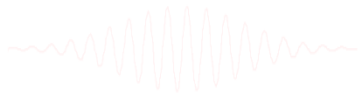


STUDY ICA component clustering



Edit dataset info

EEGLAB v9.0.0.0b

File Edit Tools Plot **Study** Datasets Help

STUDY set:

- Study filename: ...s/data
- Study task name
- Nb of subjects
- Nb of conditions
- Nb of sessions
- Nb of groups
- Epoch consistency
- Channels per frame
- Channel locations
- Clusters
- Status
- Total size (Mb)

Edit study info

- Select/Edit study design(s)
- Precompute channel measures
- Plot channel measures
- Precompute component measures
- Measure Product clustering
- PCA clustering (original)

pop_study(): Pre-select components

Enter maximum residual (topo map - dipole proj.) var. (in %)
NOTE: This will delete any existing component clusters!

15

Keep only in-brain dipoles.

Cancel Help Ok

Create a new STUDY set -- pop_study()

Edit STUDY set information - remember to save changes

STUDY set name: Sternberg

STUDY set task name: Sternberg

STUDY set notes:

	dataset filename	browse	subject	session	condition	group	Select by r.v.	
1	C:\Users\julie\Documents\Wor	...	S01		memorize		Comp.: 3 5 ...	Clear
2	C:\Users\julie\Documents\Wor	...	S01		ignore		Comp.: 3 5 ...	Clear
3	C:\Users\julie\Documents\Wor	...	S01		probe		Comp.: 3 5 ...	Clear
4	C:\Users\julie\Documents\Wor	...	S02		memorize		Comp.: 5 6 ...	Clear
5	C:\Users\julie\Documents\Wor	...	S02		ignore		Comp.: 5 6 ...	Clear
6	C:\Users\julie\Documents\Wor	...	S02		probe		Comp.: 5 6 ...	Clear
7	C:\Users\julie\Documents\Wor	...	S03		memorize		Comp.: 6 7 ...	Clear
8	C:\Users\julie\Documents\Wor	...	S03		ignore		Comp.: 6 7 ...	Clear
9	C:\Users\julie\Documents\Wor	...	S03		probe		Comp.: 6 7 ...	Clear
10	C:\Users\julie\Documents\Wor	...	S04		memorize		Comp.: 1 2 ...	Clear

Important note: Removed datasets will not be saved before being deleted from EEGLAB memory

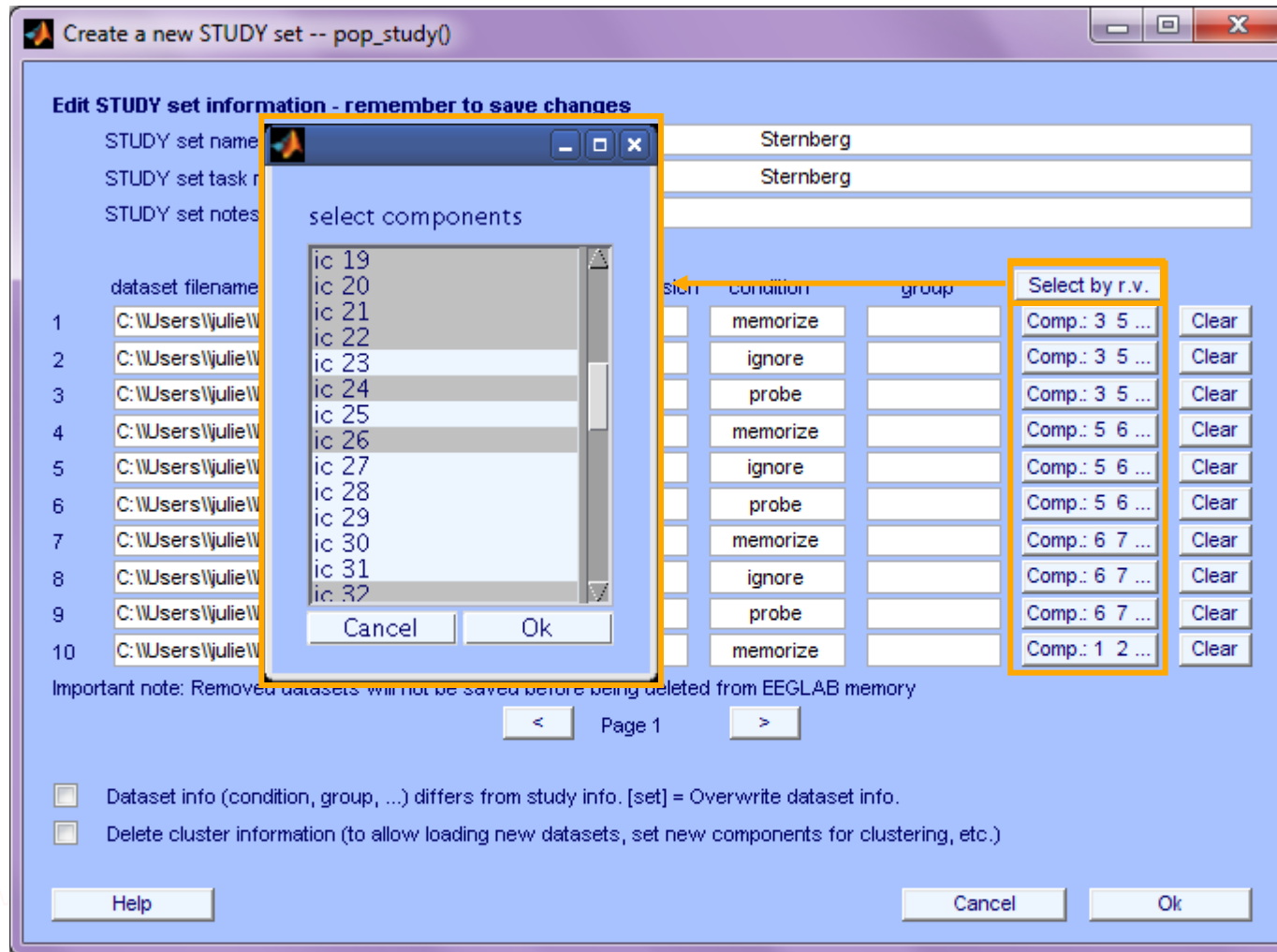
< Page 1 >

Dataset info (condition, group, ...) differs from study info. [set] = Overwrite dataset info.

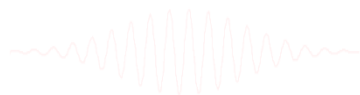
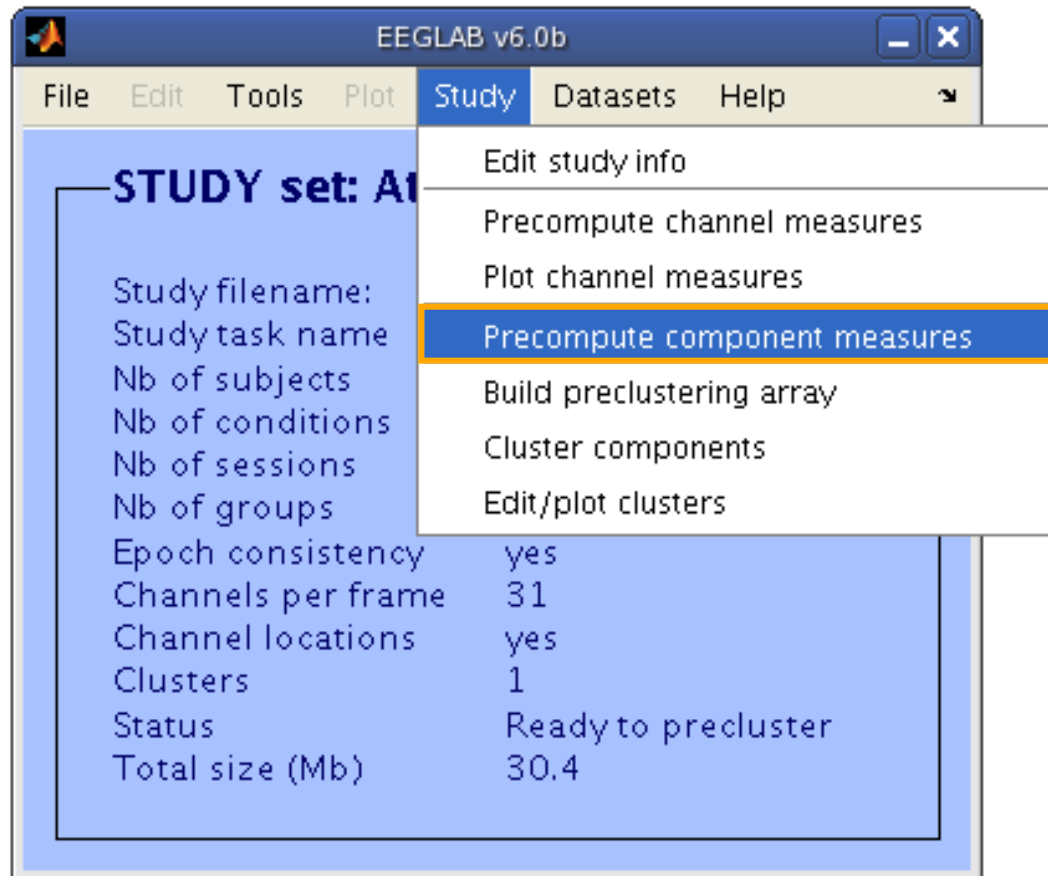
Delete cluster information (to allow loading new datasets, set new components for clustering, etc.)

