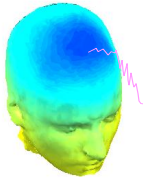
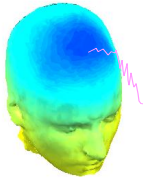
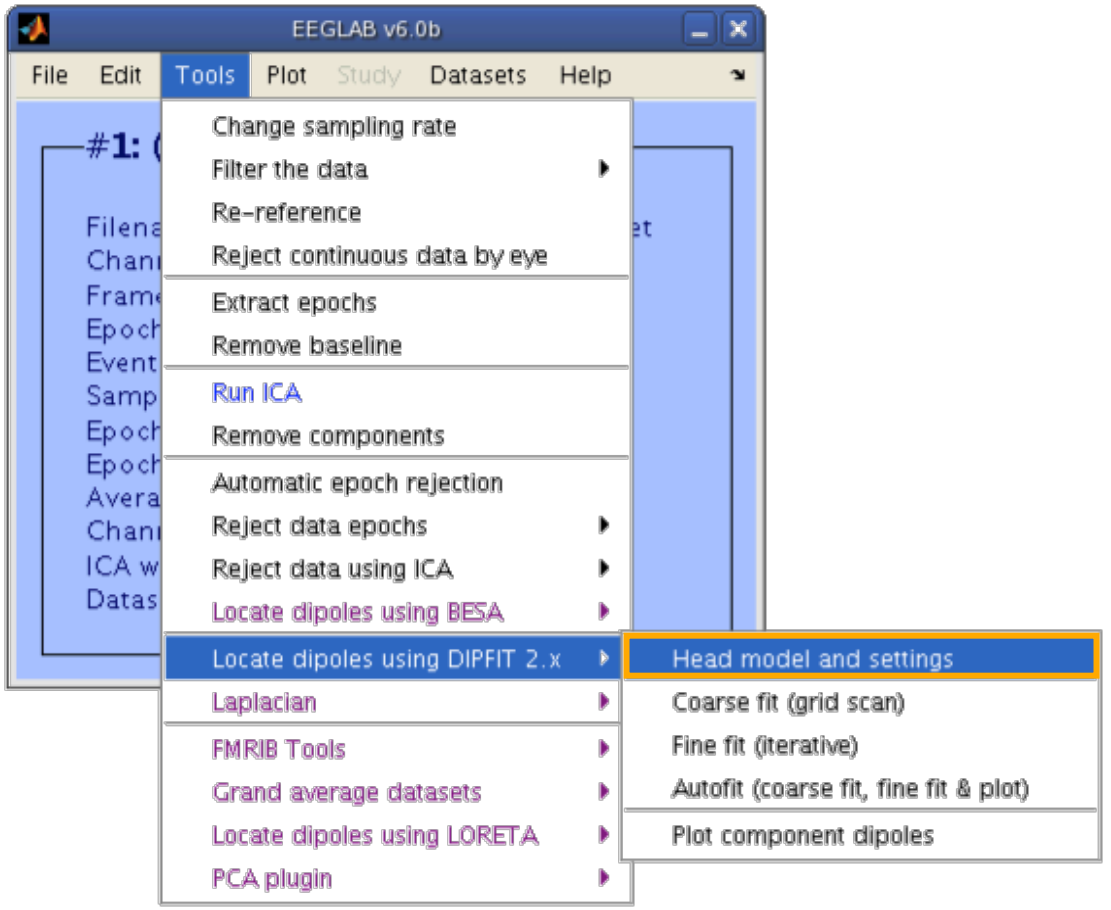
# DIPFIT and model co-registration



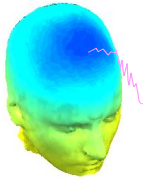
1. Co-register electrodes with model
2. Autofit, plot dipoles, fine fit
3. 3D headplot co-registration

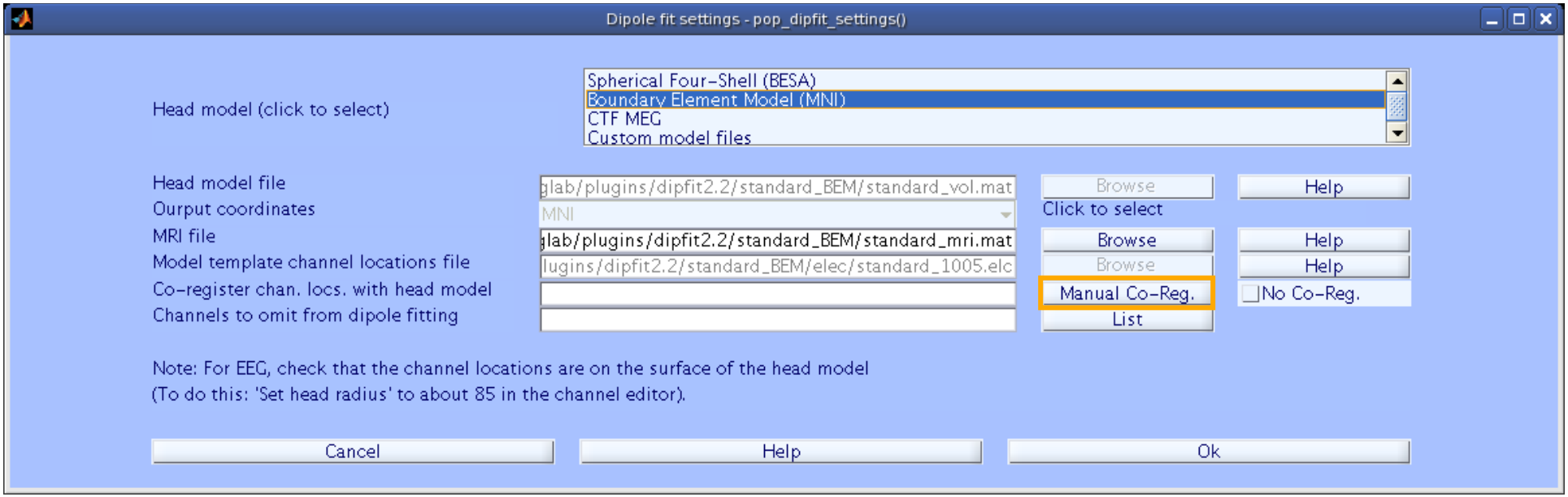
# Finding dipole locations using DIPFIT in EEGLAB



