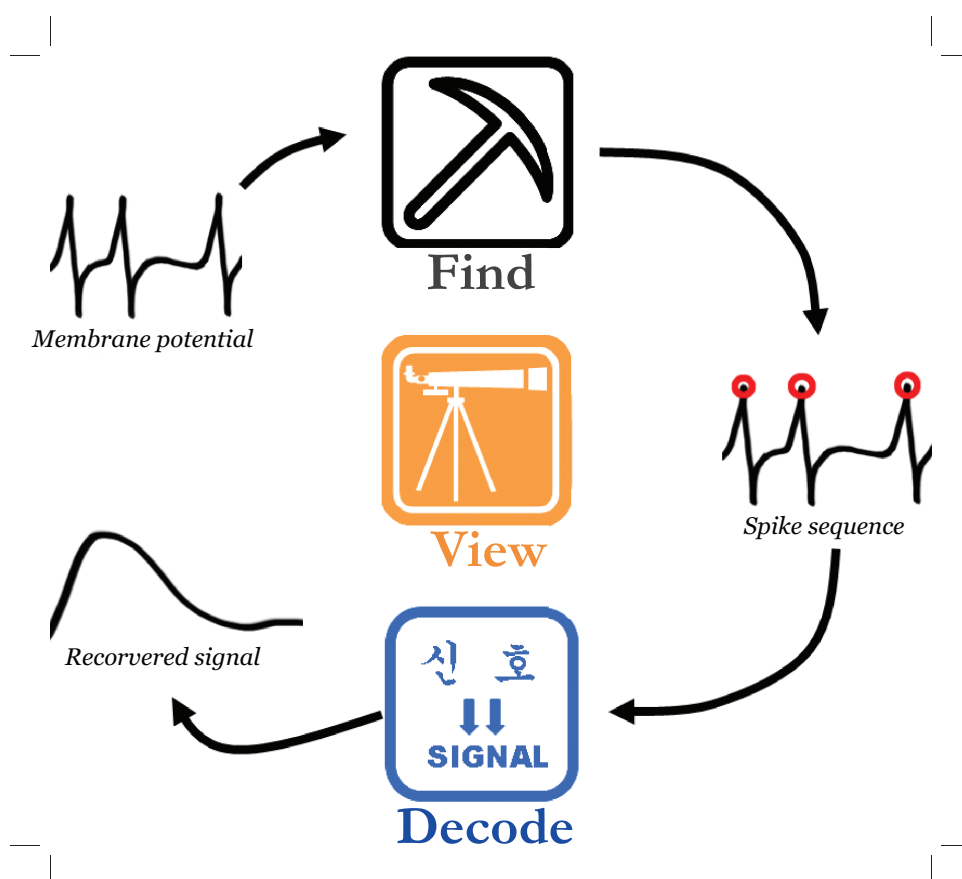


# FlySpikes 1.0 - User Manual and Tutorials

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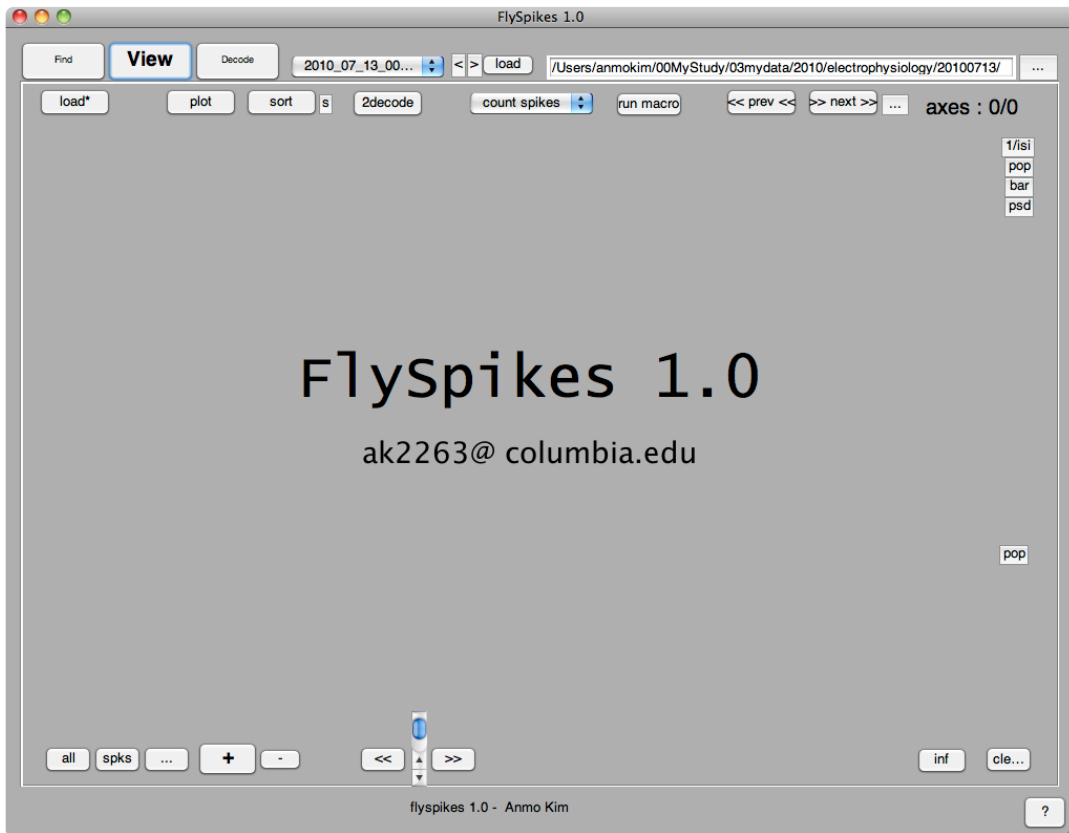
2006-2010



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# 1 Introduction