Help Cancel Ok

ICs to cluster



Precompute data measures



Precompute data measures

TIP: Compute all measures so you can test different combinations for clustering

Select and compute component measures for later clustering -- pop_precomp()

Pre-compute component measures for STUDY 'Sternberg'

Compute ERP/spectrum/ERSP only for components selected by RV (set) or for all components (unset)

List of measures to precompute

ERPs Baseline ([min max] in ms) [-200 0]

Power spectrum Spectopo parameters Test

ERSPs Time/freq. parameters 'cycles', [3 0.5], 'nfreqs', 100 Test

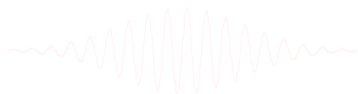
ITCs

Scalp maps

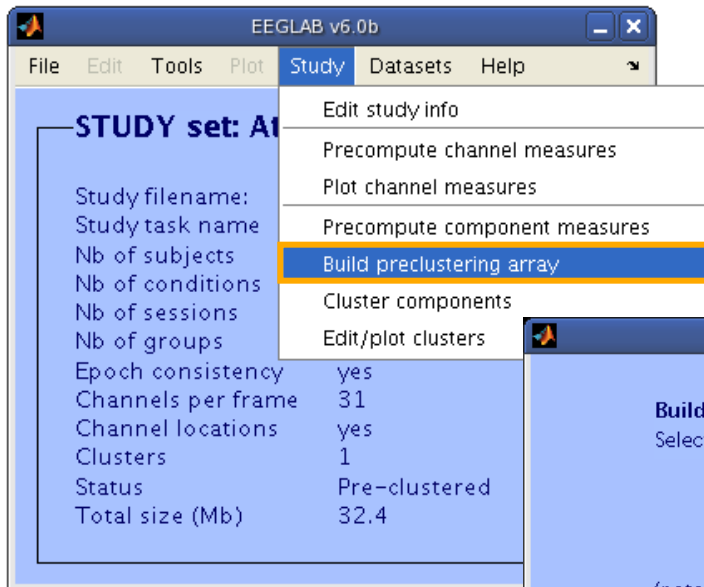
Recompute even if present on disk

Help Cancel Ok

Time-frequency options



Cluster components



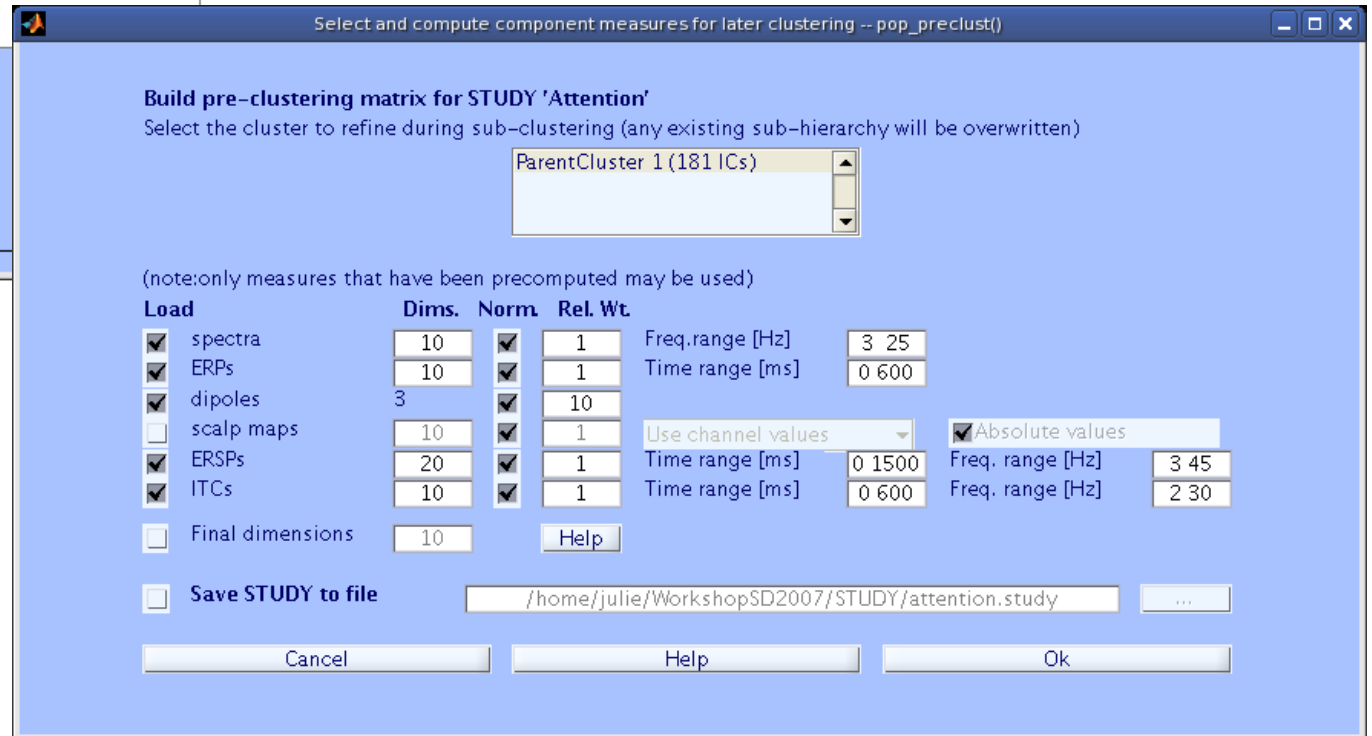
EEGLAB v6.0b

File Edit Tools Plot Study Datasets Help

STUDY set: Attention

Study filename:
Study task name
Nb of subjects
Nb of conditions
Nb of sessions
Nb of groups
Epoch consistency: yes
Channels per frame: 31
Channel locations: yes
Clusters: 1
Status: Pre-clustered
Total size (Mb): 32.4

Study menu options:
Edit study info
Precompute channel measures
Plot channel measures
Precompute component measures
Build preclustering array
Cluster components
Edit/plot clusters



Select and compute component measures for later clustering -- pop_preclust()

Build pre-clustering matrix for STUDY 'Attention'
Select the cluster to refine during sub-clustering (any existing sub-hierarchy will be overwritten)

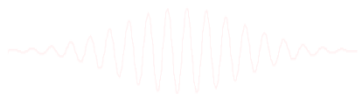
ParentCluster 1 (181 ICs)

(note: only measures that have been precomputed may be used)