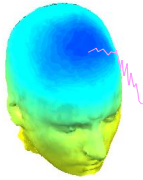


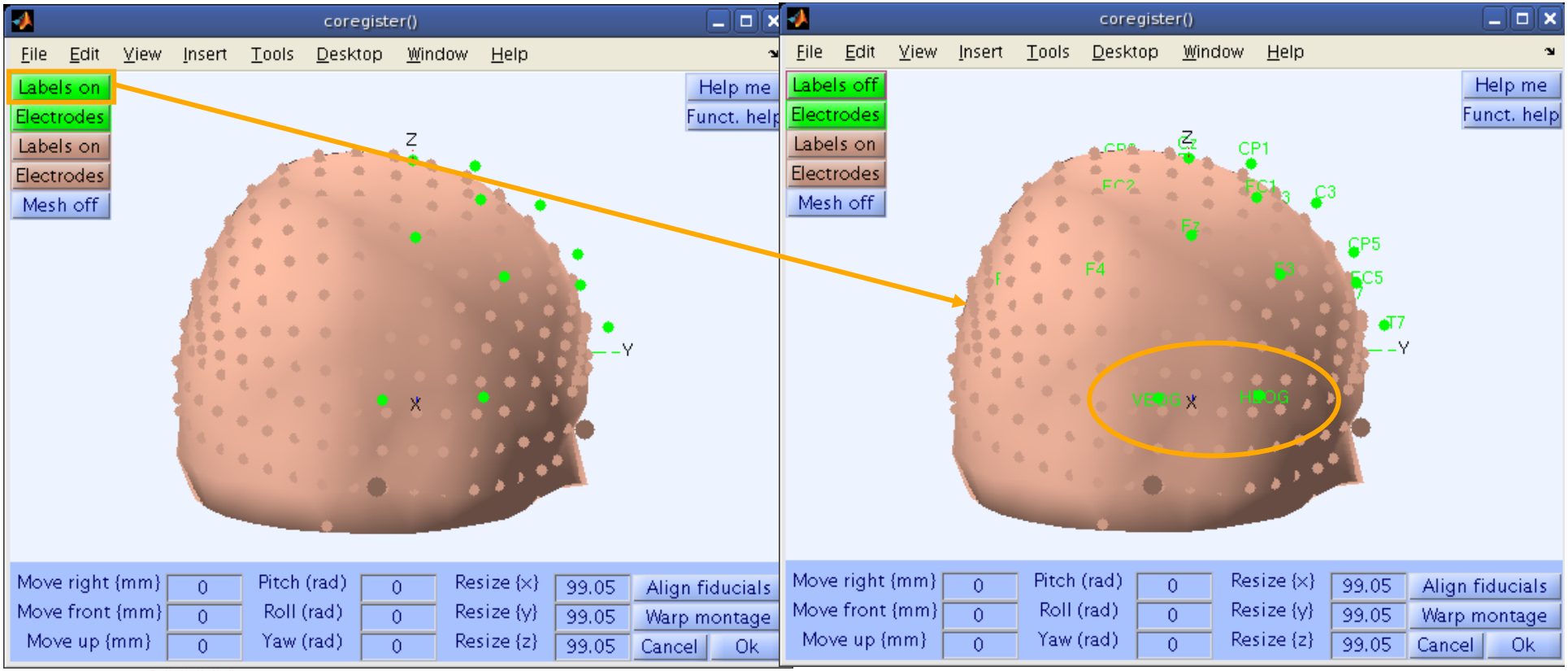
# Co-register to model



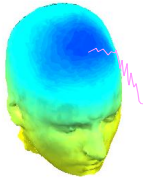


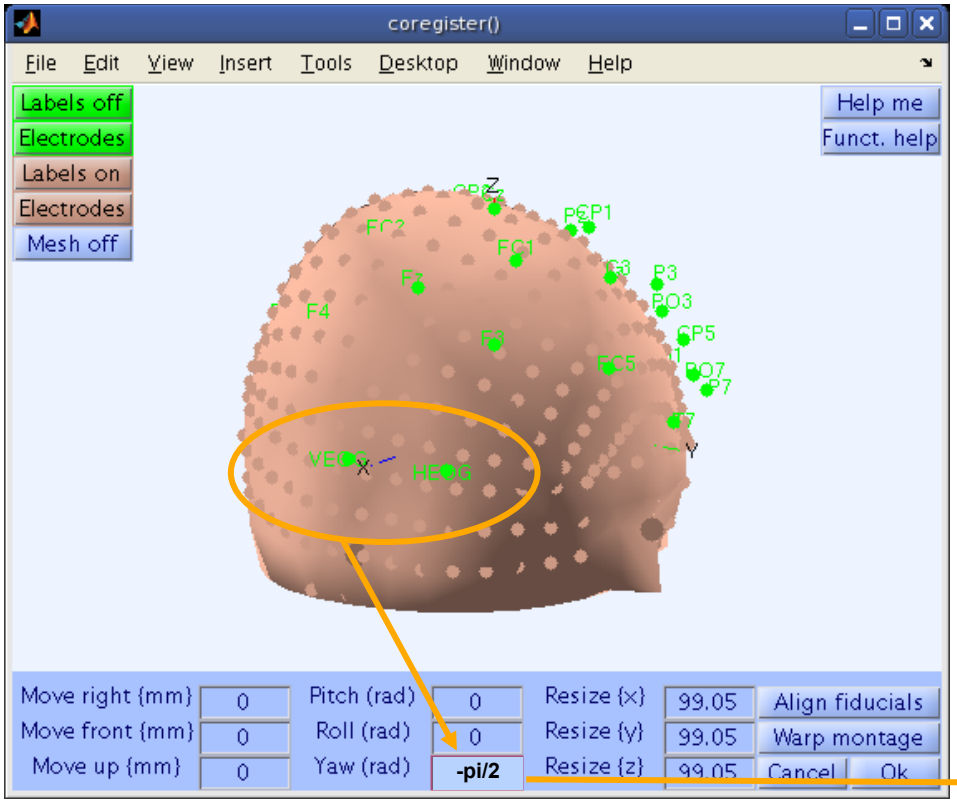
# Co-register to model, cont'd

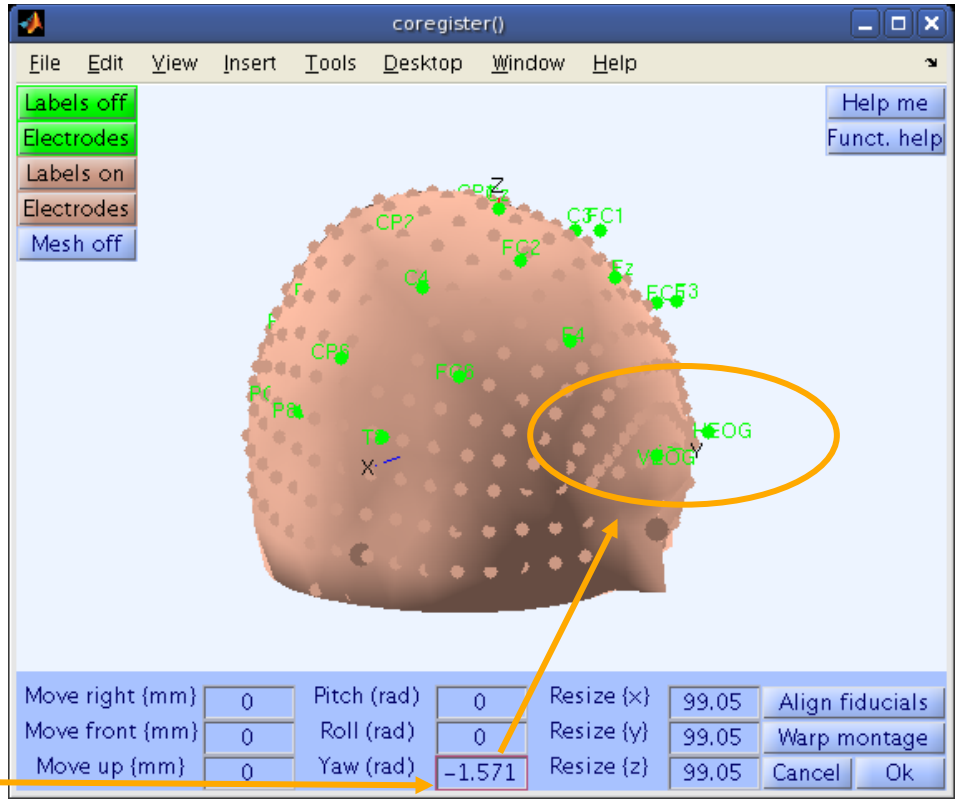




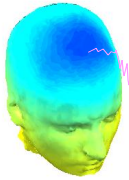
# Perform translation of electrode positions

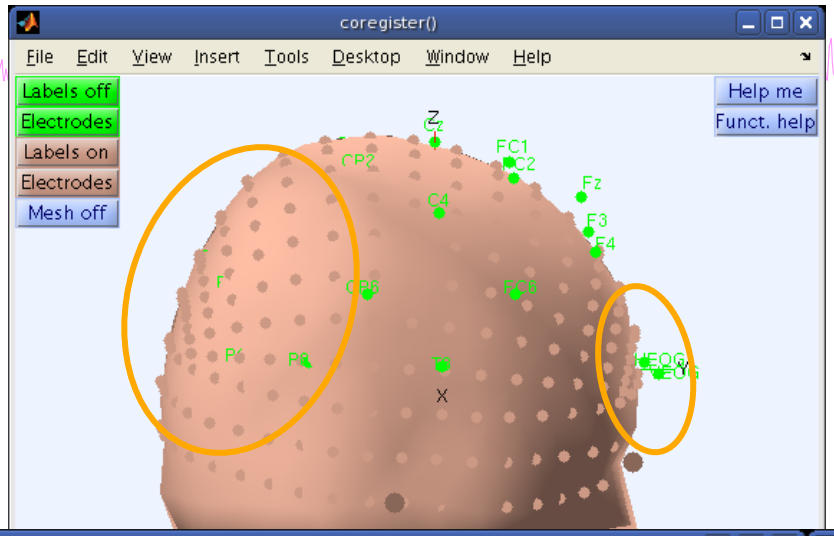


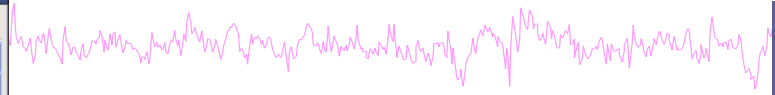


# Perform translation of electrode positions



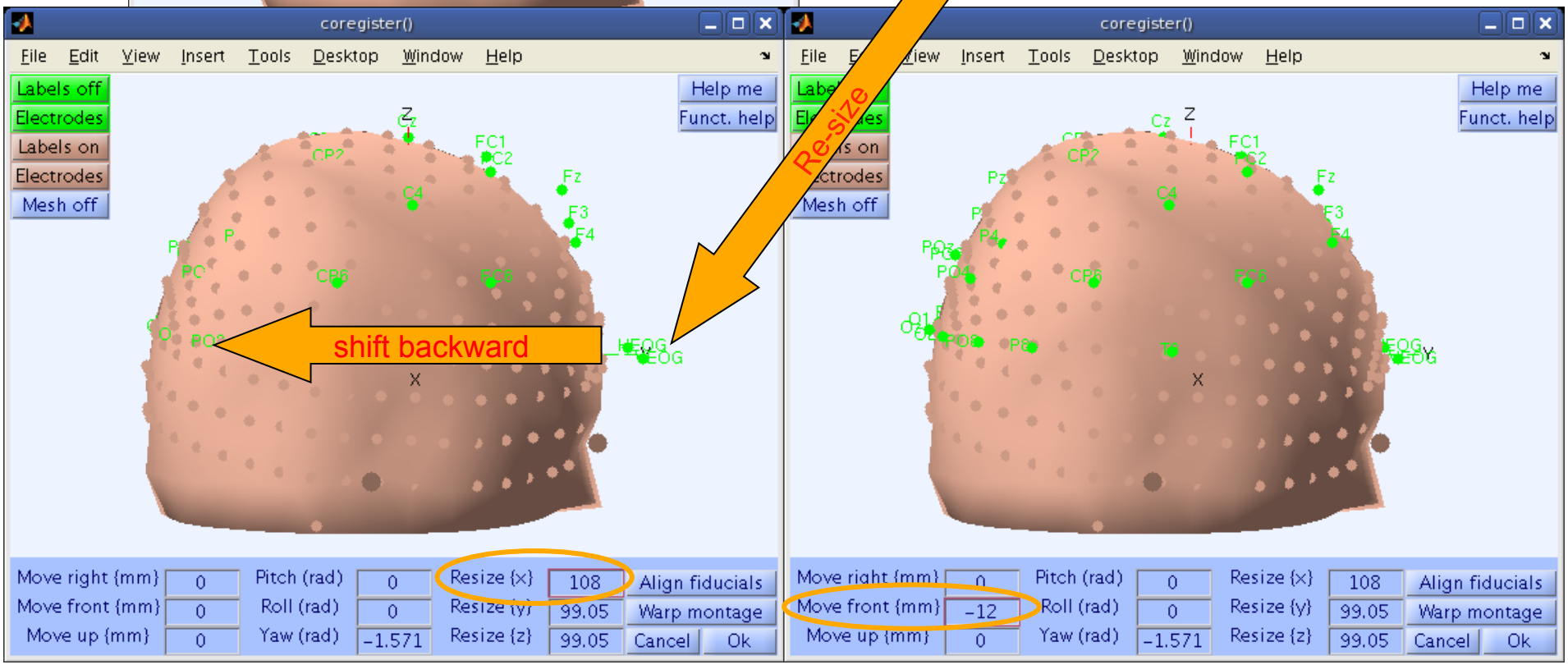


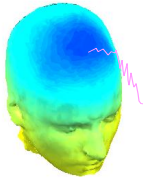
Requires a shift toward back of the head

