AERoPlot: a Praat plug-in for plotting data

User's Manual

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AERoPlot version 1.3

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1 Getting Started

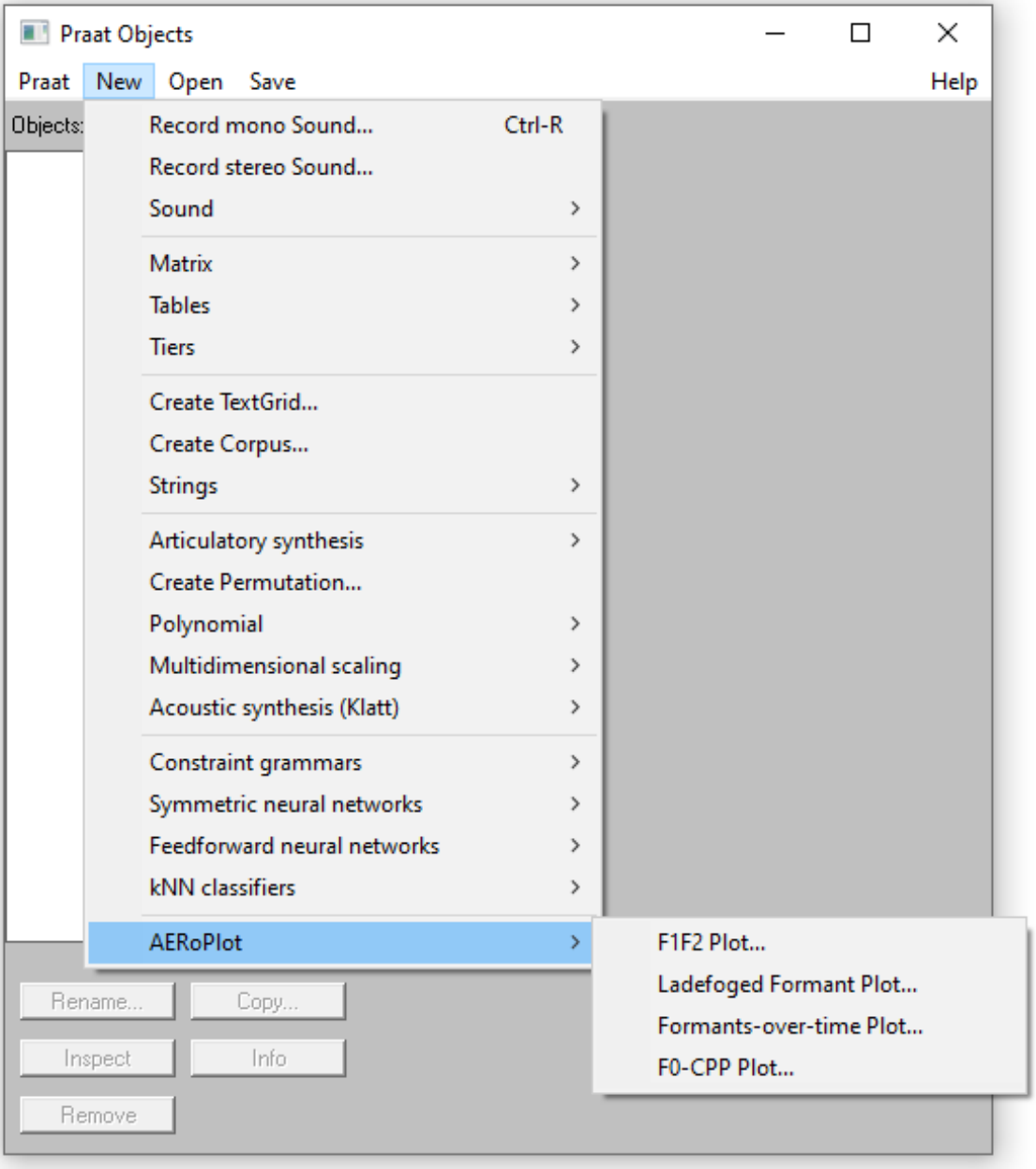
First of all, I'm very please you somehow found your way here. I hope you find my plugin and this manual useful. Do get in touch if you have any comments, suggestions or queries. If for some strange reason you happen to have a copy of this manual but have not downloaded Praat or the AERoPlot Plugin, you need to visit this web page: https://github.com/AERodgers/plugin_AERoPlot. Follow the installation instructions there.

AERoPlot is a Praat plugin allows you to draw elegant and informative plots of data in Praat through a series of menus. There are four kinds of plot: F1F2 Plots (§2), Ladefoged-style plots (see §3), Formants-over-time Plots (See §4), and F0-CCP plots (not covered here).

When you run each plot, you will navigate your way through a series of menus in the following order: data table input menu, filter menu(s), graphical output menu. After this, the plot is drawn and you can save or discard it.

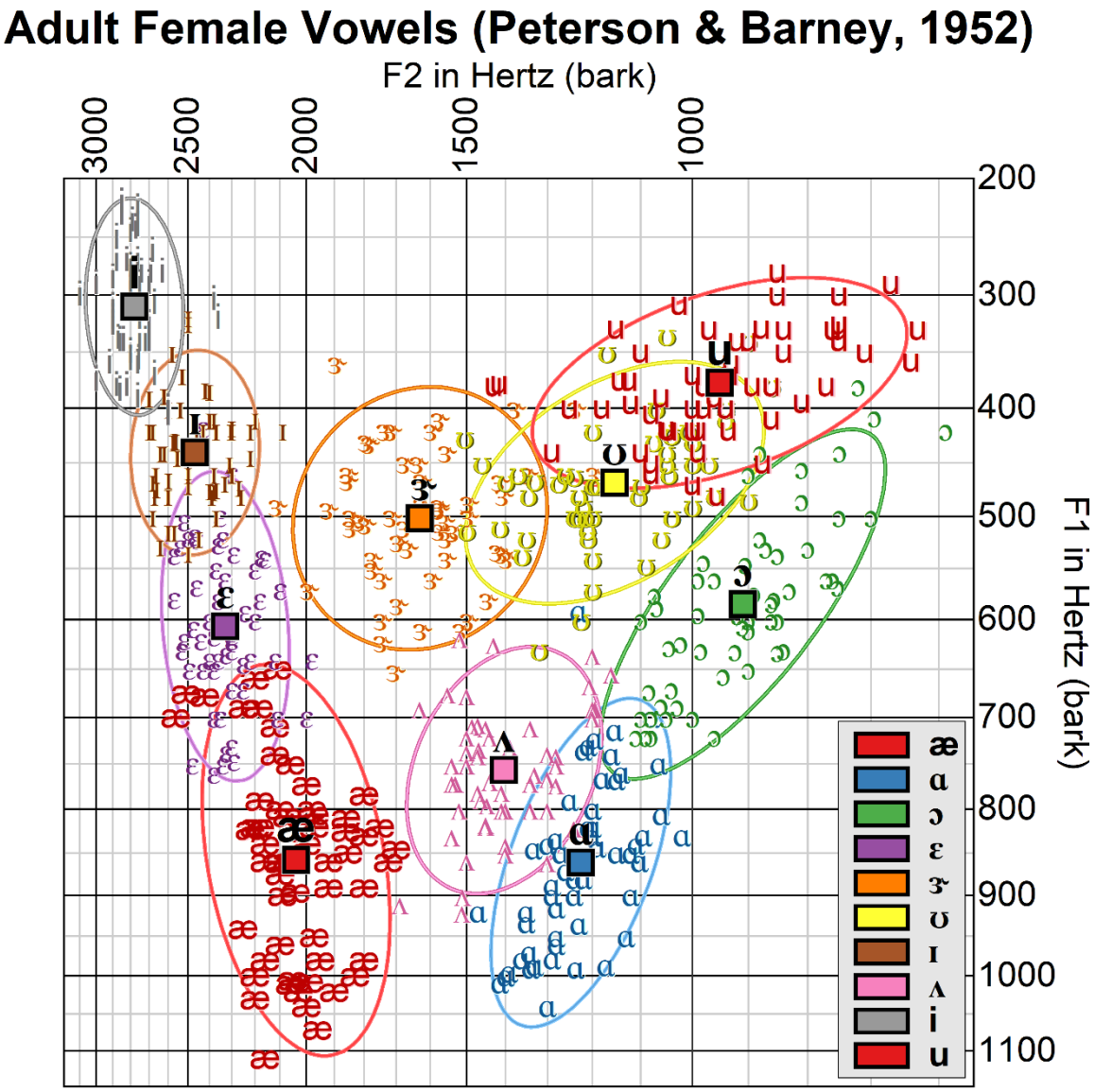
Once you have Praat up and running and installed the plugin, you can access it in Praat through the Objects Window:

- Praat Objects Window → New → AERoPlot

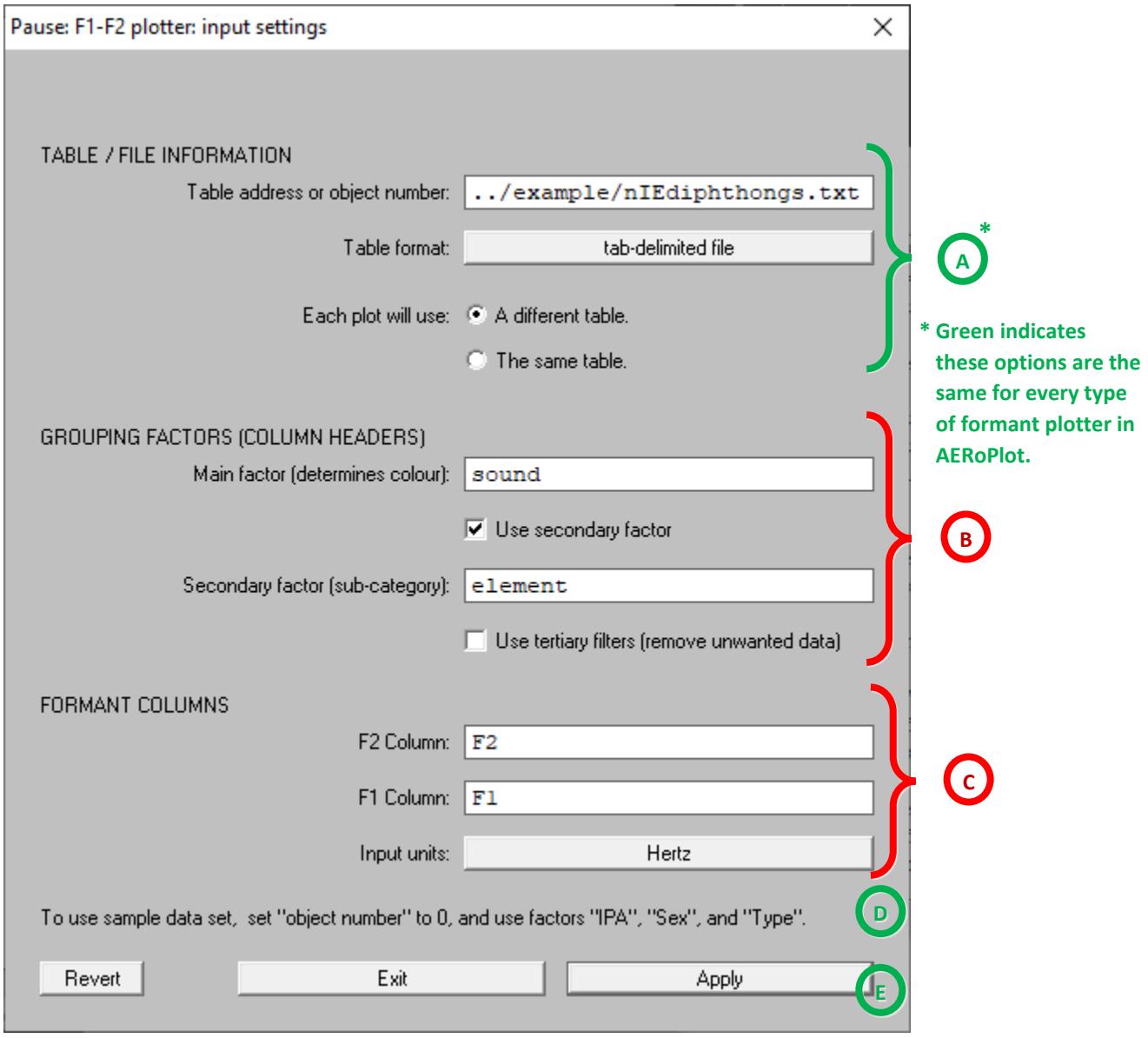


2 F1-F2 Plots

These plots display the F1-F2 values on a graph, with F1 is on the vertical plane and F2 the horizontal plane. They are arranged in such a way that the location of each sound in the acoustic space on the grid somewhat reflects the location of each sound impressionistically in terms of height and backness. Below is an example of adult female vowels from the Peterson and Barney dataset.



2.1 Data Table UI

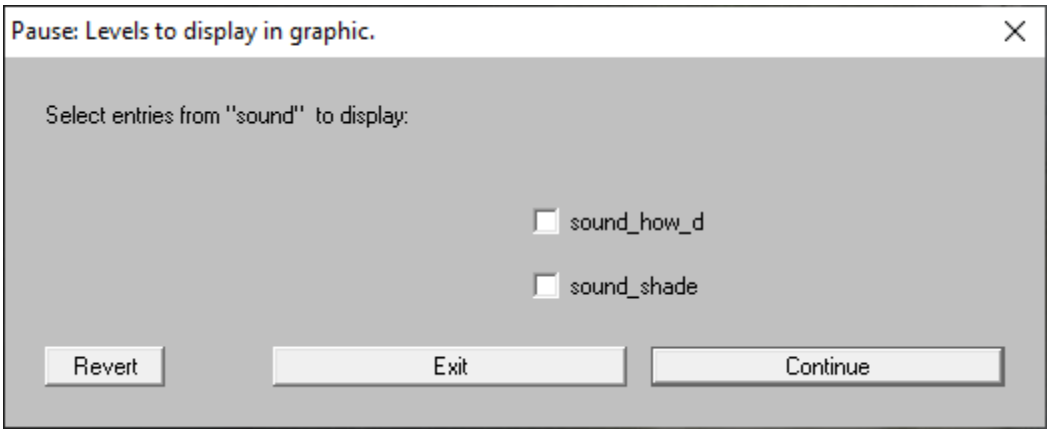


* Green indicates these options are the same for every type of formant plotter in AERoPlot.

A	***TABLE / FILE INFORMATION*** **Table address or object number** accepts both a full address of the data table (as in the example) OR the number of the table in the objects window. Typing "0" will lead the Peterson and Barney (1952) data. **Table format** allows you to choose between **tab-delimited file** (which will also open Praat tables) or **CSV file** formats. **Each plot will use** options indicate whether you will be using the same table if you want to draw multiple plots. Select **The same table** if you don't want to return to this menu again!
B	***GROUPING FACTORS*** **Main Factor** is the column heading which will always be used when plotting the chart. The colour scheme will always use this factor. **Use secondary factor** allows you to choose a second column which will divide the main factor into sub-categories. For example, in the Peterson and Barney data, your main factor might be *IPA* and the secondary factor *Sex*. This would calculate means and ellipses according to *IPA* × *Sex*
	Use tertiary filters will allow you to filter out data listed in other columns in the table. This will trigger an extra menu which lists all other columns / factors in the data table which you might want to use for filtering out unwanted data. (For example, in the Peterson and Barney, you might want to filter out data from the *Type* "*Child*".)
C	**FORMANT COLUMNS** Enter the **column headers** for F1 and F2 here. You can choose between Hertz or Bark Scale as the **Input Units**. (There are currently no output options for other frequency scales.)
D	**ACCESSING TEST DATA** The text here shows you how to access the Peterson and Barney data. This will disappear after the first time you use it.
E	**Revert** resets menu options. **Exit** does what it says on the tin. Choose **Apply** to apply settings and move to the next menu

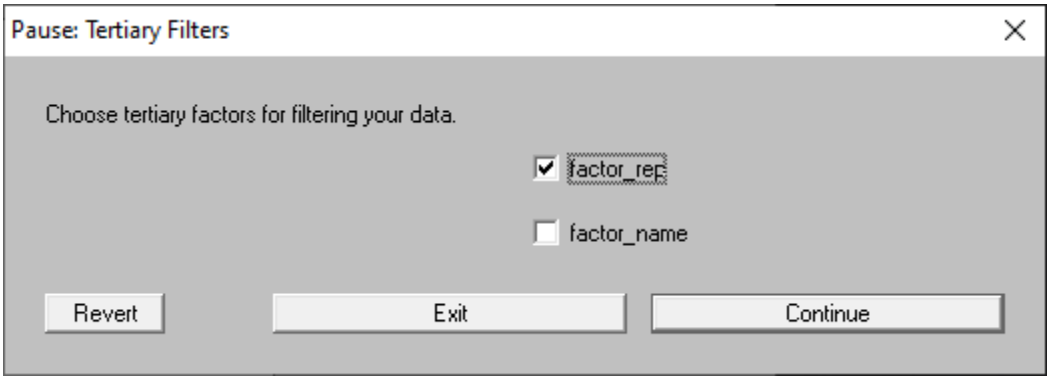
2.2 Main and Secondary Factor filtering

For the main factor (and secondary factor if you have selected one), an option menu will appear, which asks you to select which levels you want to display. This process is the same for each kind of formant plotter in AERoPlot.