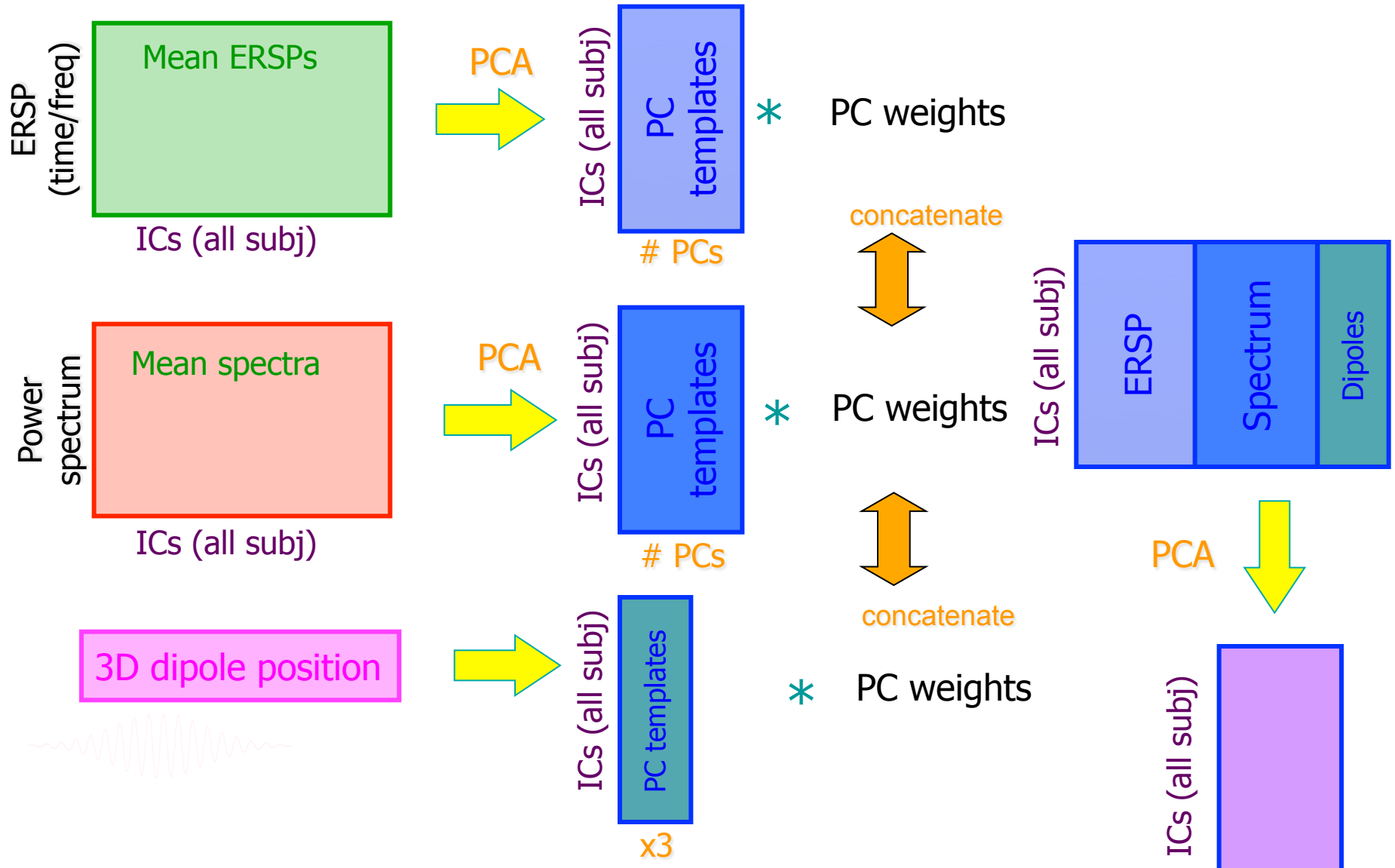
Load	Dims.	Norm.	Rel. Wt.		
<input checked="" type="checkbox"/> spectra	10	<input checked="" type="checkbox"/>	1	Freq. range [Hz]	3 25
<input checked="" type="checkbox"/> ERPs	10	<input checked="" type="checkbox"/>	1	Time range [ms]	0 600
<input checked="" type="checkbox"/> dipoles	3	<input checked="" type="checkbox"/>	10		
<input type="checkbox"/> scalp maps	10	<input checked="" type="checkbox"/>	1	Use channel values	<input checked="" type="checkbox"/> Absolute values
<input checked="" type="checkbox"/> ERSPs	20	<input checked="" type="checkbox"/>	1	Time range [ms]	0 1500
<input checked="" type="checkbox"/> ITCs	10	<input checked="" type="checkbox"/>	1	Time range [ms]	0 600
<input type="checkbox"/> Final dimensions	10			Freq. range [Hz]	3 45
				Freq. range [Hz]	2 30