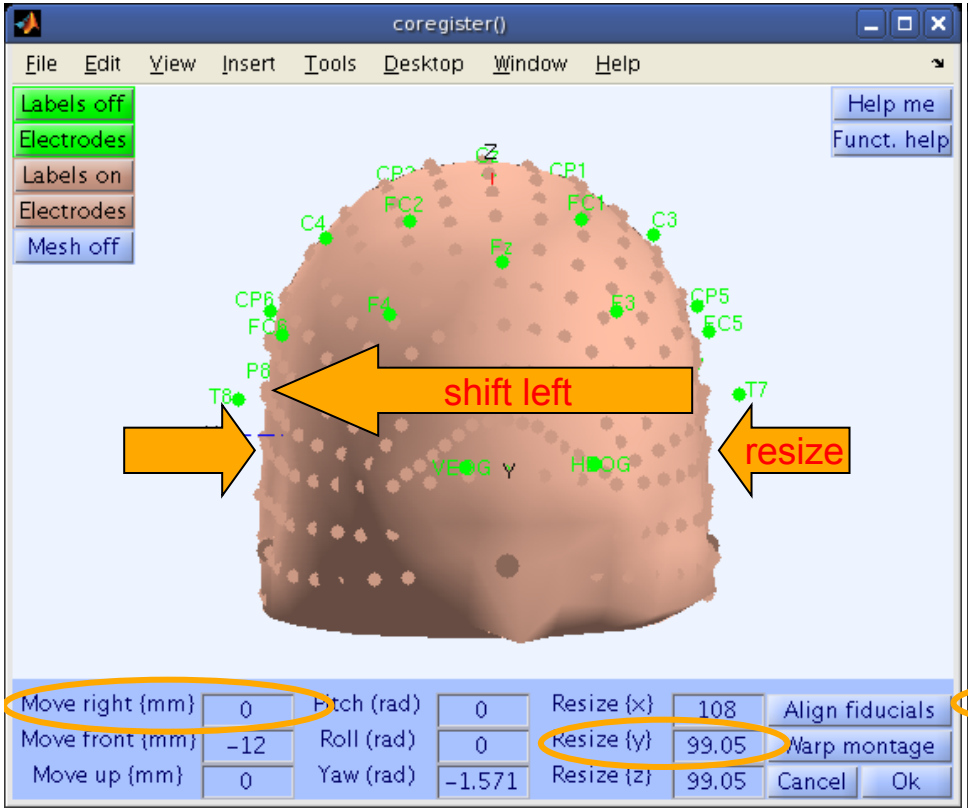
AND

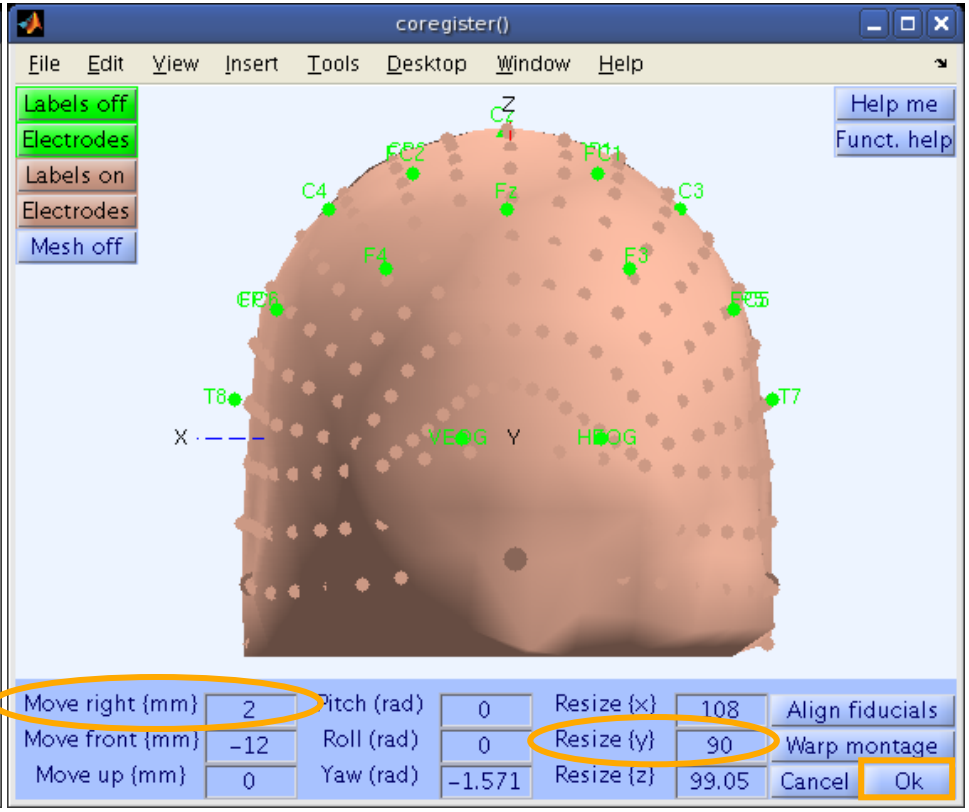
an expansion along the X-axis



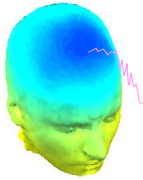
# Perform translation of electrode positions