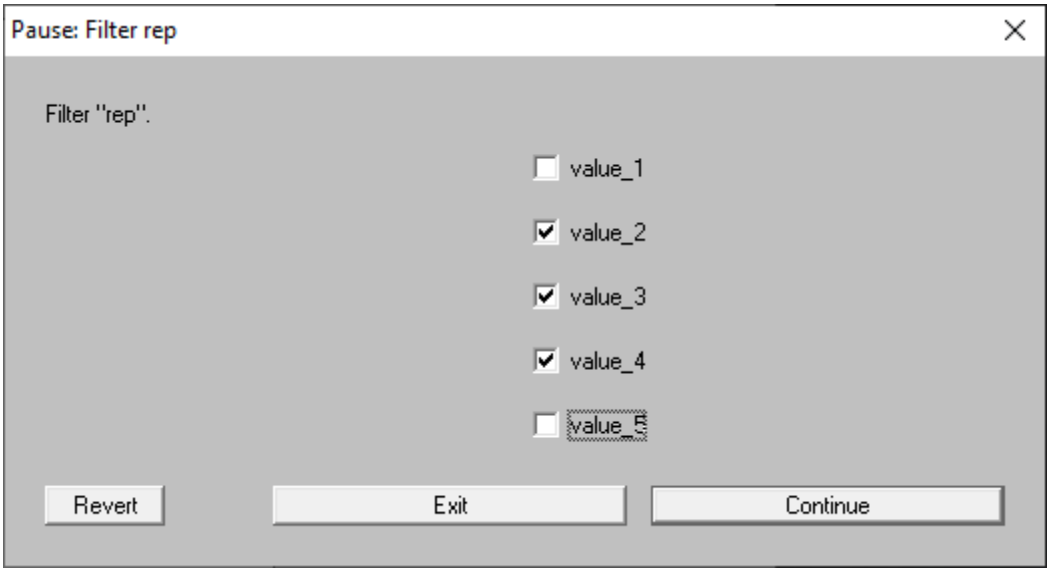


2.3 Tertiary Filters

If you chose tertiary filters, a menu will appear asking you which tertiary factors (columns) you wish to use for filtering out any unwanted data. This process is the same for each kind of formant plotter on AERoPlot.

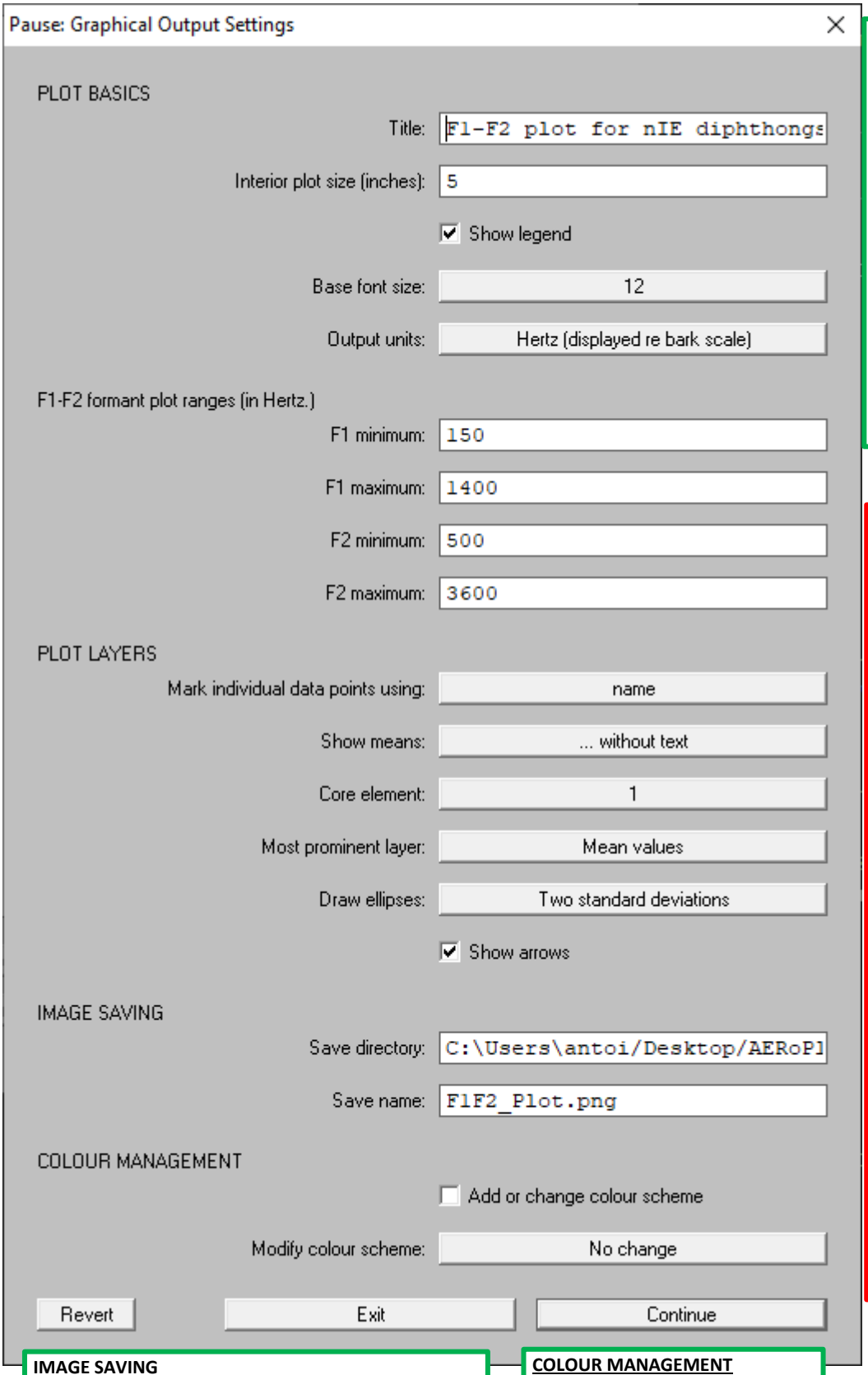


For each tertiary factor you choose, a filter menu will appear, which behaves in the exact same manner as the Main and Secondary Factor filters (see §2.1)



2.4 Graphical Output Settings

In this second major menu you choose the setting related to the plot appearance.



PLOT BASICS

Interior plot size does not include the title and axis labels.

Output units only appears if the input units are Hertz. You can display the axes in Hertz or kilohertz. You can display the data linearly or warp the axes to either log or bark scales. I prefer Hertz (bark).

These options are the same for each type of formant plotter in AERoPlot, though **formant plot range** options depend on the plot type.

PLOT LAYERS

Mark individual data points using allows you to **choose a column** containing text for marking individual data points, **chose X marks**, or simply not to mark them.

Show means does the same with mean values, though means are always indicated with a circle (though see next item).

Core element allows you to chose a single secondary level to display with a square (such as the dominant element in a diphthong)

Most prominent layer allows you to draw Mean values or Individual data points a the top layer.

Draw ellipses allows you to choose between no ellipses, and ellipses of one or two standard deviations.

Choose **Show Arrows** if you want to draw arrows across secondary factors.

IMAGE SAVING

Does exactly what you expect. By default, AERoPlot will create a **Save directory** (folder) called "AERoPlot_Images" on your desktop.

It will also add number suffixes to save names if you do not change the **Save name**.

COLOUR MANAGEMENT

These options allow you to use a range of colour management options. The options are the same across all plot types, and are described in §3.