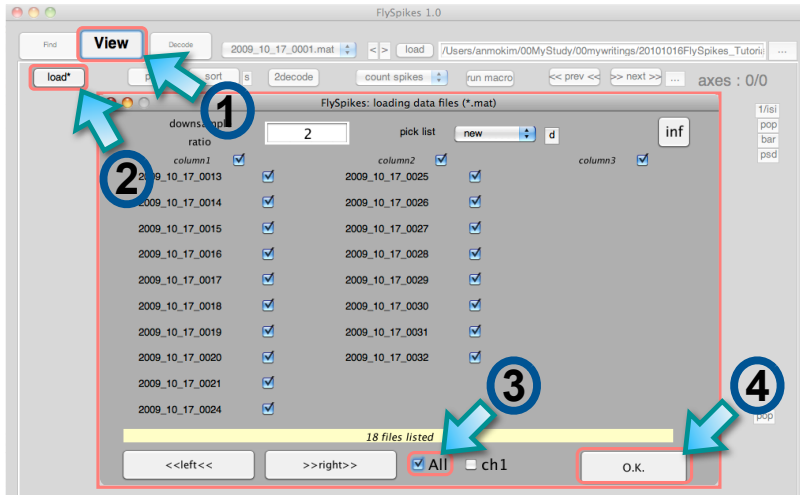
## 2 Installation of *FlySpikes 1.0* and Sample Data

First, include the main folder of the FlySpikes project to the MATLAB path, and run the FlySpikes by typing flyspikes at the command prompt.