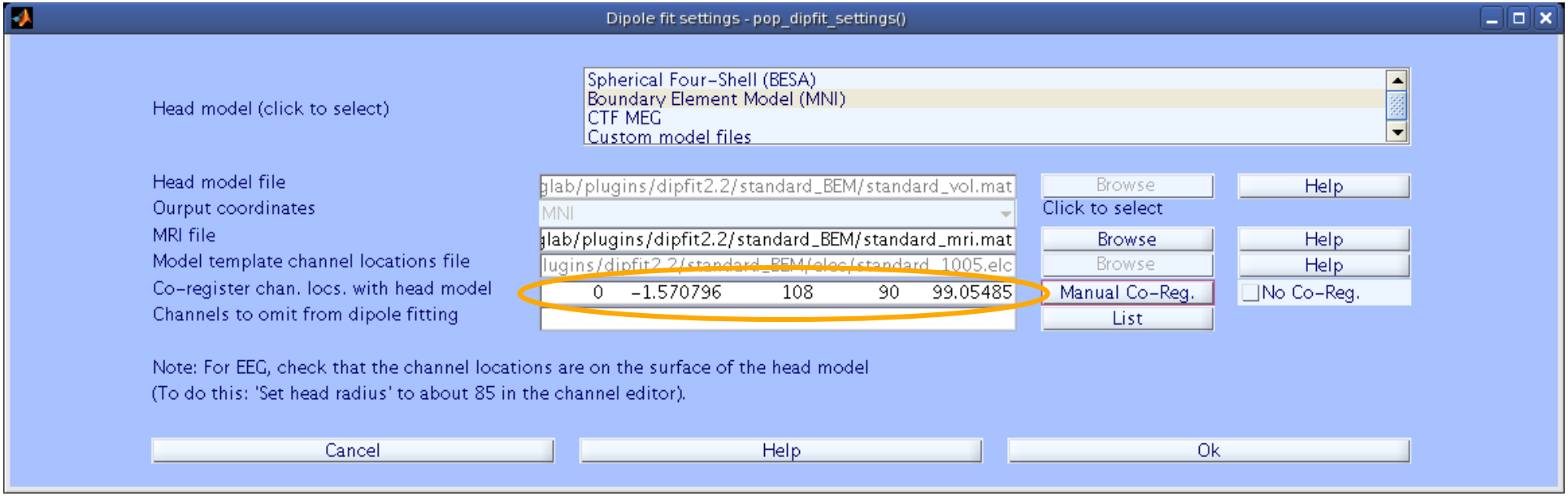




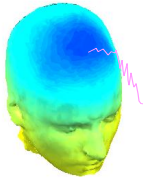



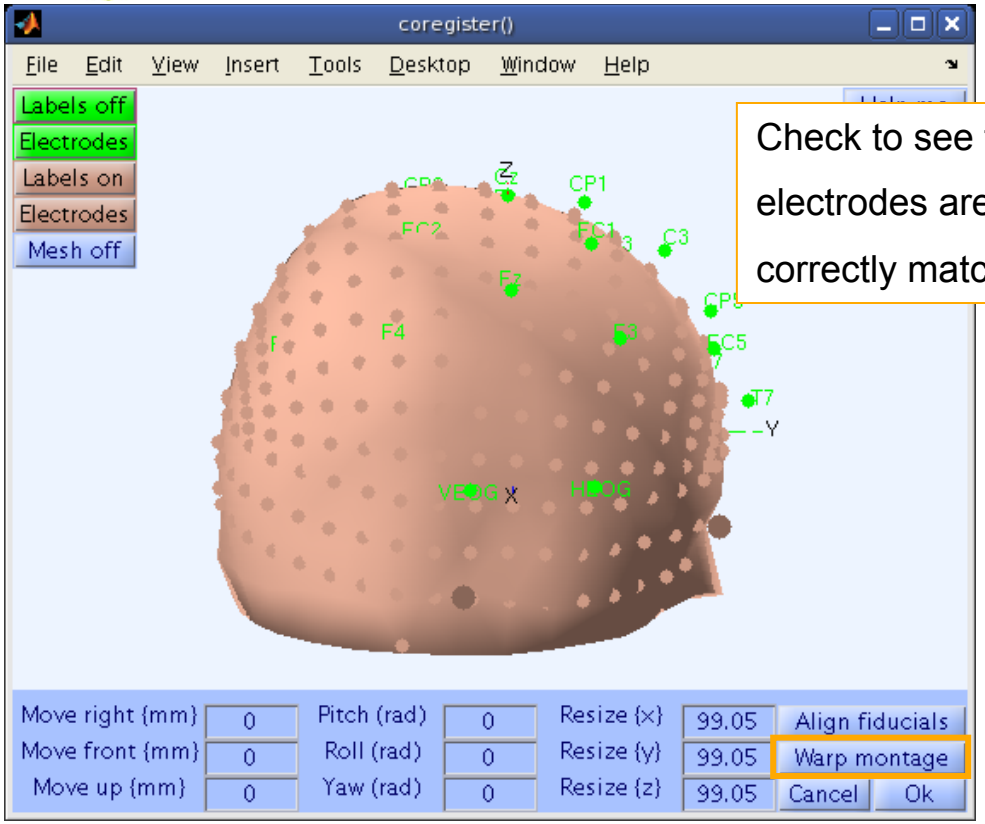
# Confirm electrode transformation



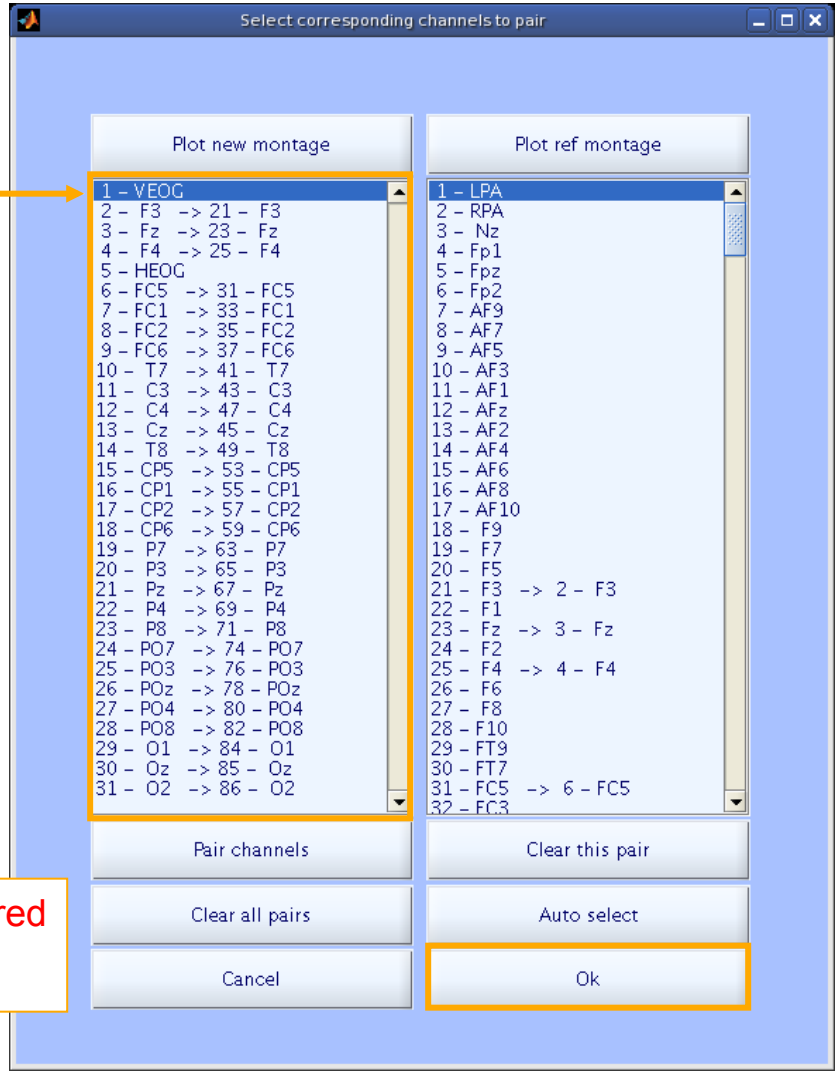


# Alternatively, warp to standard montage



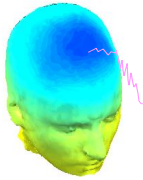


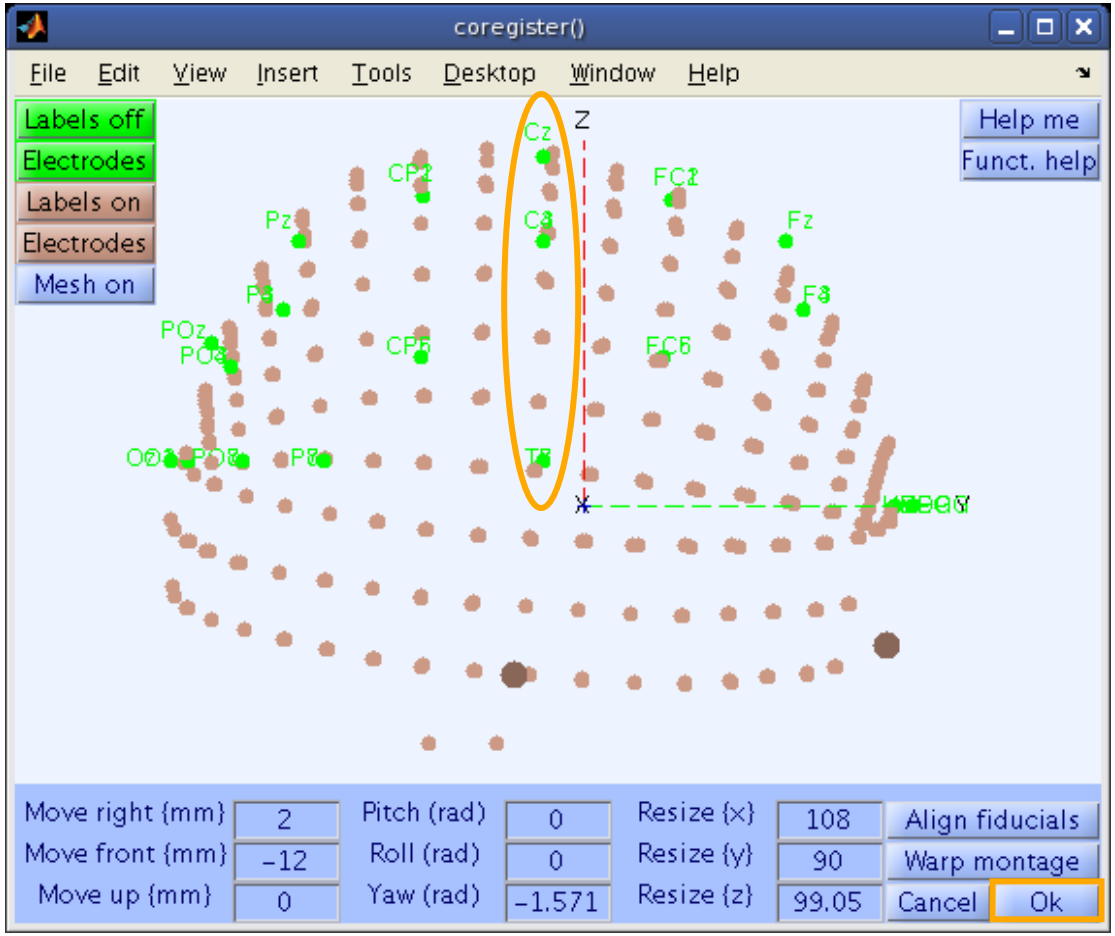

Check to see that electrodes are correctly matched



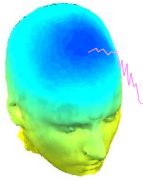

stats toolbox required for warping

# Check coregistration with model





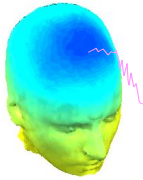
# EEG.dipfit structure



```
>> EEG.dipfit
ans =
            hdmfile: [1x76 char]
            mrifile: [1x71 char]
           chanfile: [1x83 char]
            chansel: [1x33 double]
         coordformat: 'spherical'
              model: [1x33 struct]
            current: 32
                vol: [1x1 struct]
     coord_transform: [0 0 -1.570796 100 76 90.87264 1 1 1]
```