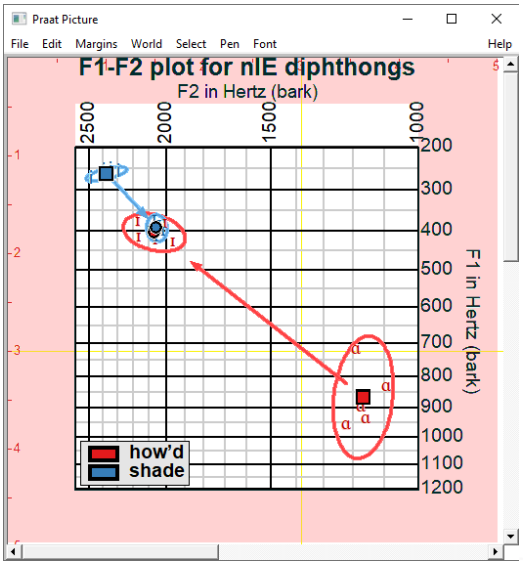
2.5 Saving

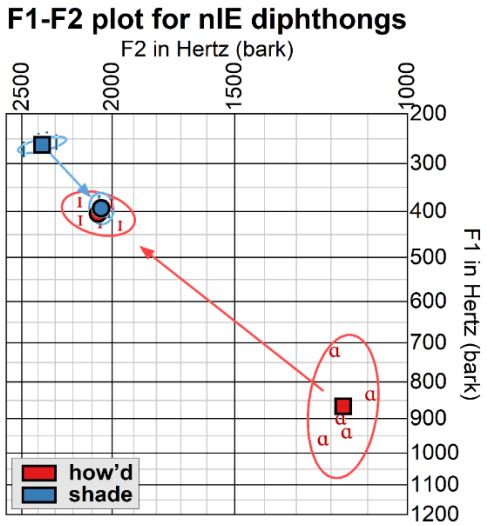
When the plot is drawn in the Picture window, you have options to **Save** and / **Exit** the script.

If you want to draw another plot, chose **Continue** or **Save & cont.**. These options will return you to the Main Input UI or the Filter menus depending on whether you chose to use the same data table or a different data table.

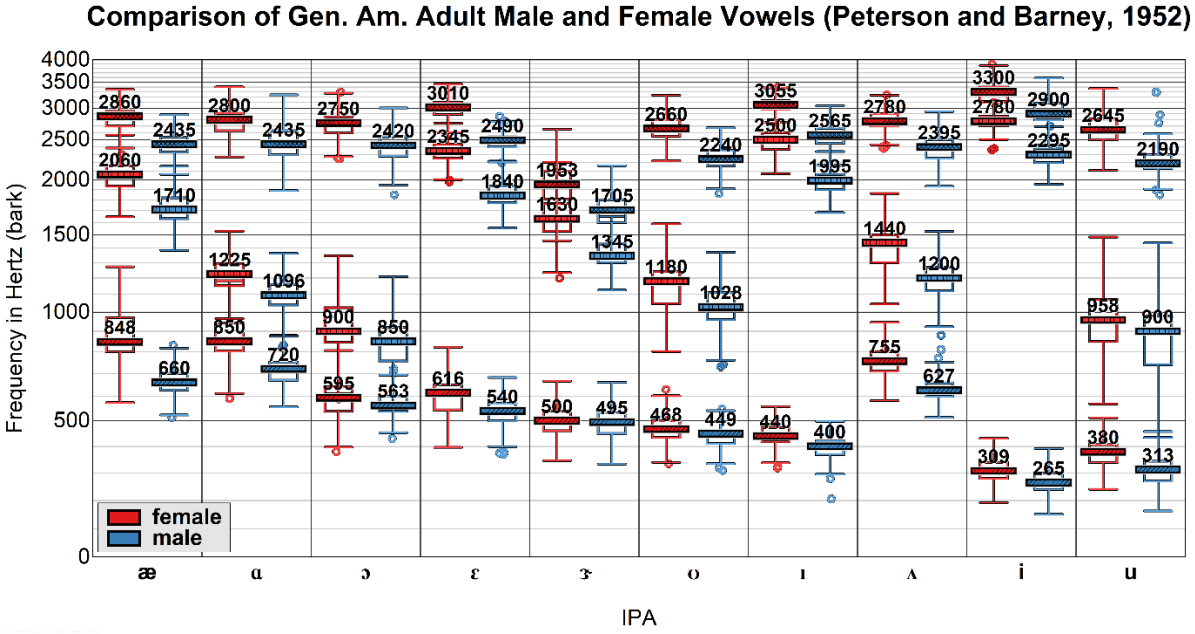
These options are the same for every plot type in AERoPlot.

NOTE that the quality of the saved image is much higher than that displayed in the Praat Picture window (see the images below).





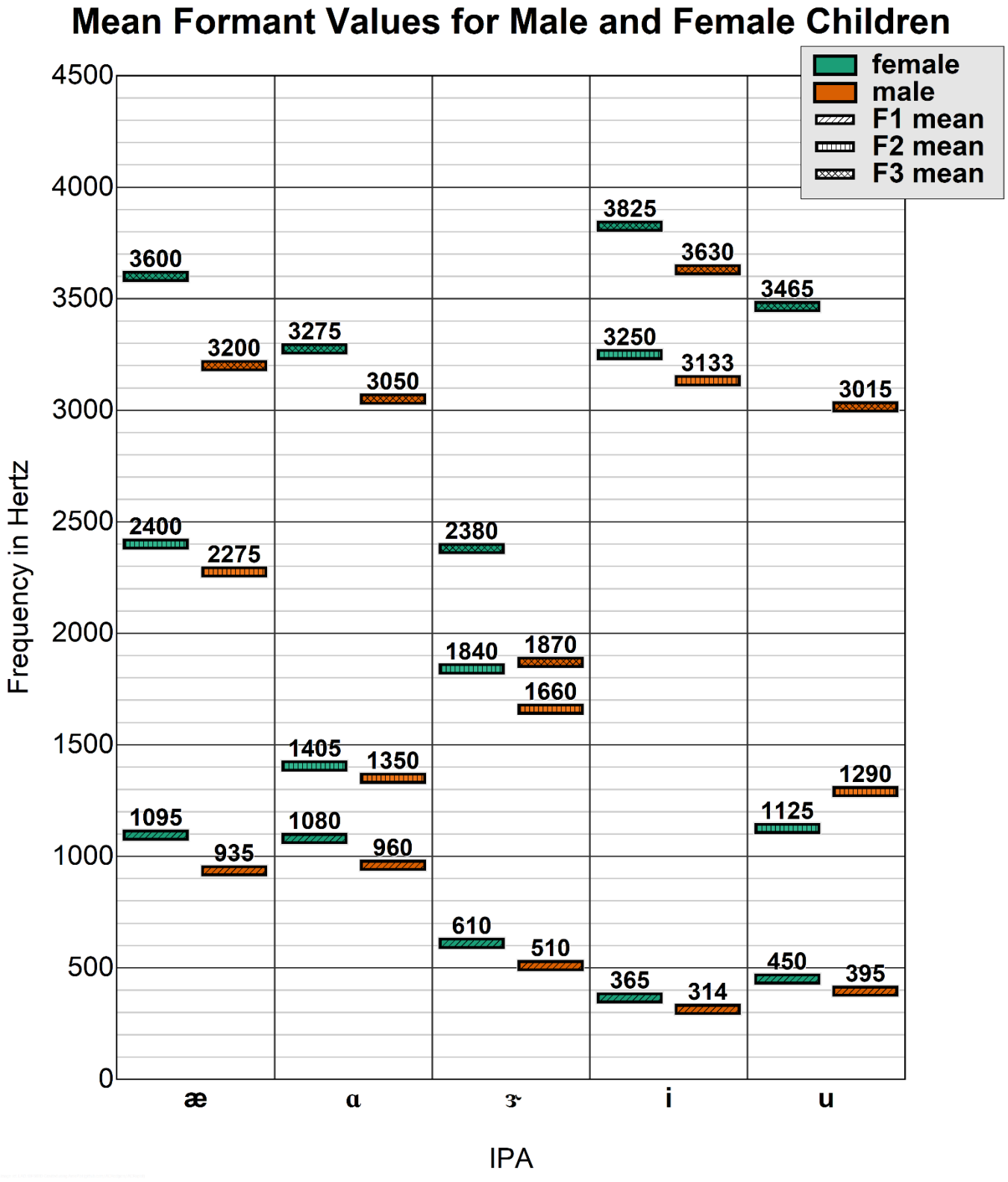
If your image is very large, it might not completely fit in the Picture window; however, it will still be saved correctly, as shown in the Ladefoged-style plot (§3) here.