### 3 Tutorial - plotting triangle waveforms and responses

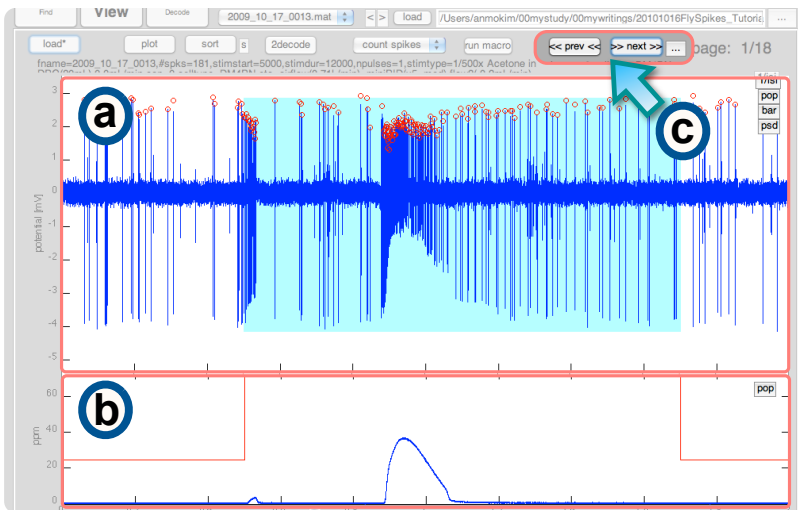
In this section, we will provide a tutorial session in which a set of triangle odor concentration waveform and the corresponding PSTHs are plotted. The 18 sample data files are provided in the *Tutorial1* folder. Before starting the following tutorial instructions, make sure the current folder in **FlySpikes** is the *Tutorial1* folder. (If you cannot find the folder, please download *Tutorial1.zip* and extract it to your computer and move to the extracted *Tutorial1* folder using **...** button next to the path information at the top right corner.

- Selecting data files to be loaded



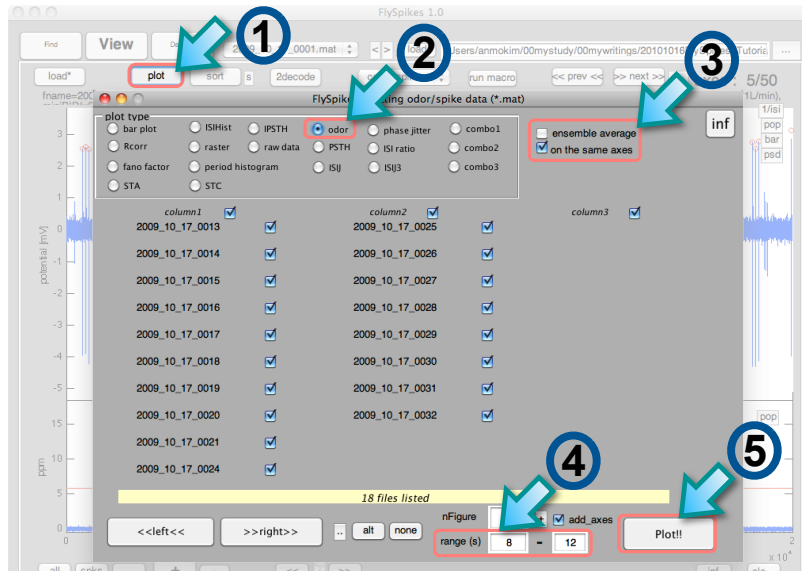
1. move to the **View** tab
2. click **load\*** button to open the loading modal window
3. check the **All** checkbox to select all the data files.
4. click **O.K.** button to complete the selection of the data files to be loaded

- Browsing among the loaded data files



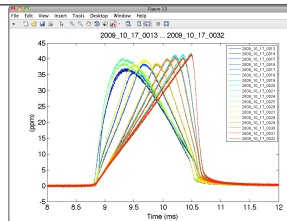
- a. a neuronal output voltage (or current) signal is displayed on the top axes
- b. if available, an input stimulus is displayed on the bottom axes
- c. use **<<left<<** or **>>right>>** buttons to browsing among loaded pages. the **...** button allows one to jump to a page by providing its index