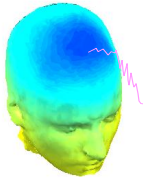
From head model transformations

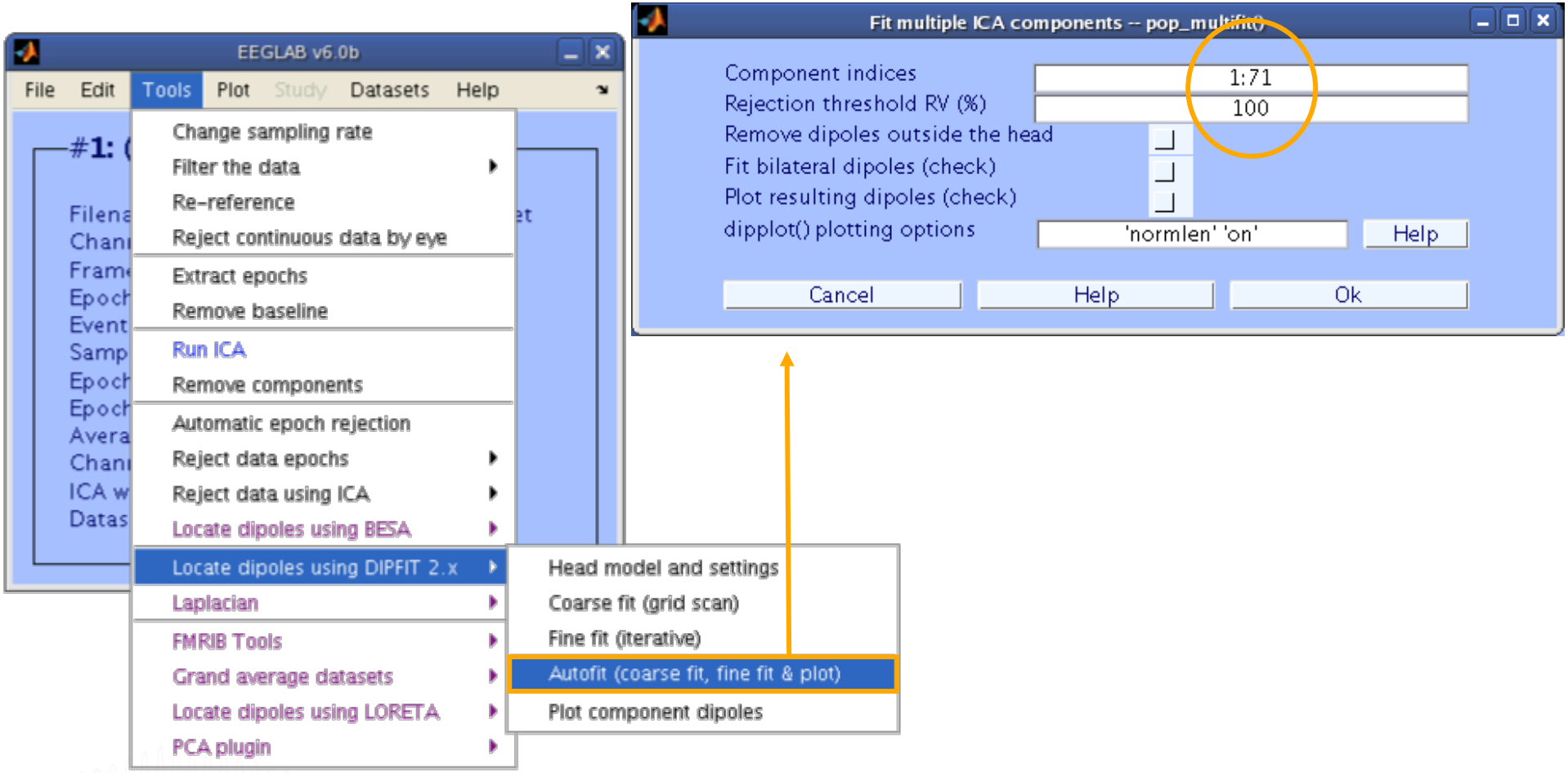
# DIPFIT and model co-registration



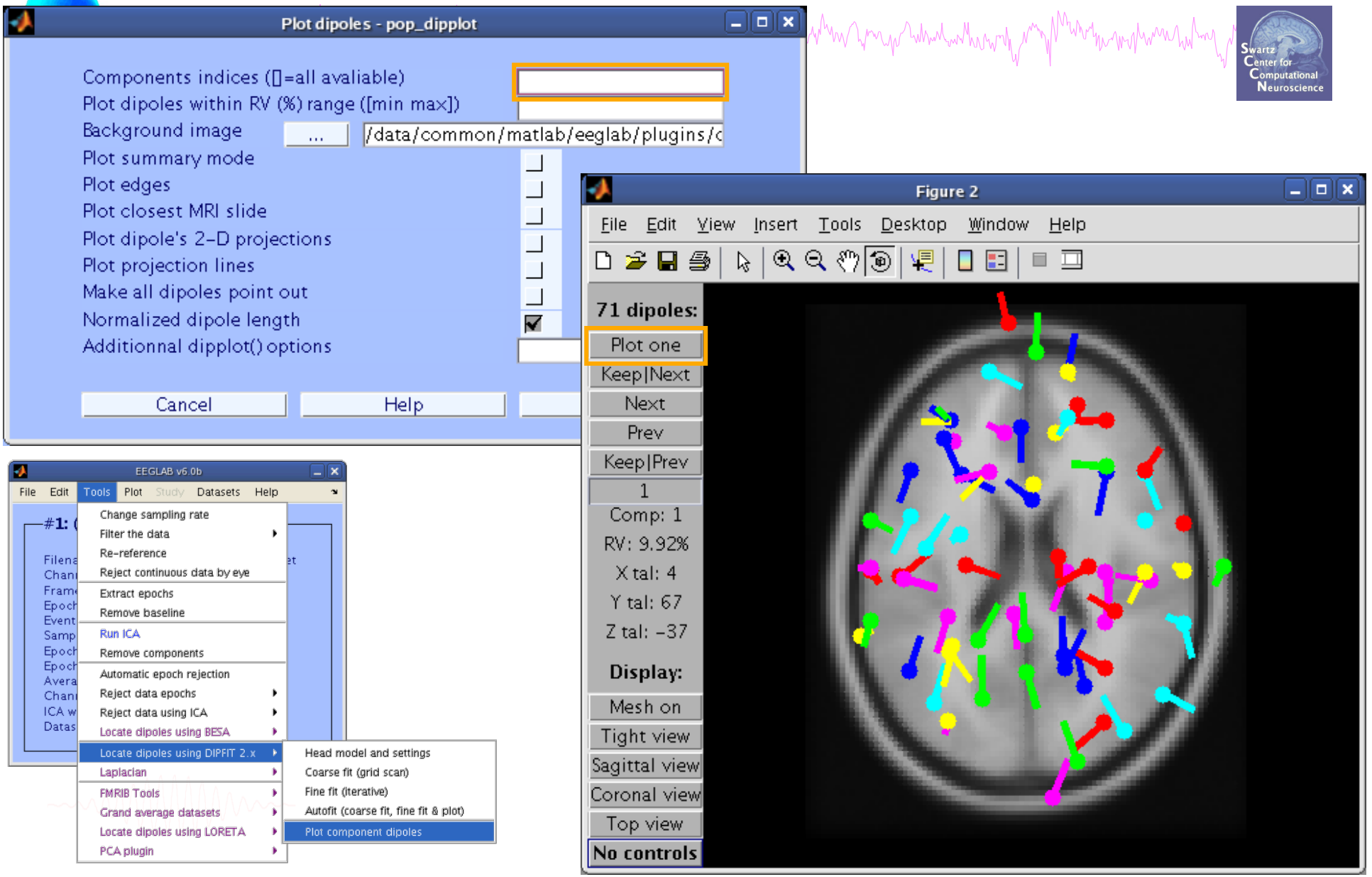
1. Co-register electrodes with model
2. Autofit, plot dipoles, fine fit
3. 3D headplot co-registration