3 Ladefoged-style plots

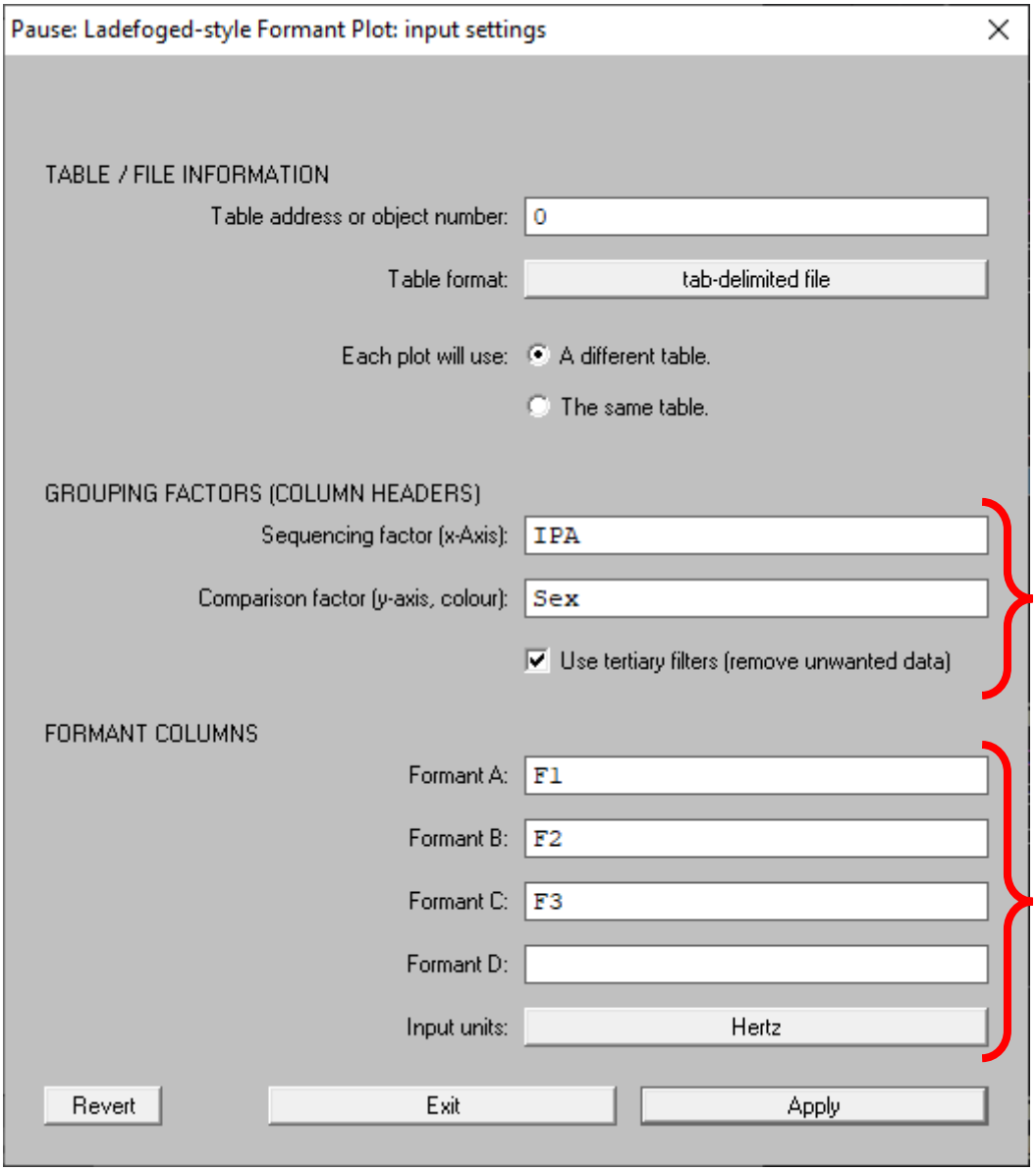
These plots display formant along the Y-axis for each level (usually a vowel) of a sequencing factor (typically Vowels). The secondary factor (comparison factor) can be stack on the same vertical line or spread out along the x-axis.

The example below displays vowels on Hertz without any axis-warping. Note the legend is placed so as to avoid obscuring any text or data. (If this is not possible, use user can choose to hide the legend).



3.1 Data Table UI

Note, much of this is the same as the menu for the F1-F2 plotter (§2.1). The input shown in the example was used to create the chart above.



GROUPING FACTORS

Sequencing factor determines which factor (column header) will be used to determine content along the x-axis. Here it is *IPA*, as displayed in the plot above.

Comparison factor determines how the sequencing factor will be compared. In this case it is *Sex*.

Use tertiary filter (§**Error! Reference source not found.**) was selected here to filter in subsequent menus by *Type*,

FORMANT COLUMNS

You only need enter the column names for the Formants you want to display.

Only provide the names of the columns you want to display in order starting from **Formant A**. (By default, it is F1, F2, F3).

3.2 Main and Secondary Factor filtering

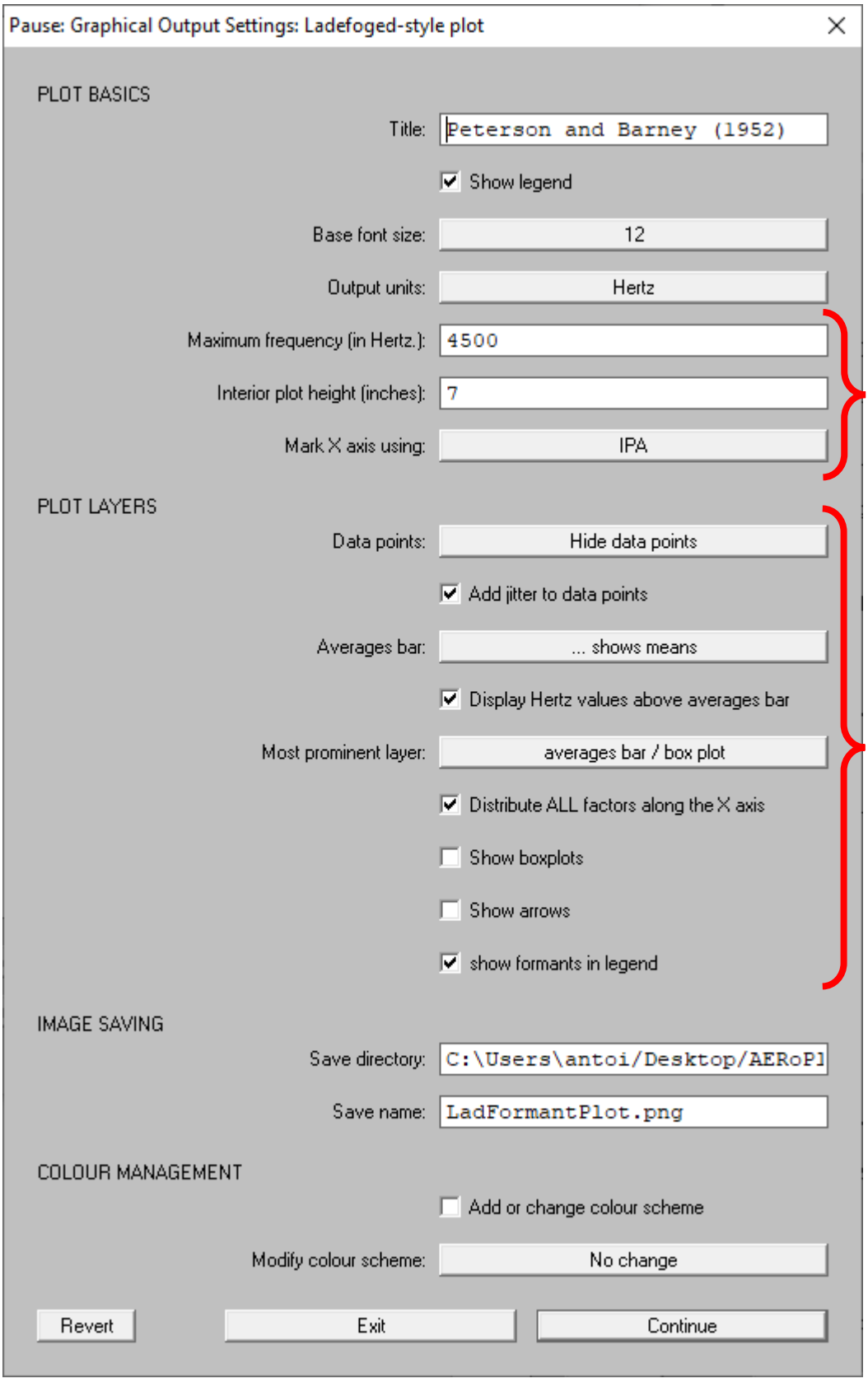
See §2.2.

3.3 Tertiary Filters

See §2.3.

3.4 Graphical Output Settings

Only elements unique to the Ladefoged-style plots are explained here. For the rest of **Plot Basics**, **Plot Layers**, and **Image Saving**, see §2.4. For Colour Management, see §0



PLOT BASICS

These plots always start from 0 Hertz, so only M**aximum Frequency** is needed.

You can change the **Interior plot height**, but plot width is determined by the number of items along the x-axis.

By default, the labels along the x-axis are the levels (categories) of the sequencing factor. However, if the script thinks alternative labels can be found in other columns, you can **Mark X axis** using alternative labels.