Save STUDY to file: /home/julie/WorkshopSD2007/STUDY/attention.study

Buttons: Cancel Help Ok

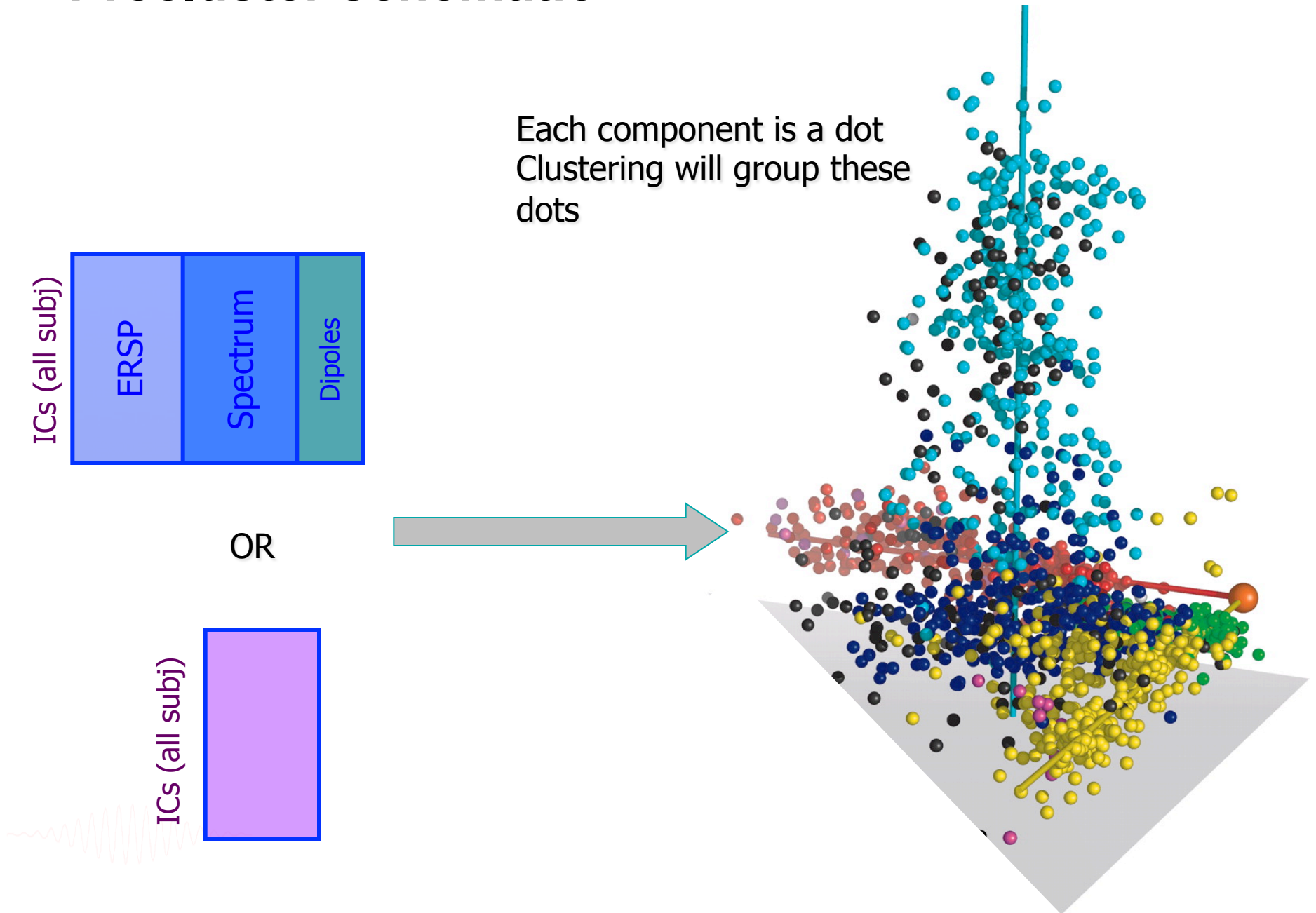


Precluster schematic

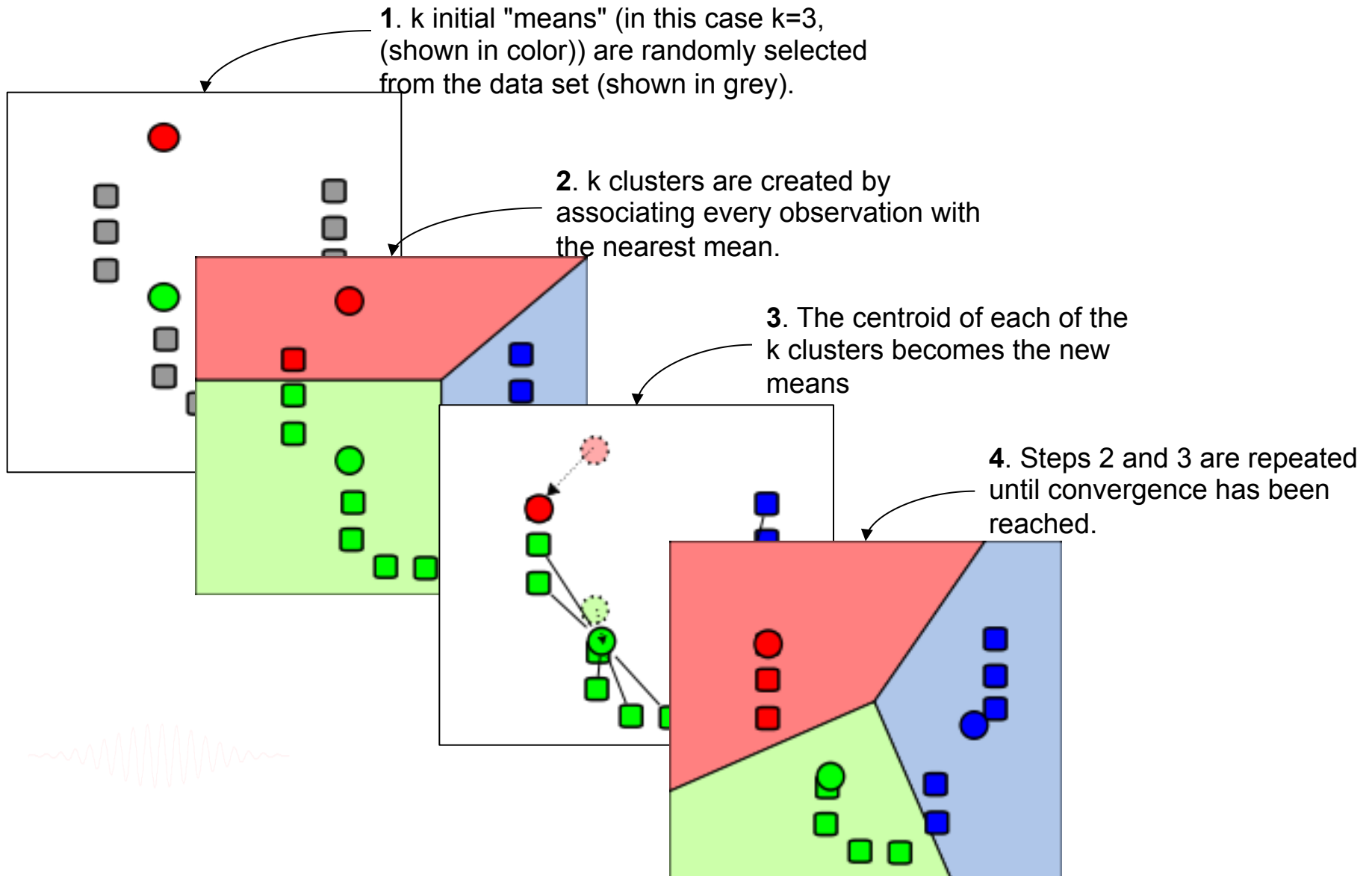


Precluster schematic

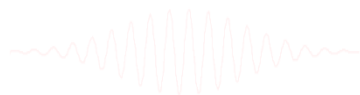
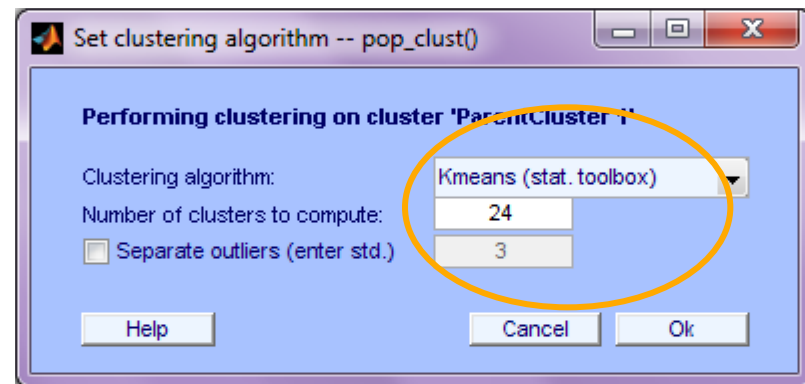
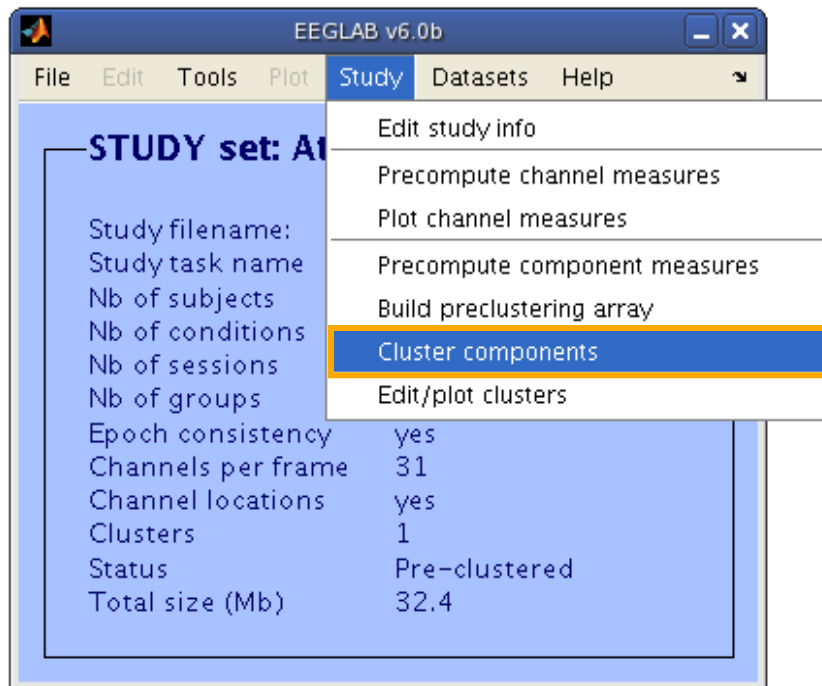
Each component is a dot
Clustering will group these dots



Classical KMean



Cluster components



Choosing data measures

What measure(s) should you use?

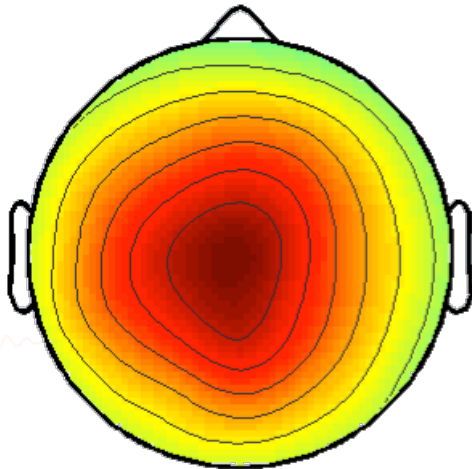
It depends on your final cluster criteria...

- If for example, your priority is dipole location, then cluster only based on dipole location...