# Autofit equivalent dipoles

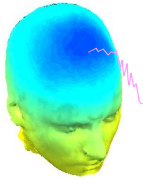


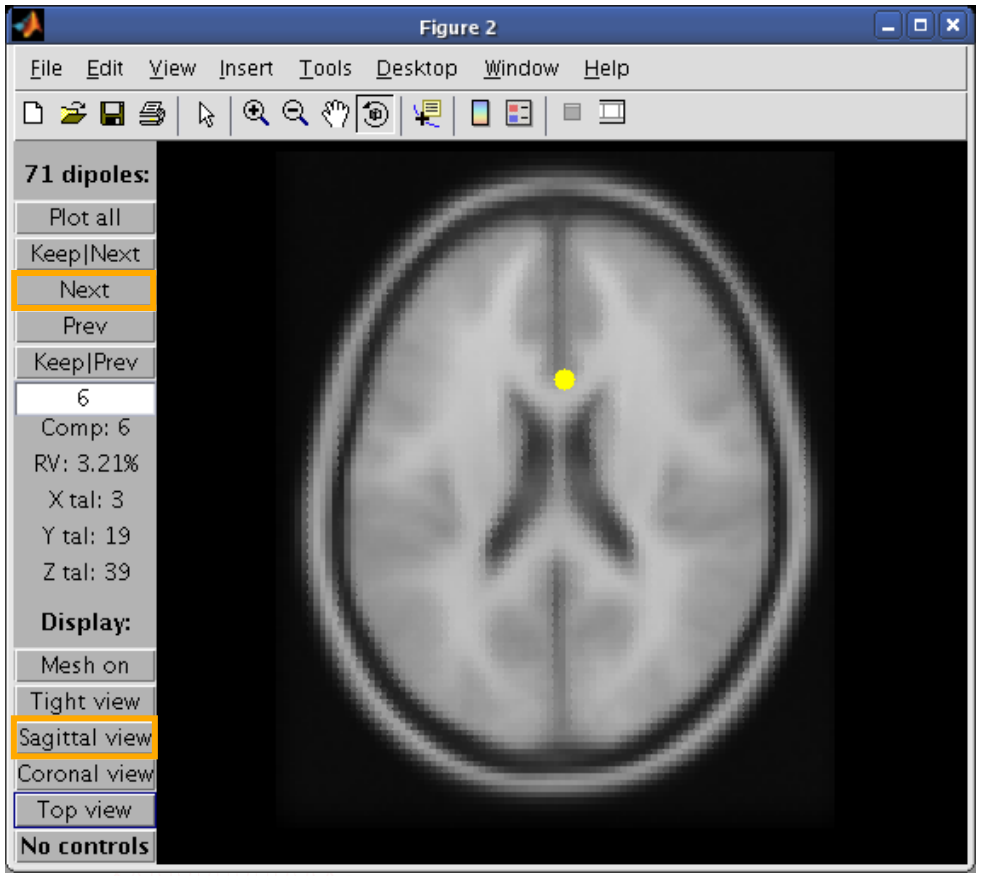


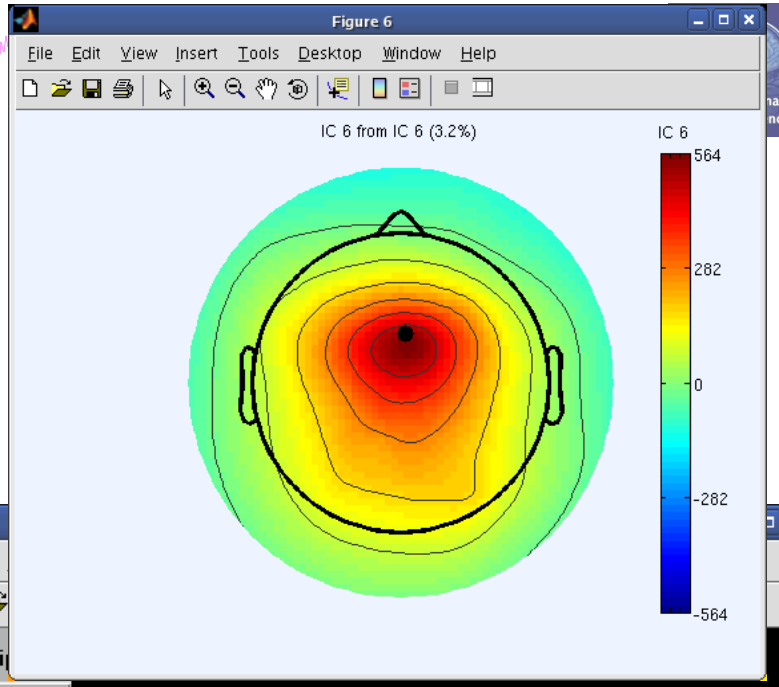
# Plot dipoles

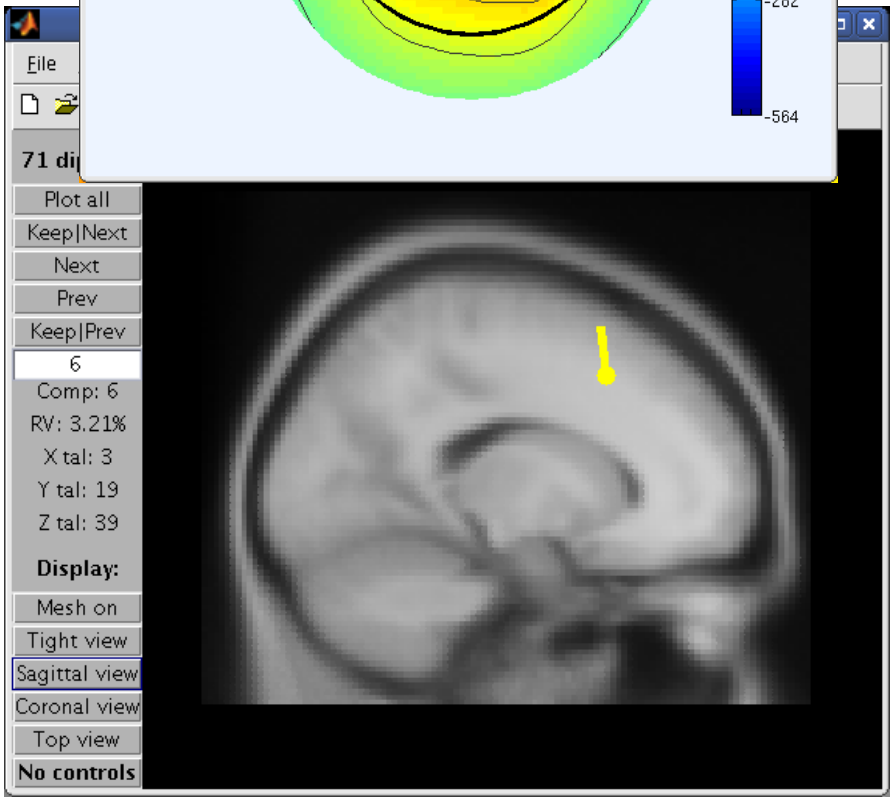


# Scroll through dipoles

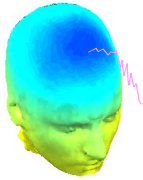


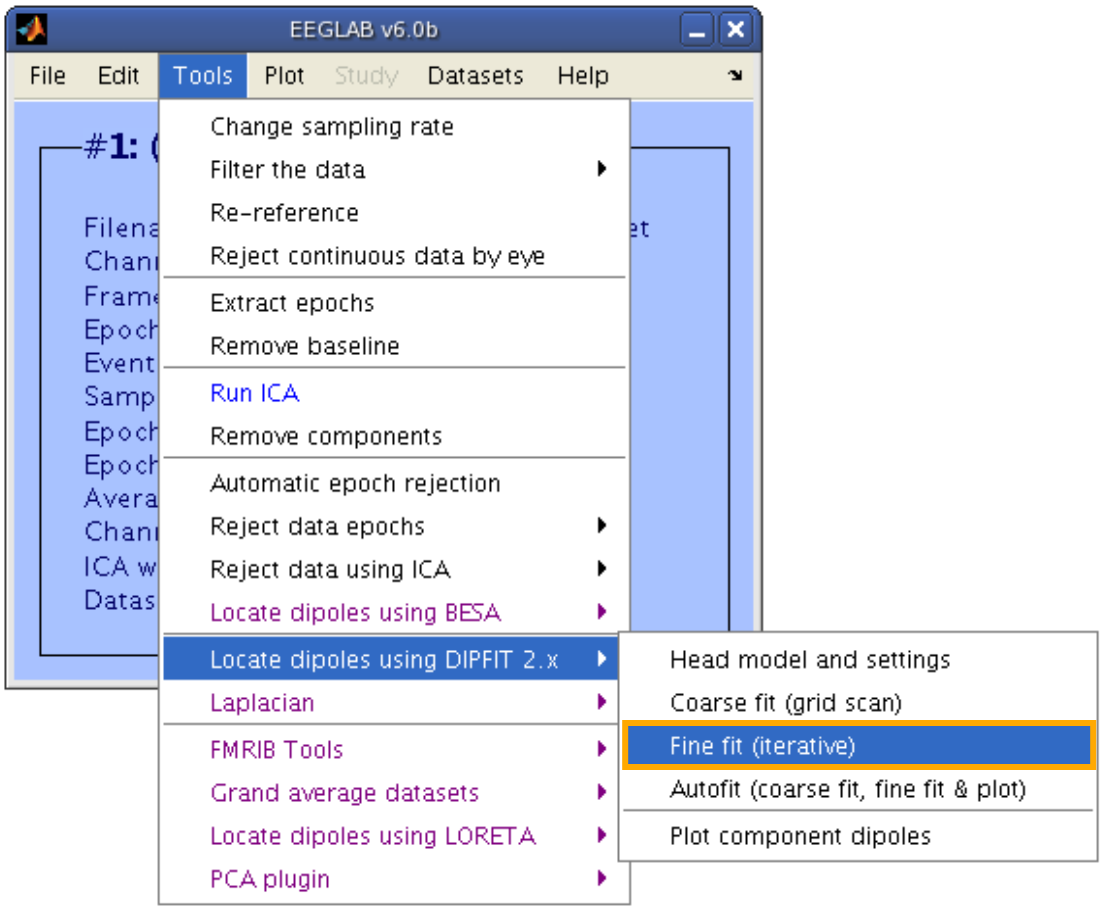


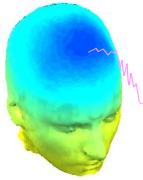



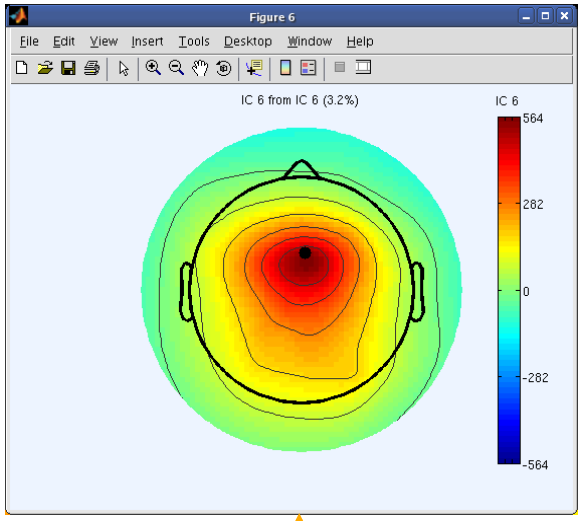
# Fine fit options in DIPFIT





# Fine fit menu






Manual dipole fit -- pop_dipfit_nonlinear()

Component to fit 6 | Plot map | Residual variance = 3.21%

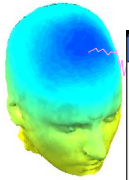
| dipole | fit | position | moment | |
|---|---|---|---|---|
| #1 | ☑ | 28.222 -2.401 37.331 | 2.380 475942.653 3819304.288 | Flip (in\|out) |
| #2 | ☐ | 0.000 0.000 0.000 | 0.000 0.000 0.000 | Flip (in\|out) |

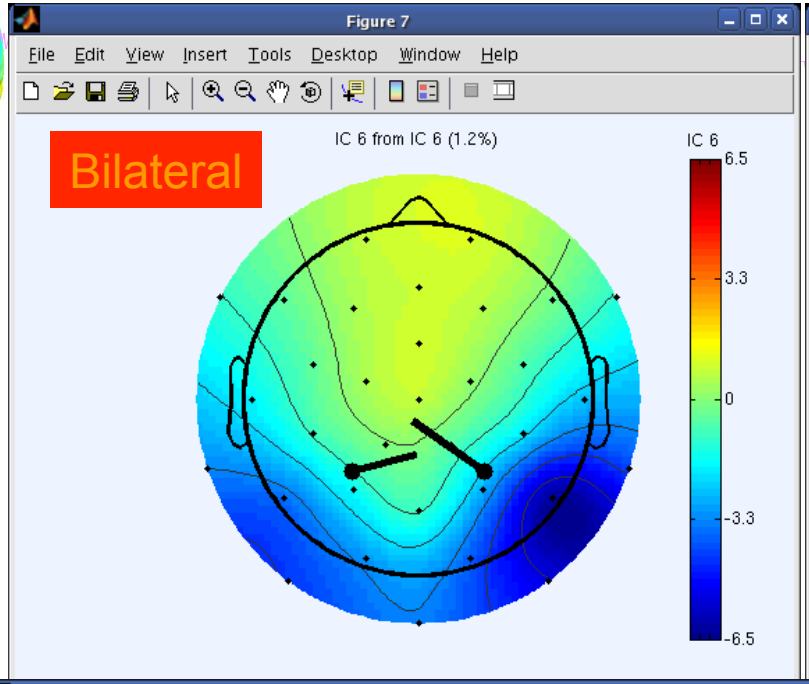
☑ Symmetry constrain for dipole ...