PLOT LAYERS

Add jitter to data points makes it easier to see individual data points.

Averages bar can **show means, show medians**, or **remain hidden**.

You can show the values of averages by selecting **Display [Hertz / Bark] values above averages bar**.

If you don't want to stack the comparison factors in the same place along the x-axis, tick **Distribute ALL factors along the X axis**.

To **Show boxplots**, this the appropriate box.

To **Show arrows** between formants along sequencing factor, tick the relevant box.

If you want to show the formant crosshatching patterns in the legend, tick **Show formants in legend**. (Better unticked in case it obscures part of the plot.)

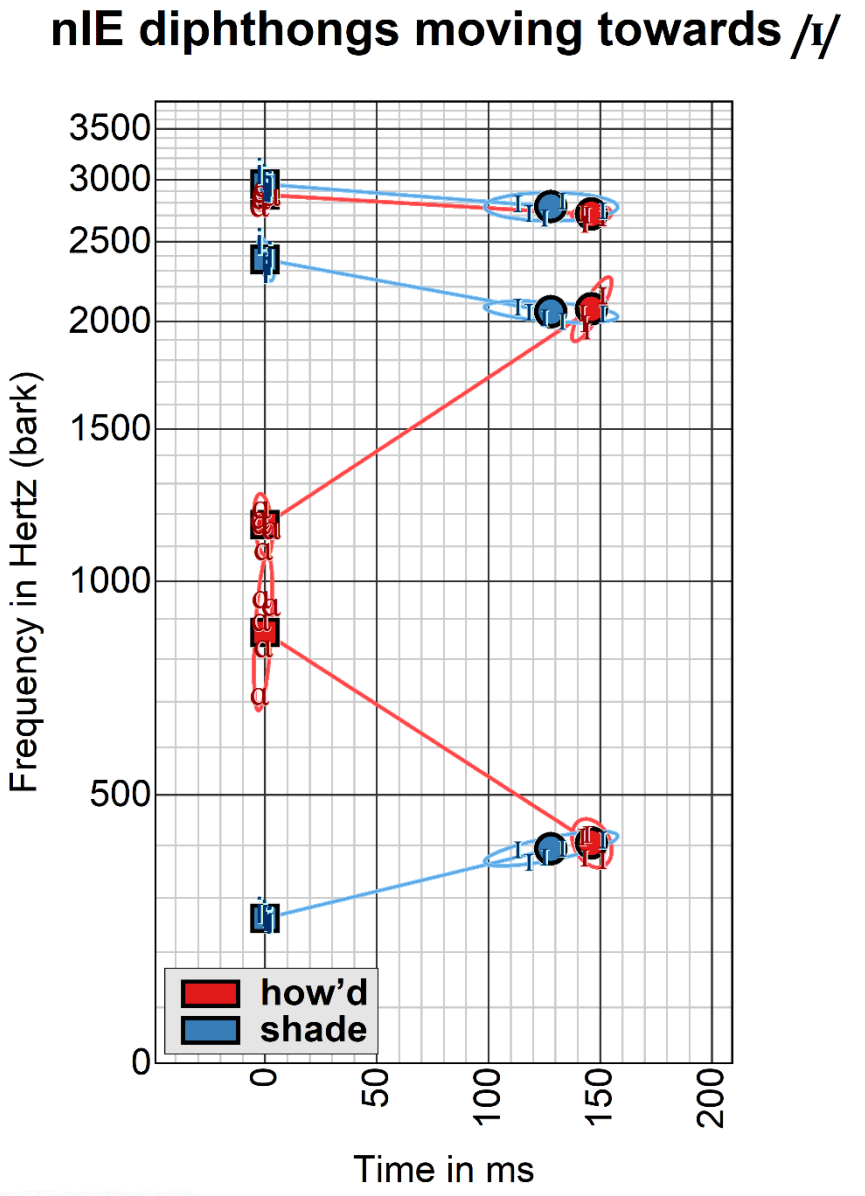
3.5 Saving

See §2.5

4 Formants-over-time Plots

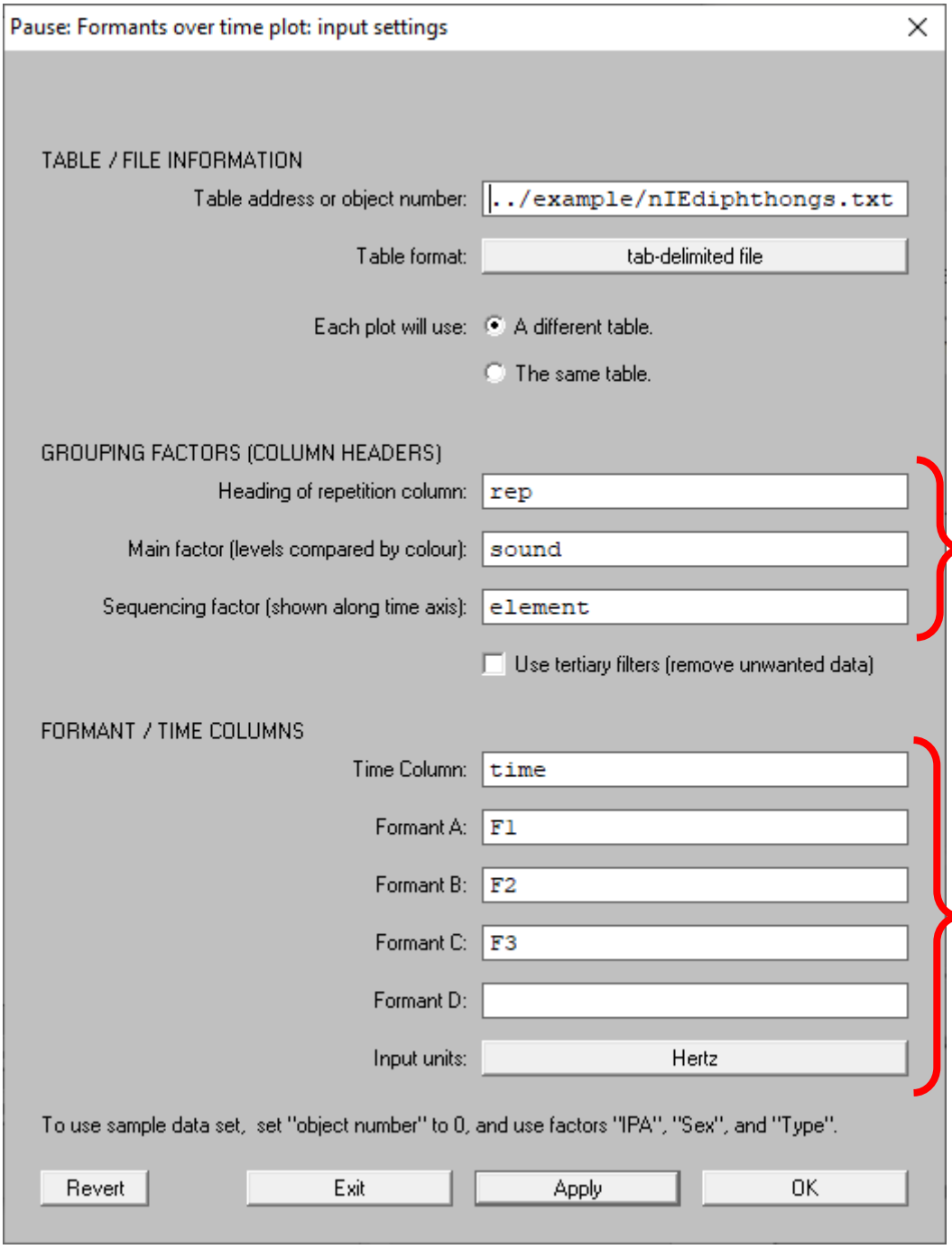
These are quite similar to the Ladefoged-style plots. However, the x-axis displays time. These plots can be used to compare how the both temporal and spectral differences in formant structure, such as in diphthongs.

The example below compares two northern Irish English (Lurgan) diphthongs framed in the words “how’d” and “shade”.



4.1 Data Table UI

Much of this is identical to Data Table UIs in either the F1-F2 Plot or the Ladefoged-style plot.



GROUPING FACTORS

If there are multiple repetitions of target, type the appropriate column name in **Repetition column**. Otherwise leave it blank.

The **Main factor** box identifies the column with items which will be differentiated by colour. (Here it is *sound*.)

Sequencing factor determines which factor (column header) will be used to determine content along the time axis. (Here is it *element* of diphthong).