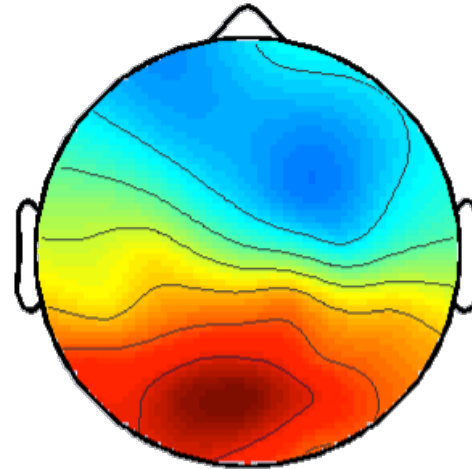
But consider:

- What is the difference between these two components?

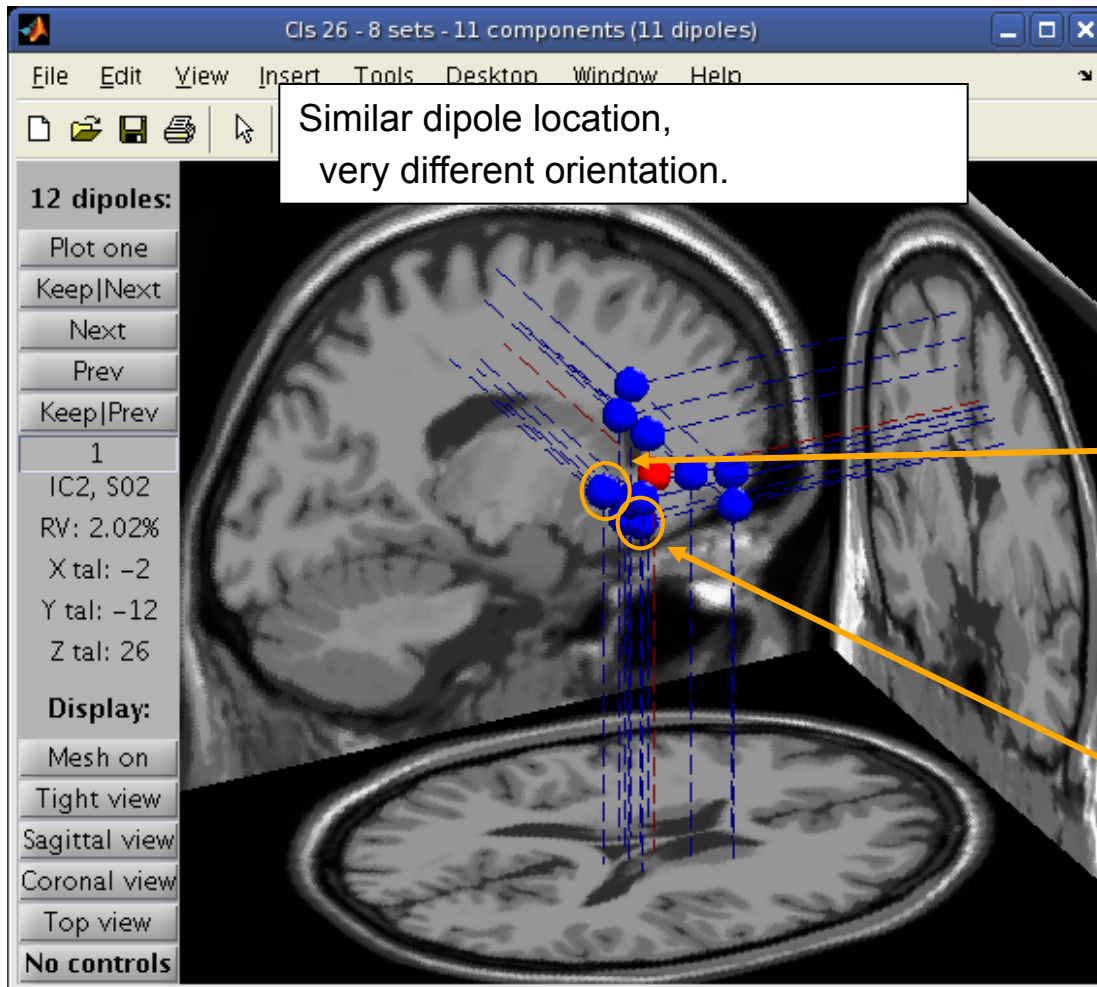
IC2 / S02, Cls 28



IC5 / S05, Cls 28

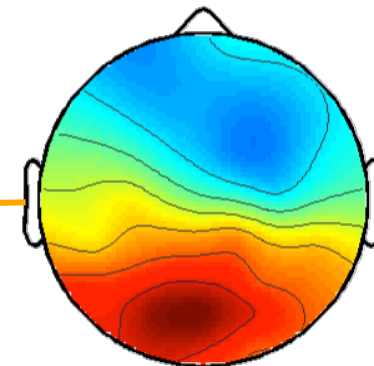


Choosing data measures

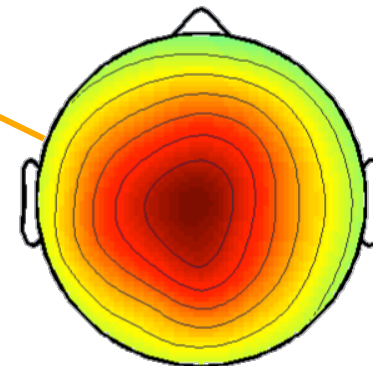


Obvious dramatic effect on
scalp map topography:

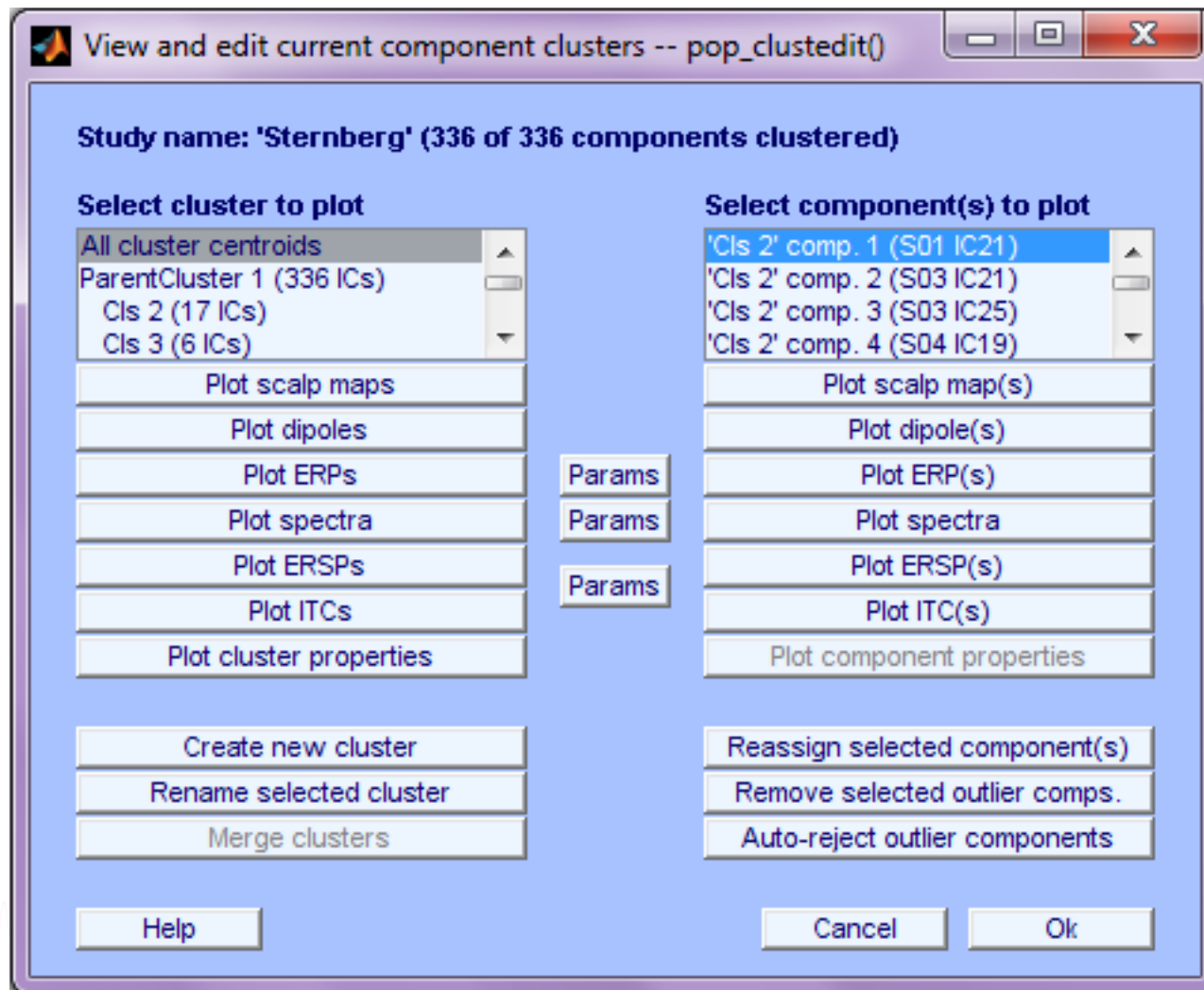
IC5 / S05, Cls 26



IC2 / S02, Cls 26



Plot/edit clusters



Plot cluster data

The image shows a software interface for plotting cluster data. The main window is titled "View and edit current component clusters -- pop_clustedit()". It displays "Study 'Attention': 181 of 181 components clustered".

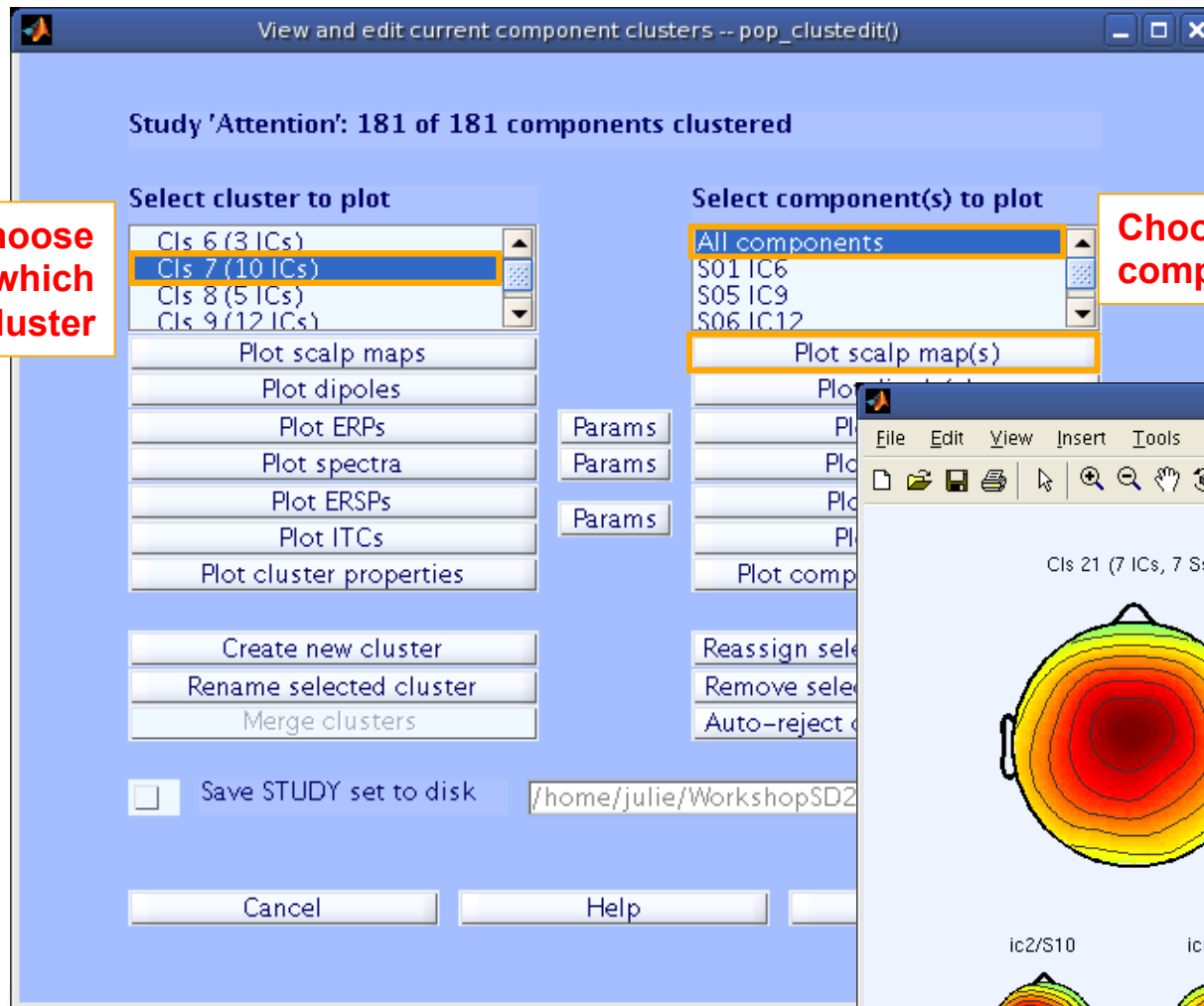
On the left, under "Select cluster to plot", a list includes "All cluster centroids", "ParentCluster 1 (181 ICs)", "outlier 2 (1 ICs)", and "Cls 3 (5 ICs)". The "Plot scalp maps" button is highlighted with an orange box. Other buttons include "Plot dipoles", "Plot ERPs", "Plot spectra", "Plot ERSPs", "Plot ITCs", "Plot cluster properties", "Create new cluster", "Rename selected cluster", "Merge clusters", "Save STUDY set to disk" (with a checkbox), "Cancel", and "Help".

On the right, under "Select component(s) to plot", a list includes "'outlier 2' comp. 1 (S12 IC12)", "'Cls 3' comp. 1 (S01 IC1)", "'Cls 3' comp. 2 (S05 IC11)", and "'Cls 3' comp. 3 (S06 IC15)". Buttons include "Plot scalp map(s)", "Plot dipole(s)", "Plot ERP(s)", and "Plot spectra".

Below the main window, a smaller window titled "Figure 3: Average scalp map for all clusters" displays a grid of 27 scalp maps. Each map is labeled with a cluster name and its components, such as "outlier 2 (12 ICs, 7 Ss)", "Cls 3 (4 ICs, 4 Ss)", "Cls 4 (8 ICs, 8 Ss)", "Cls 5 (7 ICs, 7 Ss)", "Cls 6 (3 ICs, 3 Ss)", "Cls 7 (10 ICs, 6 Ss)", "Cls 8 (5 ICs, 5 Ss)", "Cls 9 (12 ICs, 8 Ss)", "Cls 10 (4 ICs, 4 Ss)", "Cls 11 (9 ICs, 6 Ss)", "Cls 12 (3 ICs, 2 Ss)", "Cls 13 (5 ICs, 4 Ss)", "Cls 14 (5 ICs, 5 Ss)", "Cls 15 (14 ICs, 9 Ss)", "Cls 16 (3 ICs, 3 Ss)", "Cls 17 (7 ICs, 7 Ss)", "Cls 18 (4 ICs, 4 Ss)", "Cls 19 (10 ICs, 8 Ss)", "Cls 20 (17 ICs, 15 Ss)", "Cls 21 (6 ICs, 6 Ss)", "Cls 22 (11 ICs, 8 Ss)", "Cls 23 (8 ICs, 7 Ss)", "Cls 24 (7 ICs, 7 Ss)", "Cls 25 (3 ICs, 3 Ss)", "Cls 26 (3 ICs, 3 Ss)", and "Cls 27 (1 ICs, 1 Ss)".