- Plotting all individual odor waveforms

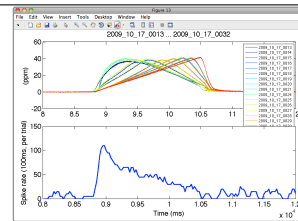


1. click **plot** to open the plotting modal window
2. choose **odor** to plot odor waveforms
3. uncheck **ensemble average** and check **on the same axes**
4. set the plotting range from 8 s to 12 s
5. click the **Plot!!** button

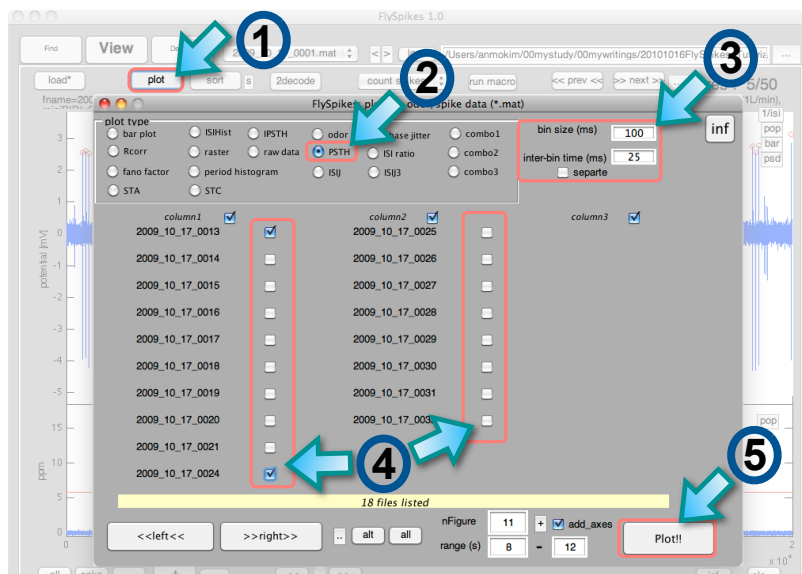
Result: odor waveforms



Result: a PSTH

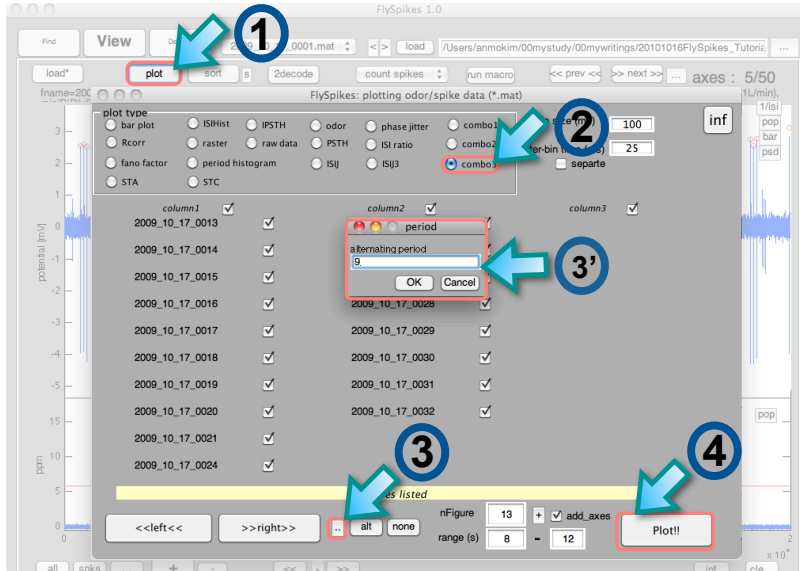


- Plotting a PSTH for the left-most triangle odor waveforms

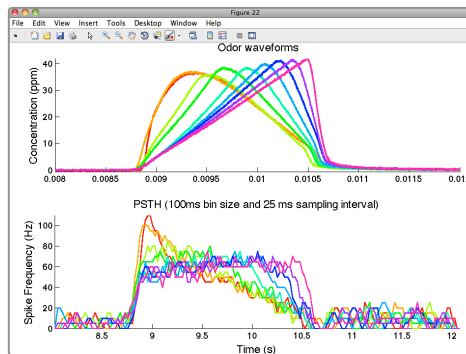


1. click **plot** to open the plotting modal window
2. choose **PSTH**
3. set the **bin size** to 100 ms and the **inter-bin time** to 25 ms. uncheck the **separate** checkbox
4. choose only xxx\_0013 and xxx\_0024
5. click the **Plot!!** button