FORMANT / TIME COLUMN HEADERS

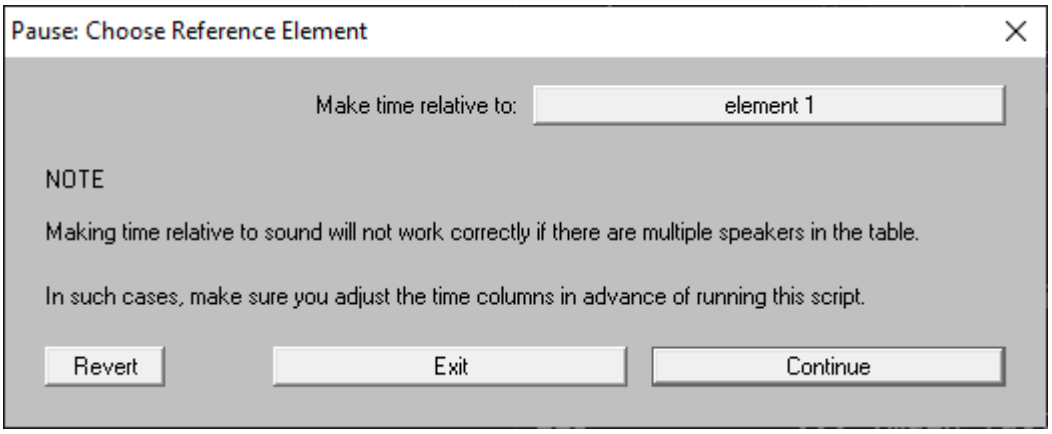
Write the name of the **Time Column** in the relevant box.

You only need enter the column names for the **Formants** you want to display.

Only provide the names of the columns you want to display in order starting from **Formant A**. (By default, it is F1, F2, F3).

4.2 Reference time

If you have not already made time relative to another element in the utterance, you can do so here by using the **Make time relative to** option menu. You can also choose not to the this or you can make time relative to one of items in the sequencing factor, (In this case, diphthong element.)



4.3 Main and Secondary Factor filtering

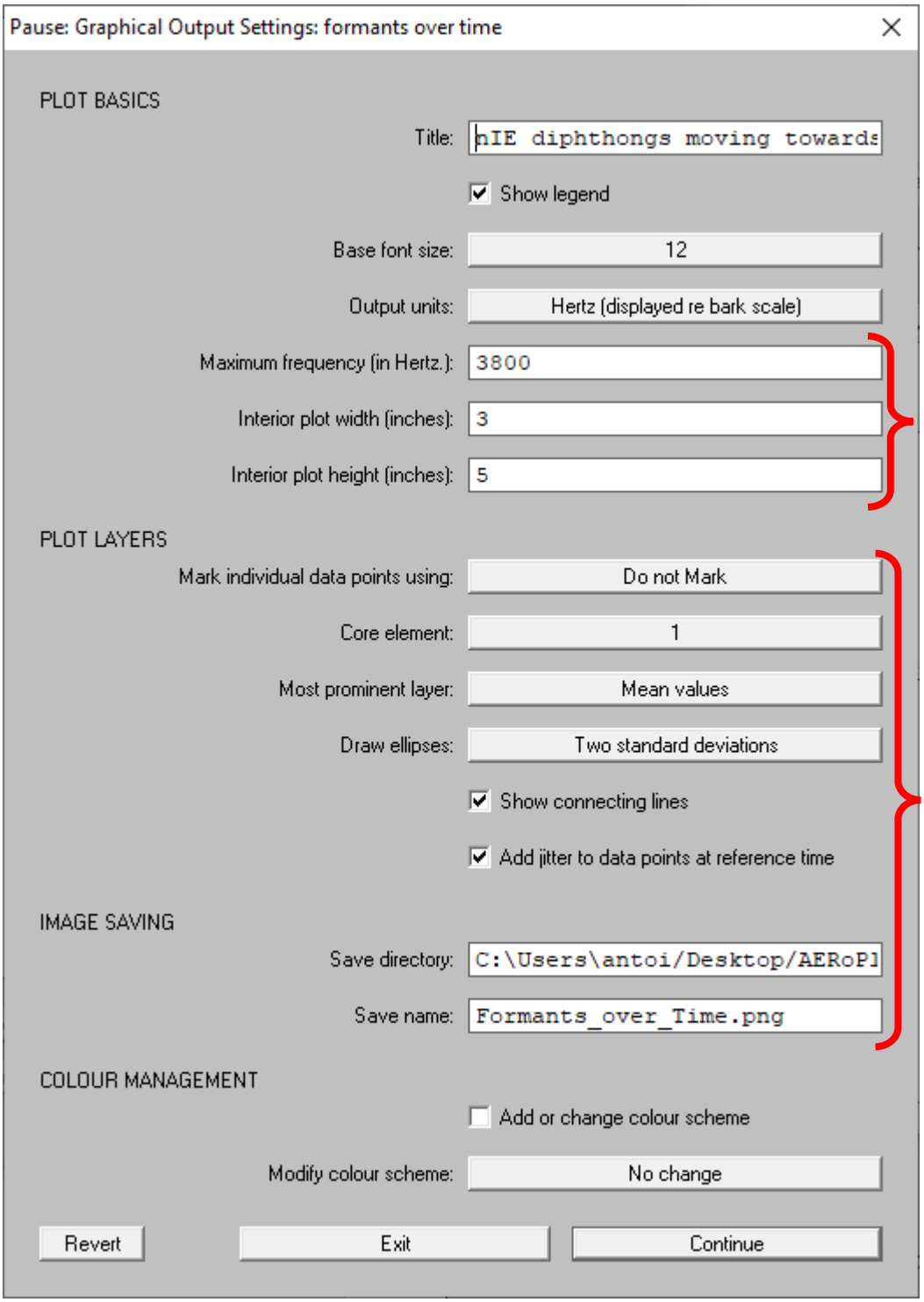
See §2.2.

4.4 Tertiary Filters

See §2.3.

4.5 Graphical Output Settings

Only elements unique to Formants-over-time plots are explained here. For the rest of **Plot Basics**, **Plot Layers**, and **Image Saving**, see §2.4. For Colour Management, see §0



PLOT BASICS

These plots always start from 0 Hertz, so only M**aximum frequency** is needed.

You can change both the **Interior plot height** and the **Interior plot width**.

PLOT LAYERS

For **Mark individual data points**, **Core element**, **Most prominent layer**, and **Draw Ellipses** see §2.4.

Add jitter to data points at reference time makes it easier to see data points at the reference time, since without added jitter they will all equal zero. Jitter adds a random value of ± 1.5 ms to the reference value.

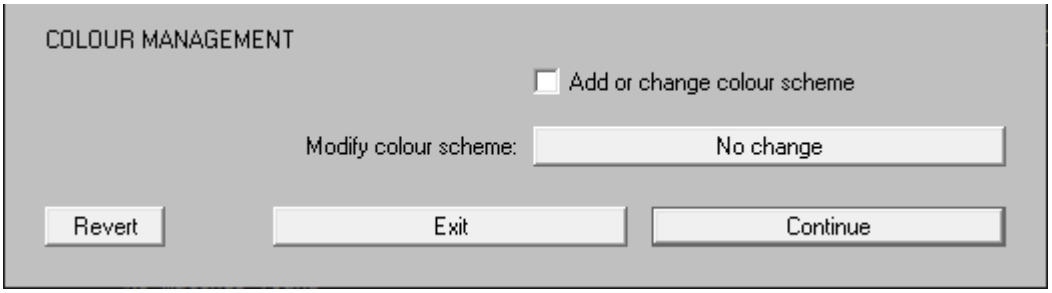
Select **Show connecting lines** if you want to draw lines across the elements in the sequencing factor. See the example plot above in §4.