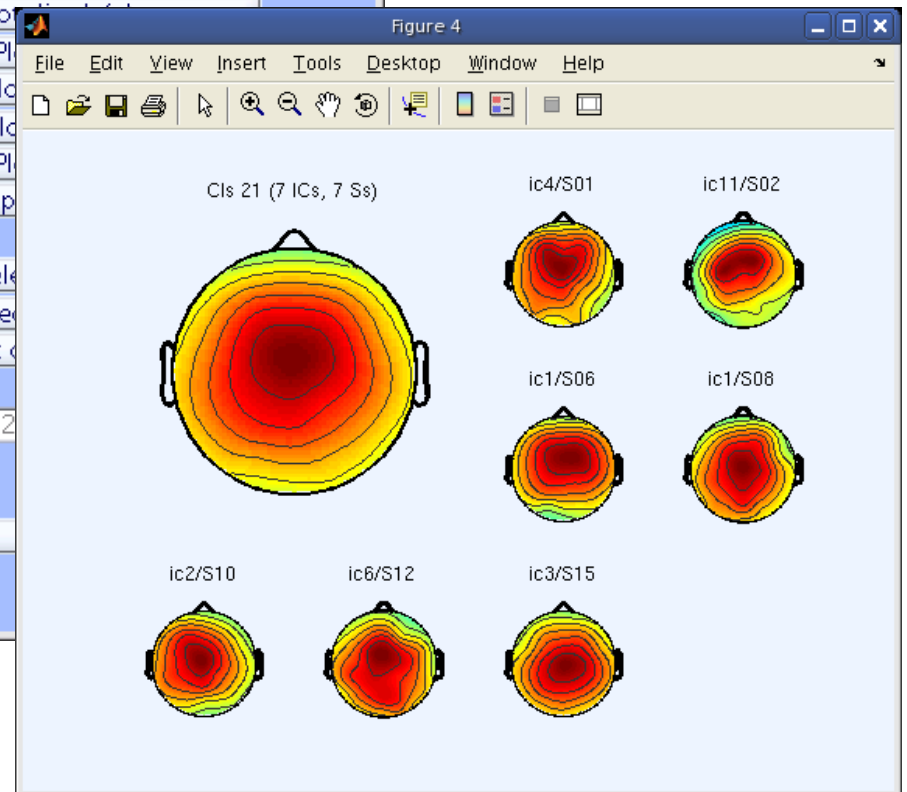
A red text annotation on the right says "Plot mean scalp maps for easy reference". An orange arrow points from the "Plot scalp maps" button in the main window to the grid of scalp maps in the smaller window.

Plot cluster data



Choose which cluster

Choose which components



Plot cluster data

The image displays a software interface for plotting cluster data. It consists of two main windows and a dialog box.

Top Left Window: "Cls 19 - 5 sets - 14 components (14 dipoles)"
This window shows a brain scan with 15 dipoles plotted. The interface includes a menu bar (File, Edit, View, Insert, Tools, Desktop, Window, Help) and a toolbar. A list of 15 dipoles is shown on the left, with the first one selected. The selected dipole's parameters are: IC3, S02, RV: 2.62%, X tal: -6, Y tal: -13, Z tal: 21. Below the list are buttons for "Display" (Mesh on, Tight view, Sagittal view, Coronal view, Top view) and "No controls".

Top Right Window: "component clusters -- pop_clustedit()"
This window is a dialog box for selecting components to plot. It features a list box titled "Select component(s) to plot" containing "All components", "S02 IC3", "S02 IC11", "S02 IC12", and "S02 IC17". Below the list box are buttons for "Plot scalp map(s)", "Plot dipole(s)", "Plot ERP(s)", "Plot spectra", "Plot ERSP(s)", "Plot ITC(s)", and "Plot component properties". There are also buttons for "Params" next to the "Plot ERP(s)", "Plot spectra", and "Plot ERSP(s)" options. At the bottom of the dialog are buttons for "Create new cluster", "Rename selected cluster", "Merge clusters", "Reassign selected component(s)", "Remove selected outlier comps.", and "Auto-reject outlier components".

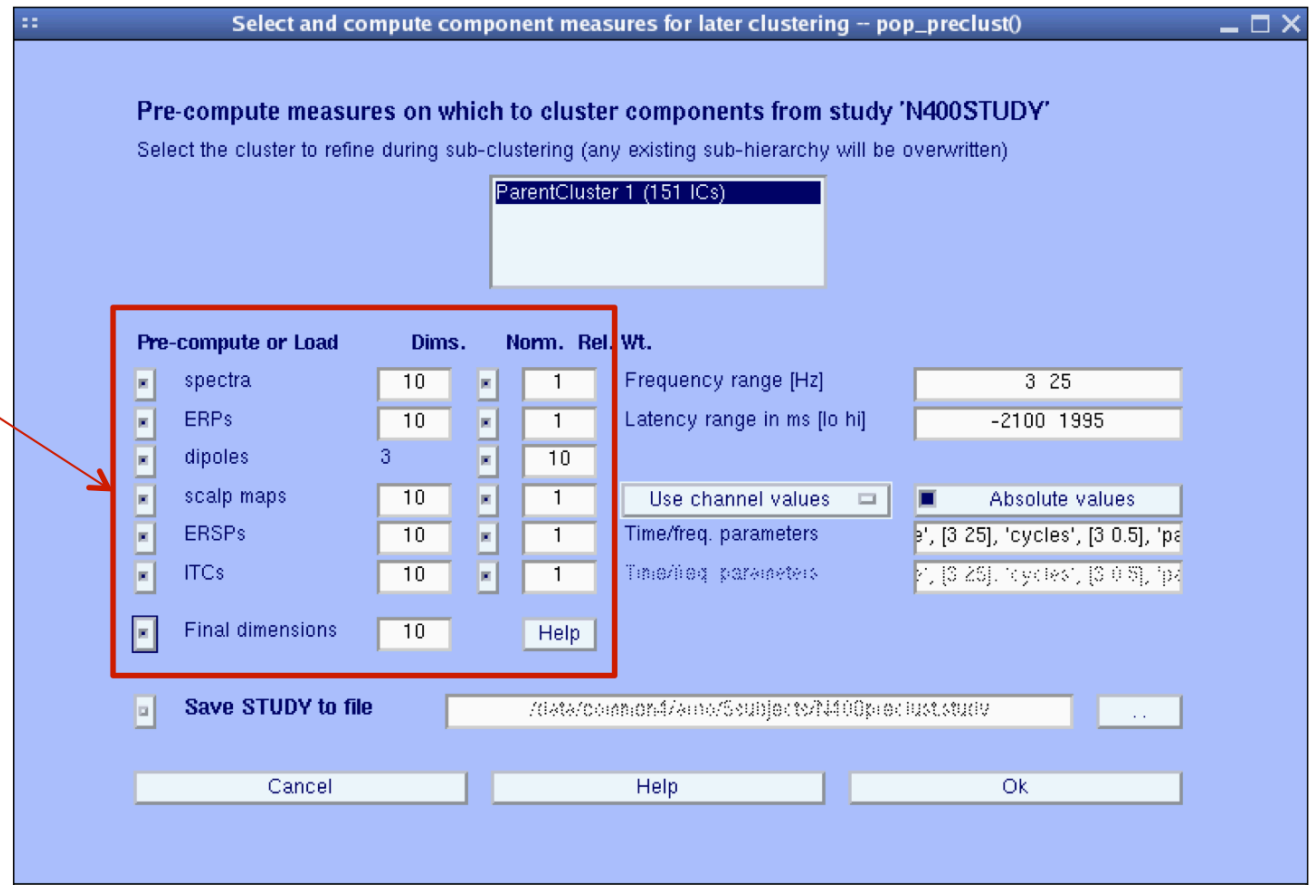
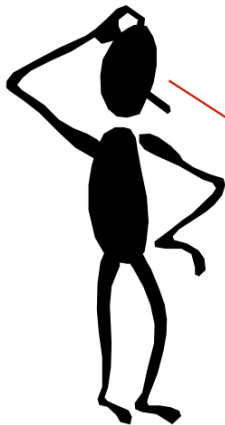
Bottom Section:
This section contains a checkbox for "Save STUDY set to disk" (checked), a text field with the path "/home/julie/workshop06/5subjects/WSstudy.study", and a "..." button. At the very bottom are "Cancel", "Help", and "Ok" buttons.

An orange arrow points from the "Plot dipole(s)" button in the dialog box to the brain scan window.