- Plotting input/output pairs of the loaded data files



1. click `plot` to open the plotting modal window
2. choose `combo3` to plot both input and output
3. click `...` button to set the period. (3') type `9` and click `OK`
4. click the `Plot!!` button



< Result: Nine input/output pairs >

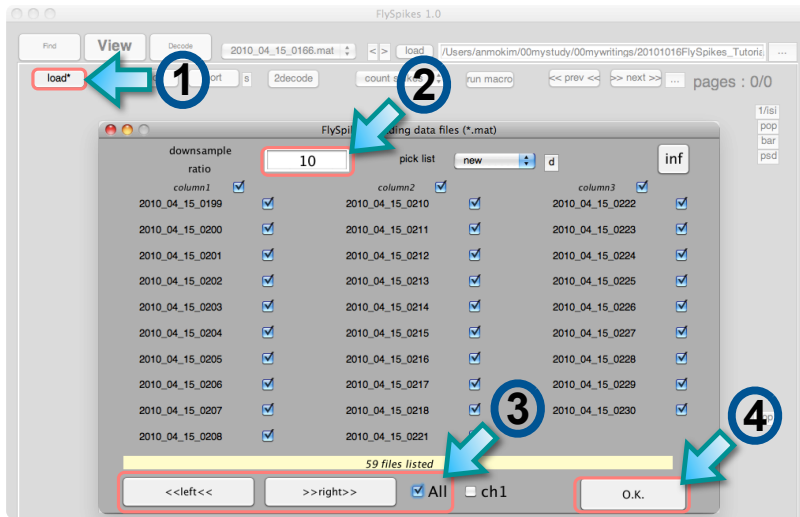
- Some information about this tutorial

- The data in this tutorial is a part of the data used in [1] to plot Figure 3. The experiment was carried out by Yevgeniy Slutskiy.
- `combo3` plots average odor waveforms and the corresponding PSTHs of a set of data files
- plotting sets for `combo3` are determined by the alternating period (`...` next to `alt`); i.e., when the alternating period is  $N$ ,  $k$ th data file belongs to the  $(k \bmod N)$ th set. Unchecked data files are counted when determining the set, but skipped for actual plotting.
- `combo3` saves the resulting plots as matlab figures and the input/output pairs as a .mat file in *Tutorial1/doc* folder; for example, 2009\_10\_17\_0001\_0054\_odor\_psth\_100\_25.mat is created once this tutorial is executed.

## 4 Tutorial - plotting frozen white noise waveforms

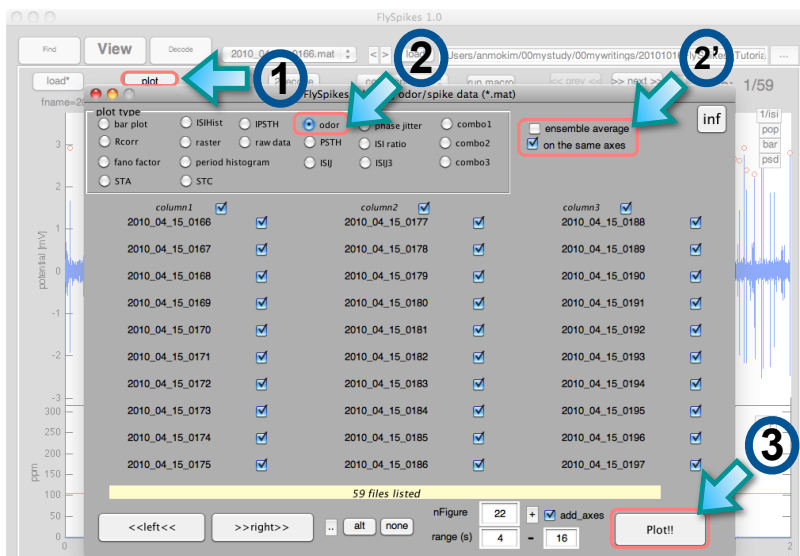
In this section, we will provide a tutorial session that will generate a figure of frozen noise odor waveforms, the corresponding spike rasters, and the PSTH. 59 sample data files are provided in the *Tutorial2* folder. Before starting the tutorial instructions, make sure the current folder in **FlySpikes** is the *Tutorial2* folder. (If you cannot find the folder, please download *Tutorial2.zip* and extract it to your computer and move to the extracted *Tutorial2* folder using **...** button next to the path information at the top right corner.