4.6 Saving

See §2.5

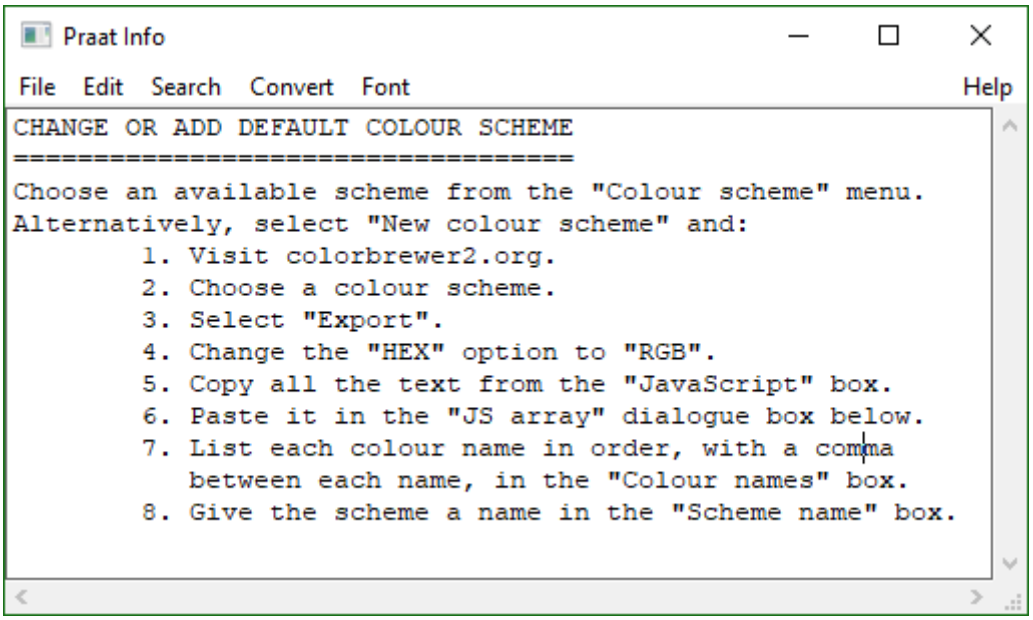
5 Colour Management

These options are shared across all plot types and appear at the bottom of each Graphical Output UI.

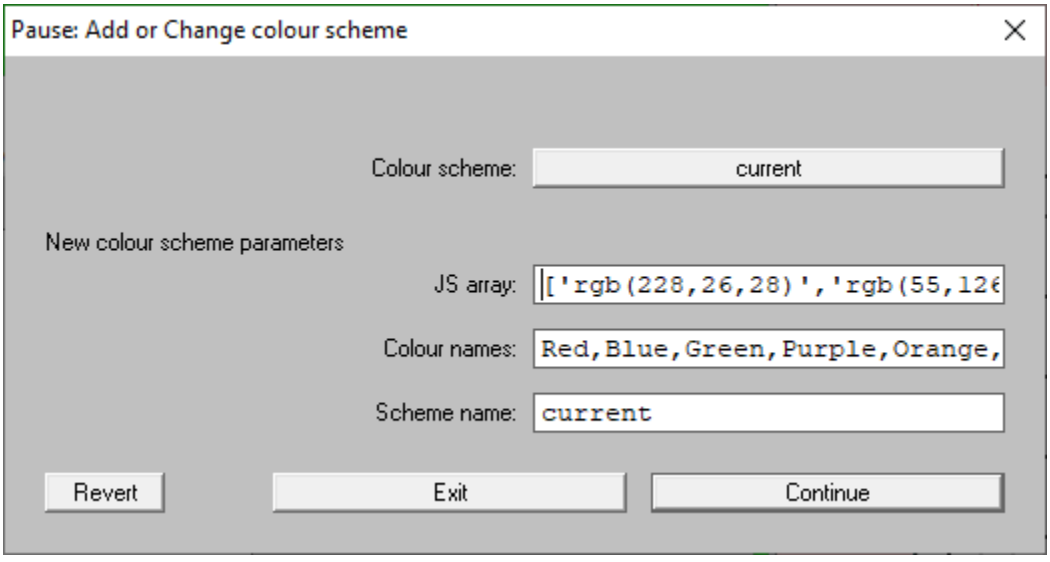


5.1 Add or Change colour scheme

This allows you to change the current colour scheme or add a new one using a JavaScript string. The first time this option is chosen, the Praat Info window explains how to create a new colour scheme.



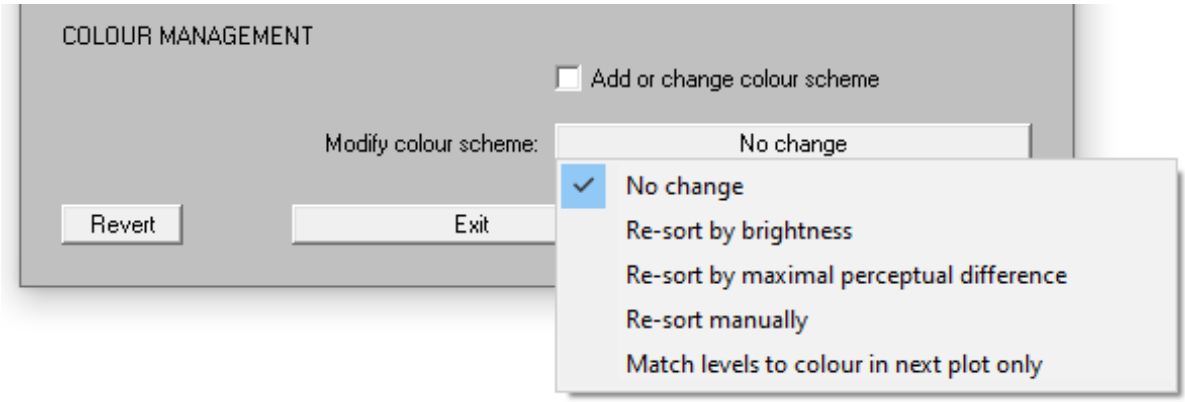
The current colour scheme is always named ***current***. The first time you run AERoPlot, ***current*** is set to “CB Qualitative Set1 9 colours”, which was imported from colorbrewer2.org. The JavaScript array for the current colour scheme is shown in **JS array**, the names of each colour in **Colour names**, and the colour scheme name in **Scheme name**.



To change colour scheme, simply select a colour scheme from **Colour scheme** options. You can also save the current colour scheme simply by changing **Scheme Name**, choosing New colour scheme from the **Colour scheme** options, and then hitting **Continue**.

5.2 Modify colour scheme

These options provide different means of re-arranging the order in which the current colour scheme is used. Every time Graphical Output UI appears, it is set to ***No change***.

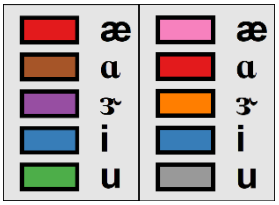


5.2.1 Re-sort by brightness

This automatically changes the default order of the ***current*** colour scheme so that the order of colours goes from darkest to lightest.

5.2.2 Re-sort by maximal perceptual difference

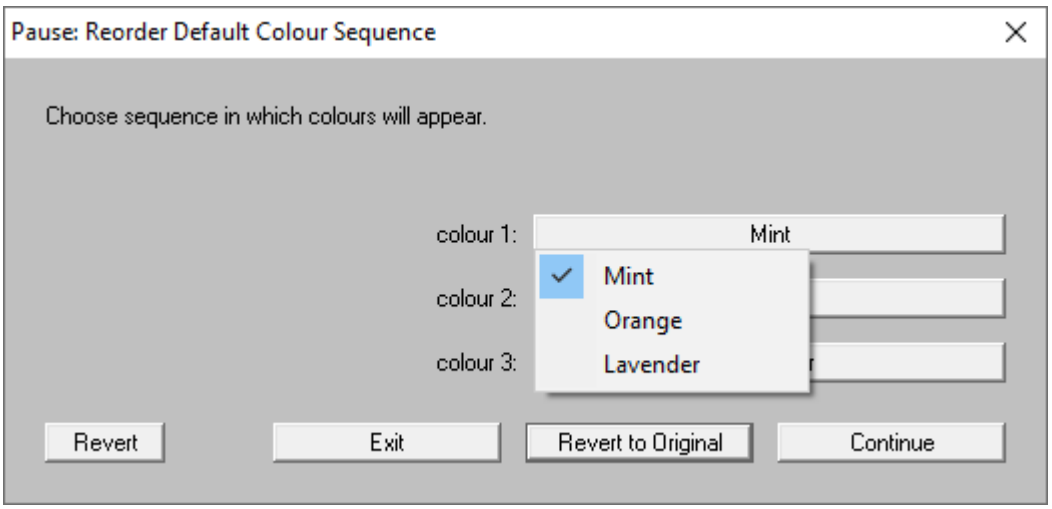
This automatically changes the default order of the ***current*** colour scheme so that each colour is as perceptually different as possible from all the previous colours. (Needs some optimising.)



Examples of a colour scheme automatically re-sorted by brightness (left) and maximal perceptual difference (right).

5.2.3 Re-sort manually

This allows you to manually change the sequence of colours in which the ***current*** colour. Note, it will not allow you to use the same colour more than once in the sequence. I recommend swapping colours one at a time to avoid any problems.



5.2.4 Match levels to colour in next plot only.

This allows you to manually (so to speak) match each of the levels in the main factor to a colour in the current colour scheme. It allows you to use the same colour more than once, though this is not recommended. It does not save changes to the **current** colour scheme.