Issue with standard clustering

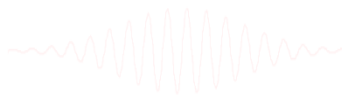
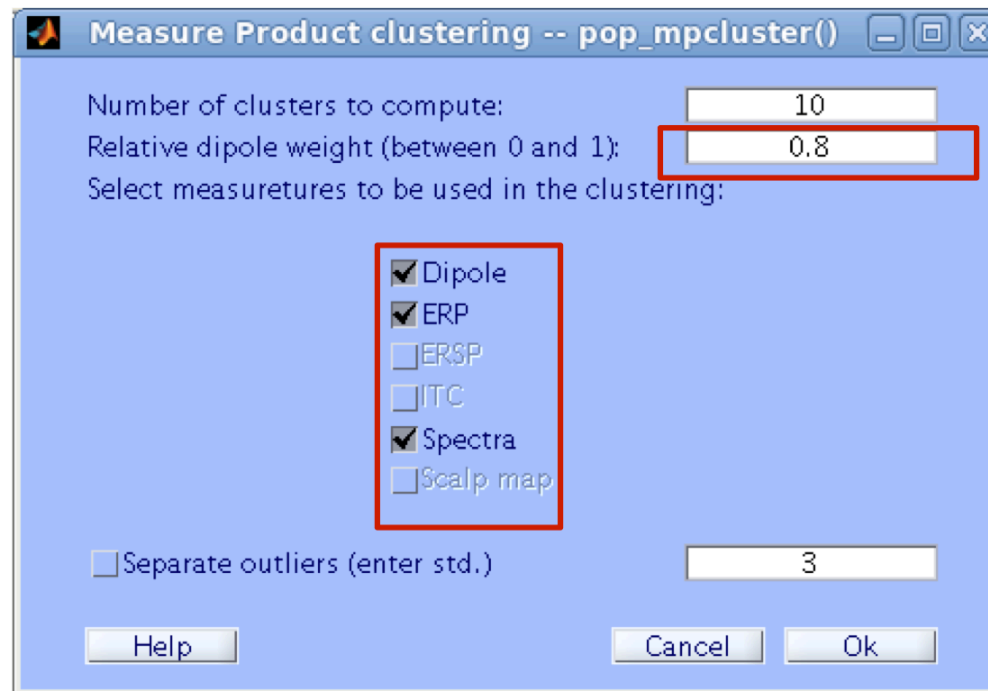
Large parameter space problem: many different clustering solutions can be produced by changing parameters and measure subsets. Which one should we choose?

EEGLAB clustering has ~12 parameters



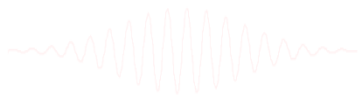
Measure projection

(EEGLAB plug-in by Nima Bigdely Shamlo)
only has one pre-clustering parameter.

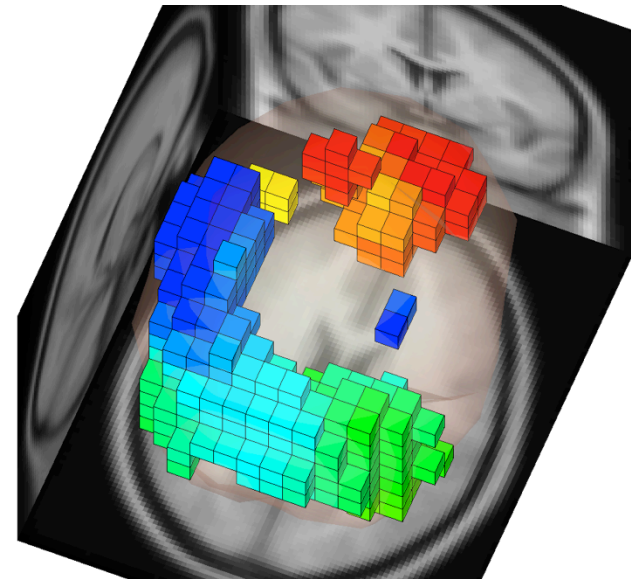
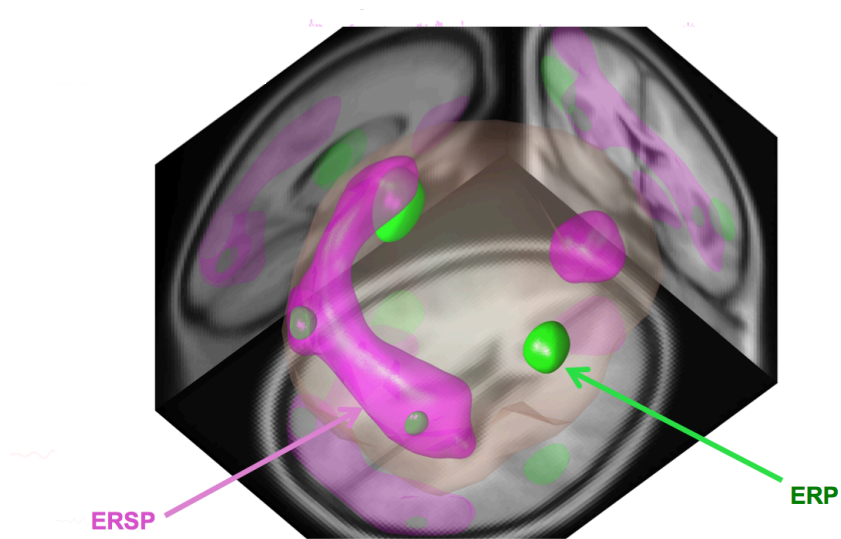
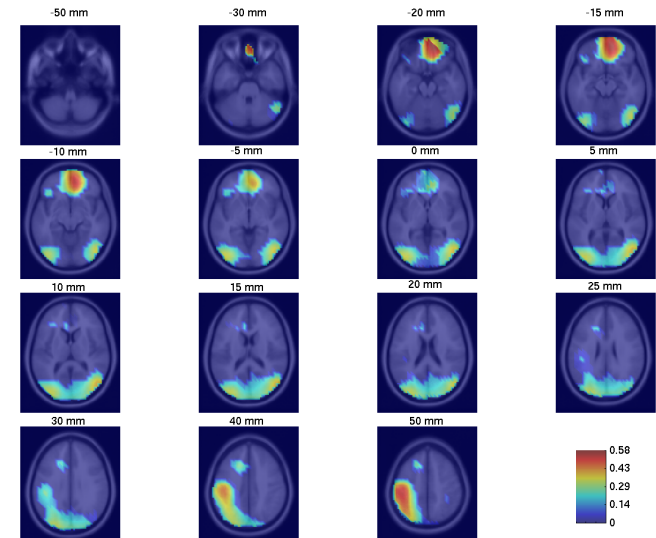
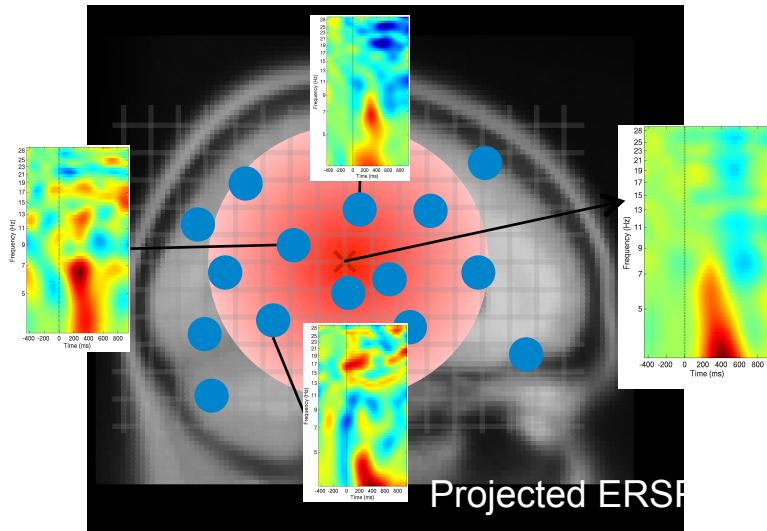


Measure projection

- **Instead**, we can directly work on pair-wise similarity matrices and prevent ICs with similarities less than certain threshold (e.g., ERSP corr. < 0.5) to be clustered together.
- The most important measure is **equivalent dipole location**



Measure Projection Toolbox



Exercise

- Load the Stern STUDY (STUDY folder)
- Precluster (pre-computation already done) and cluster components using measures of your choice. Experiment with different measures.