- Selecting data files to be loaded



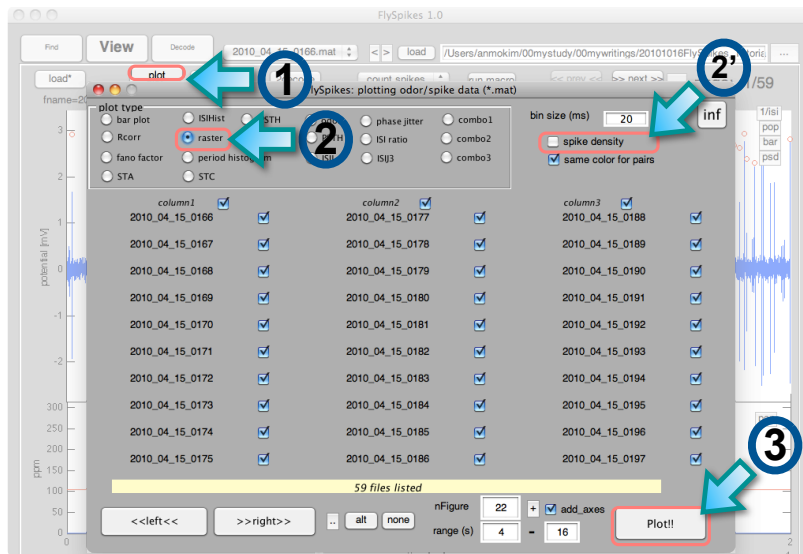
1. click **load\***
2. set the **downsample ratio** as 10 to plot the input/output after downsampling (this reduces the memory usage)
3. using **<<left<<**, **>>right>>**, and **All**, select all 59 files
4. click **O.K.**

- Plotting all individual frozen noise odor waveforms



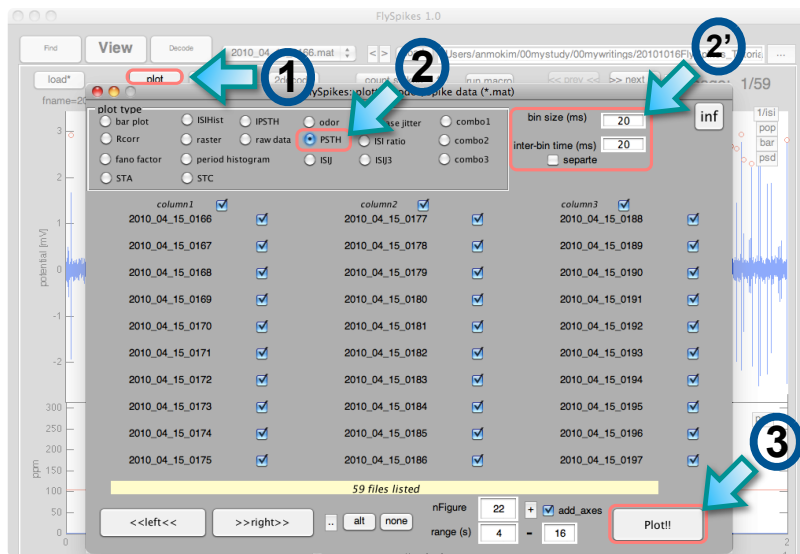
1. click **plot** in the **View** tab
2. select **odor**. (2') uncheck **ensemble average**, and check **on the same axes**
3. click **Plot!!**

