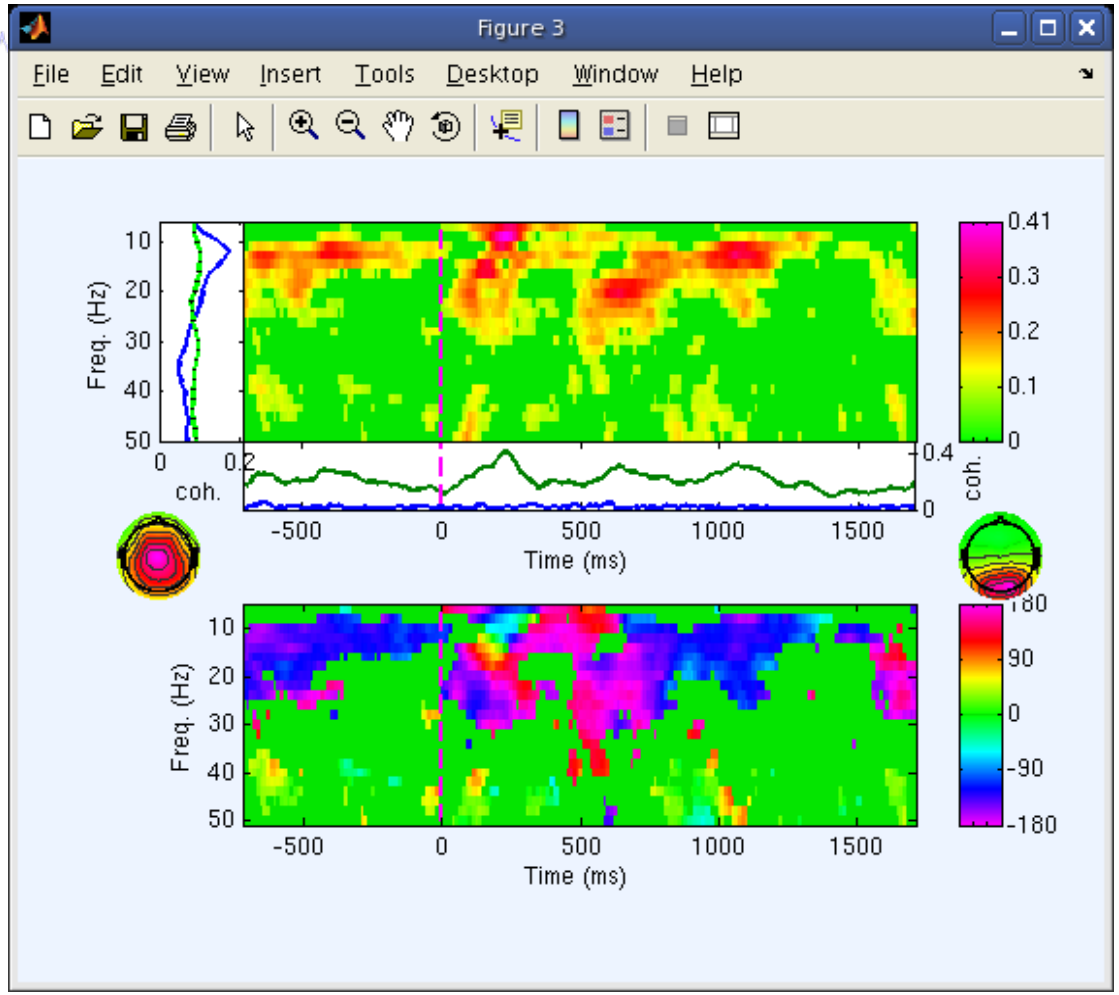


Be sure to mask by bootstrap significance limits

IC cross coherence







Exercise

- **ALL**
  - Load stern.set, epoch on Memorize letters, reject noise

- **Novice**
  - From the GUI, plot component ERPs with maps
  - Pick an interesting IC and plot an ERP image of it
  - Try sorting by RT or phase, is there any relationship to the IC activation pattern? What about power in a frequency band of choice?

- **Intermediate**
  - Plot ERSPs for selected ICs
    - ~ Compare FFT, wavelet(s), and multi-taper methods for ERSP
  - Plot cross coherence between two selected ICs
    - ~ Compare this result with cross coherence between two channels that are highly weighted in the respective ICs