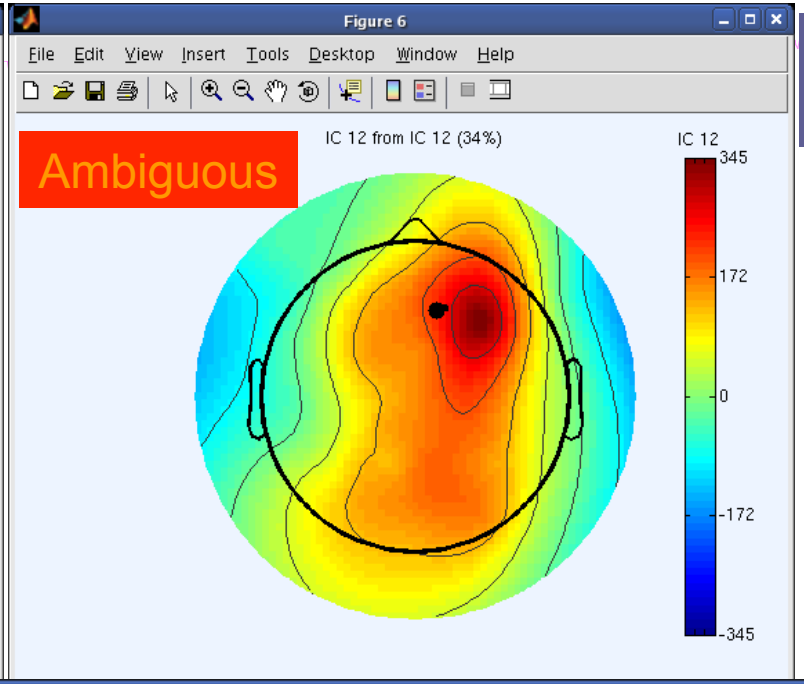
Fit dipole(s)' position & moment | Or fit only dipole(s)' moment | Plot dipole(s)

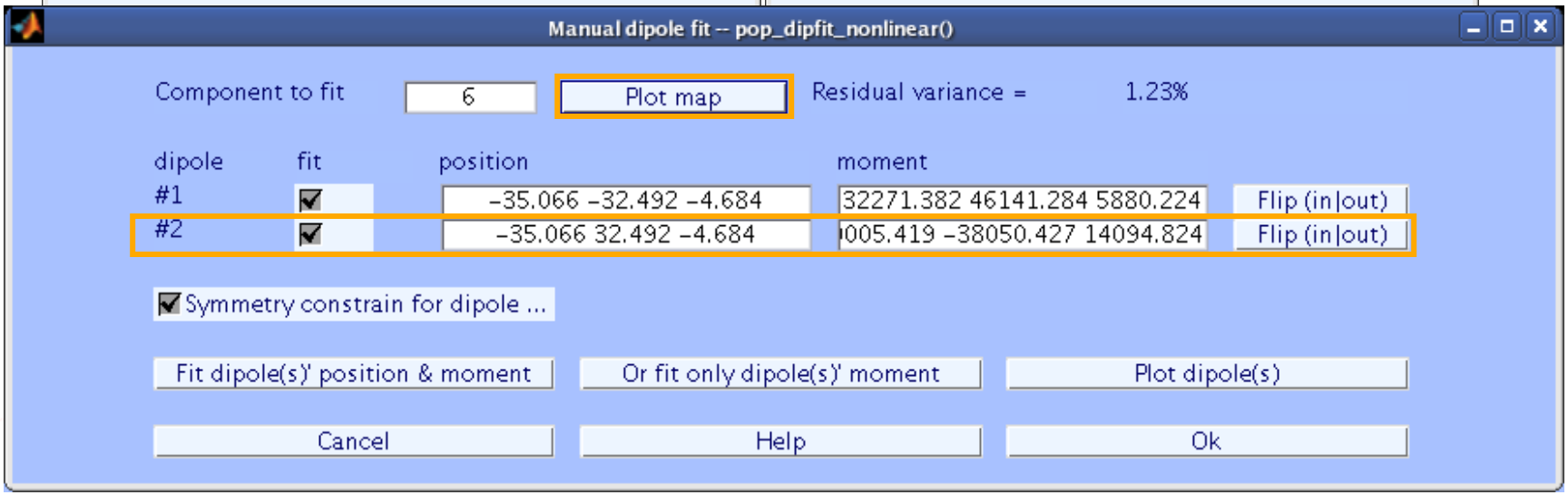
Cancel | Help | Ok

# Bilateral dipoles

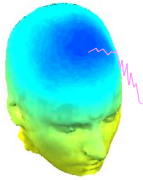






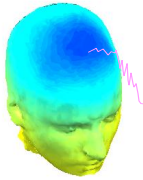
# EEG.dipfit structure

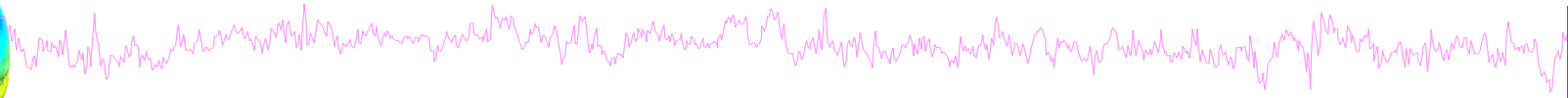


```
>> EEG.dipfit.model
ans =

1x33 struct array with fields:
    posxyz
    momxyz
    rv
    active
    select

>> EEG.dipfit.model(1)
ans =

    posxyz: [1x3 double]
    momxyz: [1x3 double]
        rv: 0.0288
    active: 1
    select: 1
```

```
                X           Y           Z
[14.9791   -86.0094   47.9448]
```