- Plotting all individual rasters



1. click *plot* in the *View* tab
2. select *raster*.  
(2') uncheck *spike intensity*
3. click *Plot!!*

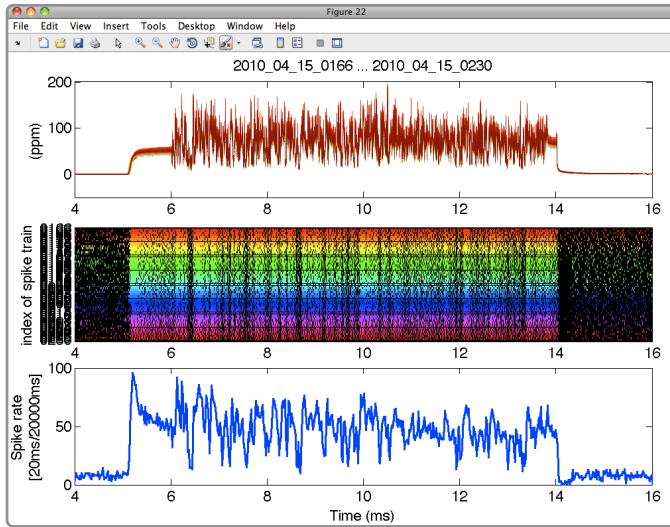
- Plotting a PSTH



1. click *plot* in the *View* tab
2. select *PSTH*.  
(2') uncheck *separate*,  
set both *bin size* and  
*inter-bin size* as 20 ms
3. click *Plot!!*



- Result



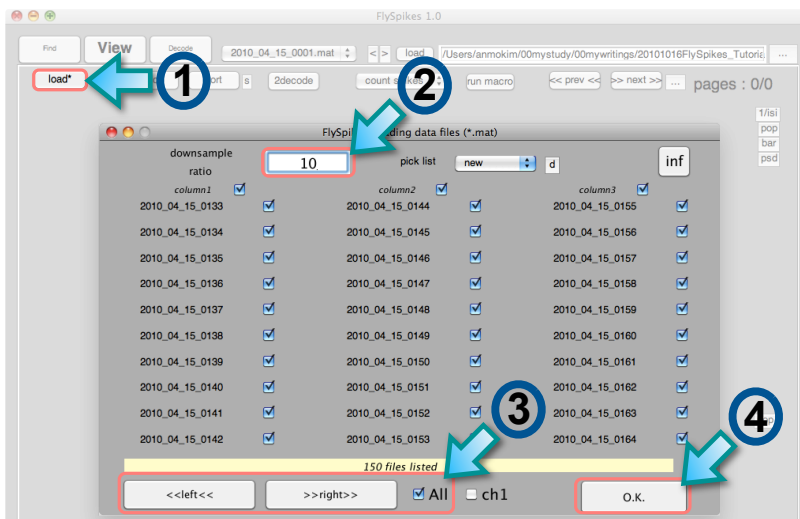
- Some information about this tutorial

- The data used in this tutorial is a part of the data used in [1] to plot Figure 4. The experiment was carried out by Yevgeniy Slutskiy.
- The *downsampling ratio* is applied only to the graphics (plots) and does not change the sampling interval of the internal data used by *FlySpikes*

## 5 Tutorial - spike-triggered average (STA) from 150 white noise waveforms

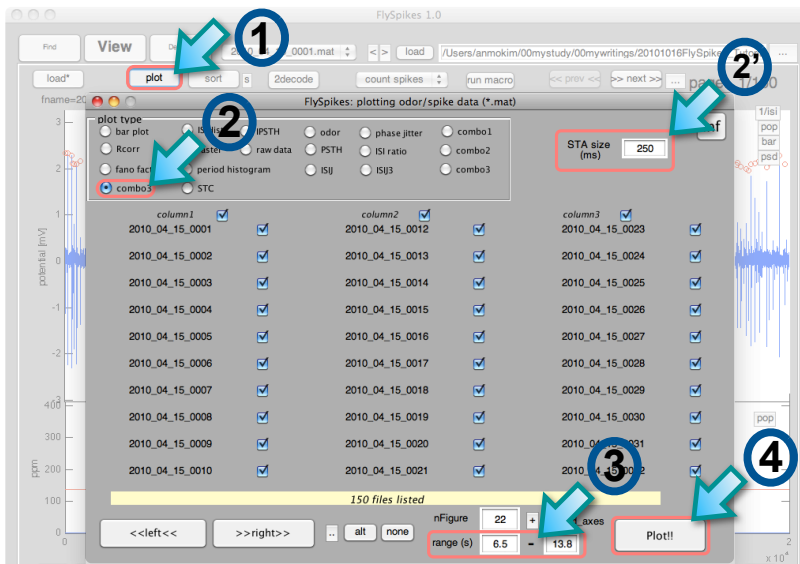
In this section, we will provide a tutorial session that will compute a spike-triggered average from 150 white noise odor waveforms. The data files are provided in the *Tutorial3* folder. Before starting the tutorial instructions, make sure the current folder in **FlySpikes** is the *Tutorial3* folder. (If you cannot find the folder, please download *Tutorial3.zip* and extract it to your computer and move to the extracted *Tutorial3* folder using **...** button next to the path information at the top right corner.

- Selecting data files to be loaded



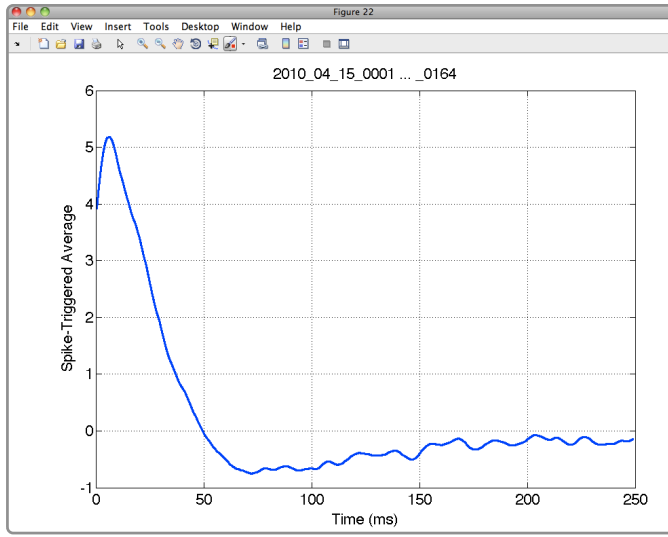
1. click **load\***
2. set the **downsample ratio** as 10 to plot the input/output after downsampling (this reduces the memory usage)
3. using **<<left<<**, **>>right>>**, and **All**, select all 150 files
4. click **O.K.**

- Computing and plotting the spike-triggered average



1. click **plot** in the **View** tab
2. select **STA**. (2') set the **STA size** as 250 ms
3. set the range from 6.5 s to 13.8 s
4. click **Plot!!**

- Result



- Some information about this tutorial

- The data used in this tutorial is a part of the data used in [1] to plot Figure 5. The experiment was carried out by Yevgeniy Slutskiy.
- `STA` saves the spike-triggered average as well as the spike-triggered ensemble as a .mat file in *Tutorial1/doc* folder (this tutorial will create 2010\_04\_15\_0001\_\_0164\_sta.250.mat).

## References

- [1] Anmo J Kim, Aurel A Lazar, and Yevgeniy B Slutskiy. System identification of drosophila olfactory sensory neurons. *J Comput Neurosci*, Aug 2010.