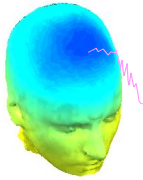
# DIPFIT and model co-registration

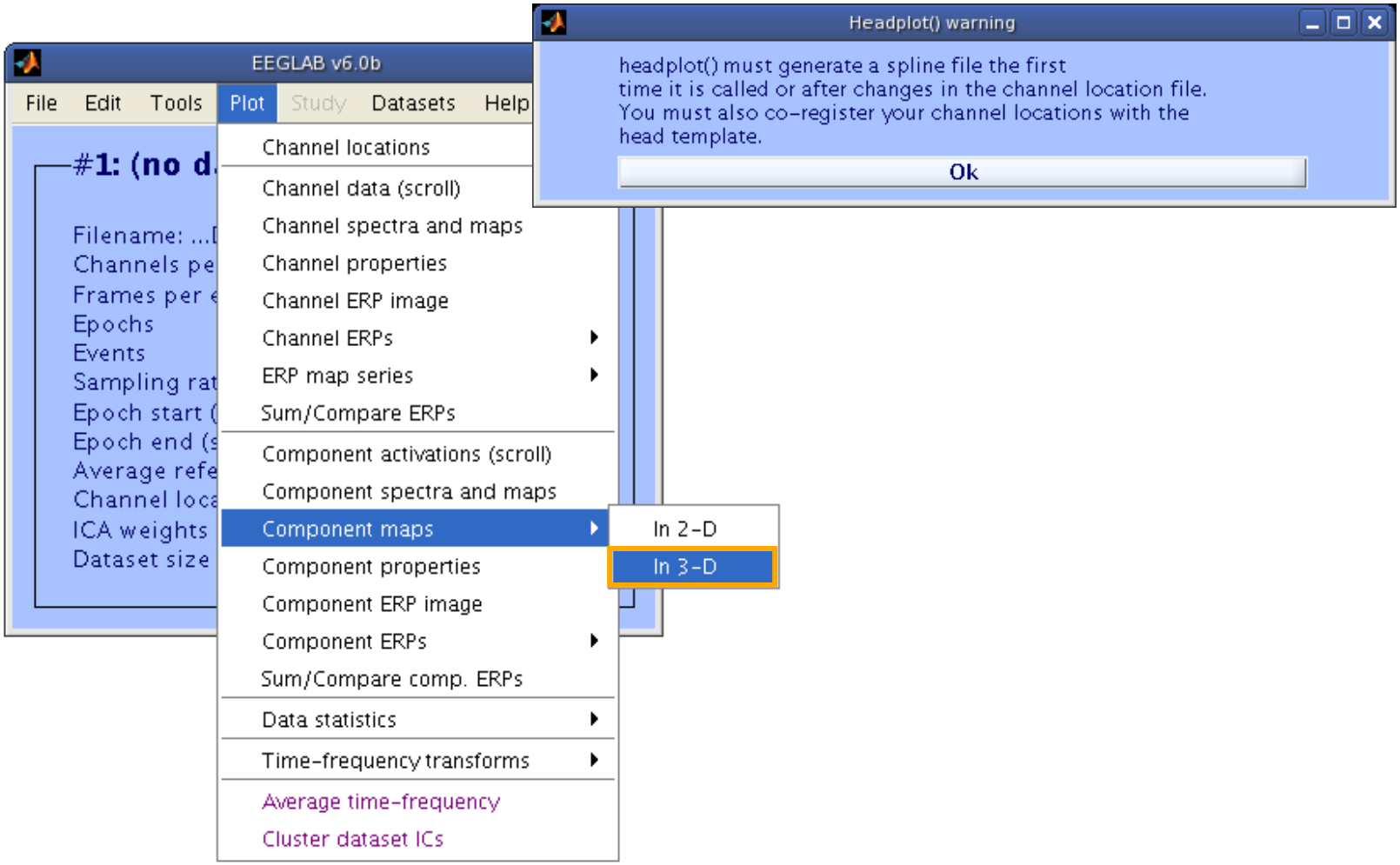




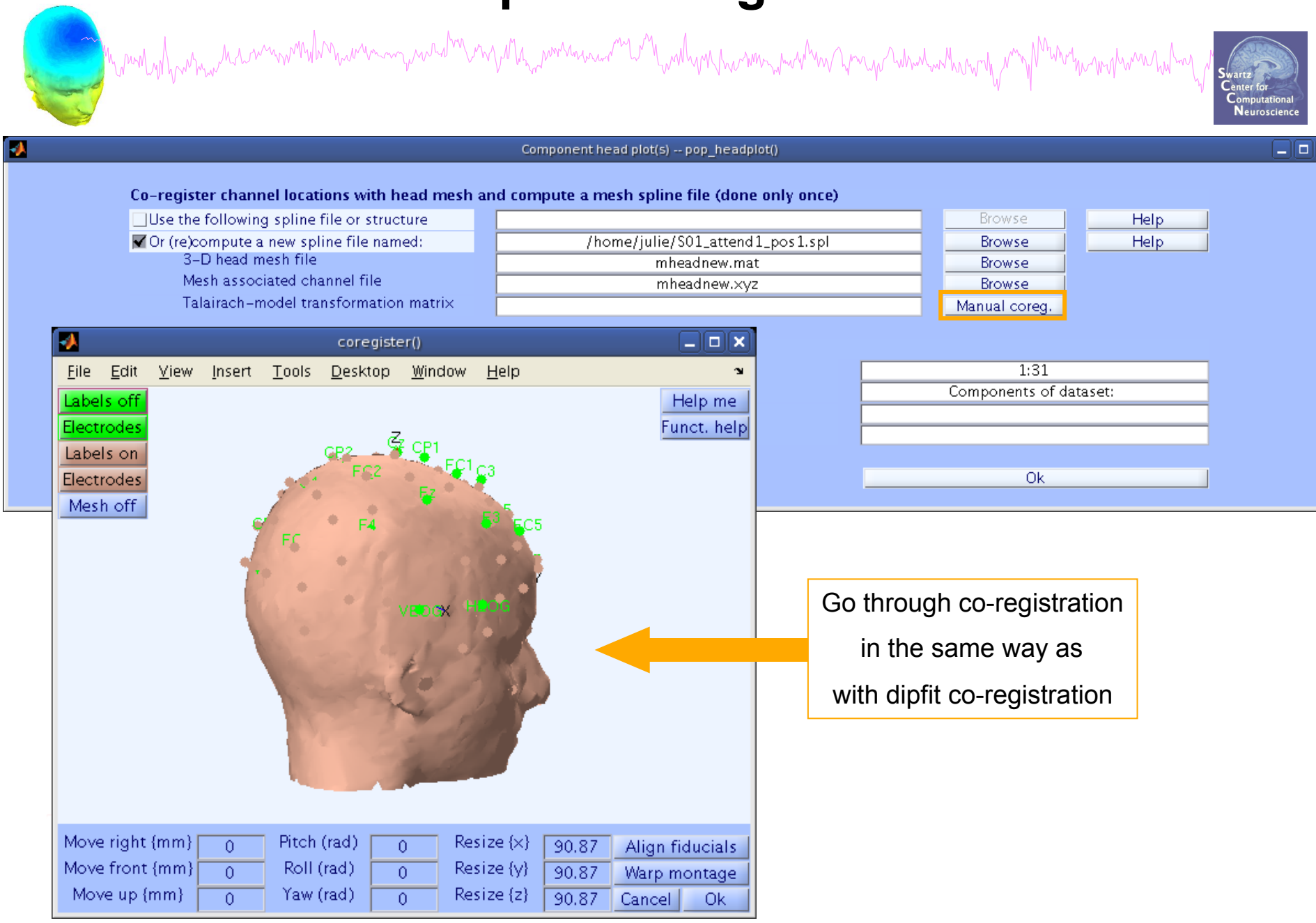
1. Co-register electrodes with model
2. Autofit, plot dipoles, fine fit
3. 3D headplot co-registration

# Plot scalp maps in 3D



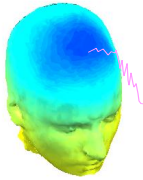


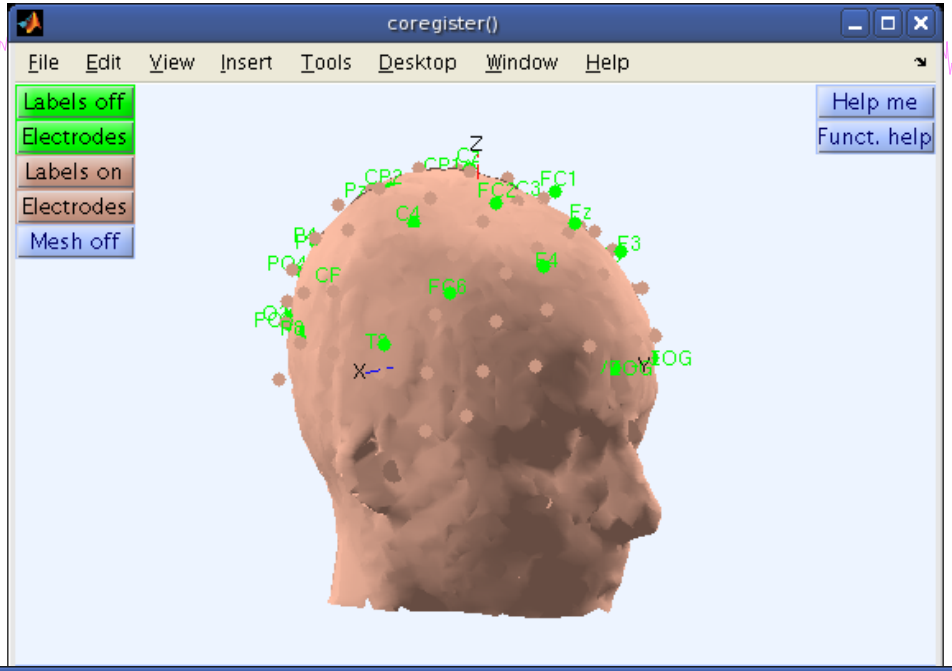
# Headplot co-registration




Go through co-registration in the same way as with dipfit co-registration

# Confirm headplot co-registration






Component head plot(s) -- pop_headplot()

**Co-register channel locations with head mesh and compute a mesh spline file (done only once)**

| | | | |
|---|---|---|---|
| ☐ Use the following spline file or structure | | Browse | Help |
| ☑ Or (re)compute a new spline file named: | /home/julie/S01_attend1_pos1.spl | Browse | Help |
| 3-D head mesh file | mheadnew.mat | Browse | |
| Mesh associated channel file | mheadnew.xyz | Browse | |
| Talairach-model transformation matrix | 0 0 -1.570796 100 76 90.87264 | Manual coreg. | |

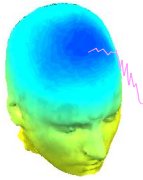
**Plot interpolated activity onto 3-D head**

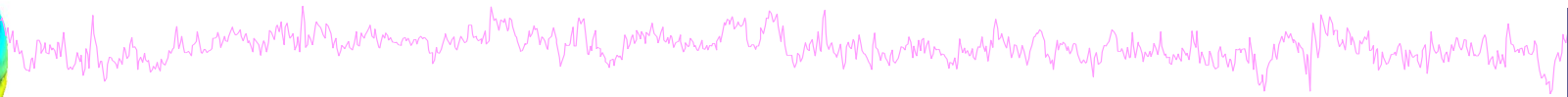
| | |
|---|---|
| Component numbers to plot (negative numbers invert comp. polarities): | 1:31 |
| Plot title: | Components of dataset: |
| Plot geometry (rows,columns): (Default [] = near square) | |
| -> headplot() options (See >> help headplot): | |

Cancel

Ok

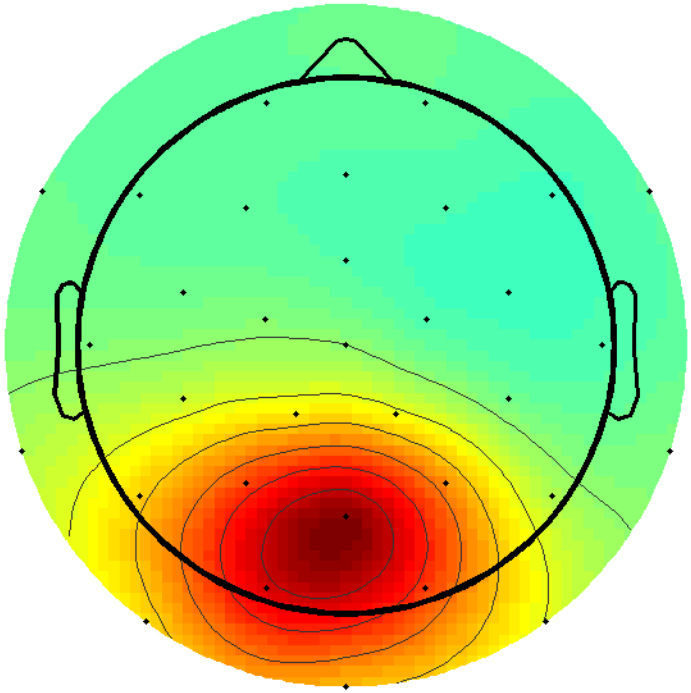
# Spline file in EEG structure



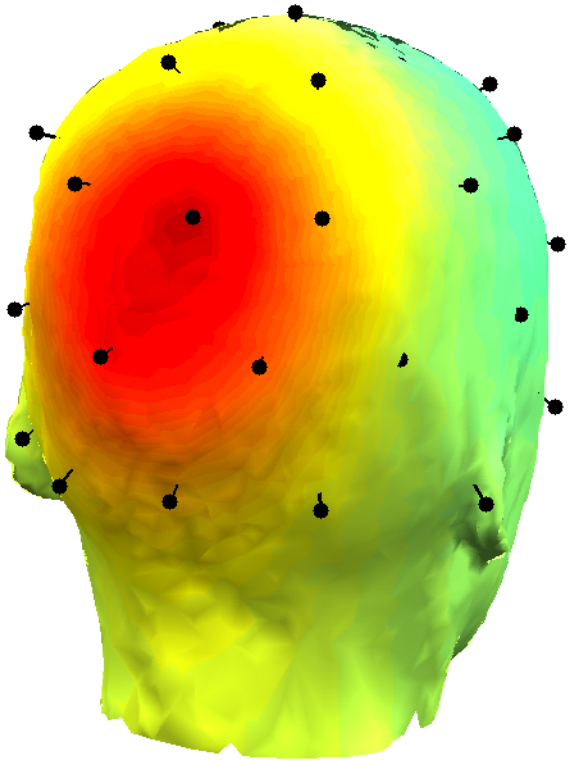


Swartz Center for Computational Neuroscience

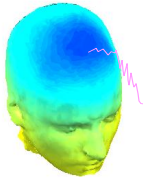
**2D scalp map for IC 12**



**3D scalp map for IC 12**



# Exercise



- **Novice / Intermediate**
  - Load ‘stern125.set’
  - Practice co-registering electrodes with **BEM** model (choose 'Erase' because this dataset has co-registration done already)
  - Autofit IC dipoles
  - Fine fit dipoles
  - Plot dipoles from the GUI; scroll through components individually
  - Co-register the head model for 3D scalp map plotting. Then plot some ICs in 3D
- **Advanced**

  - In the Finefit menu, try fitting a bilateral dipole, what happens to the residual variance?

  - Try plotting a subset of dipoles in 'summary mode'

  - Try purposely misaligning electrodes with model, how far off are the resulting dipoles from the original locations?