

# USING ‘CPX3’ FOR DATA VIEWING AND EDITING

## Ozone Edition

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Note: When this document says to click on something it means use the left mouse button, i.e., normal point and click.

## 1. About CPX3

CPX3 is a graphical user interface for viewing and editing data in the NOAA/ESRL/GMD aerosol database. In addition to aerosol data, the database contains other types of collected or managed by the GMD CPD3 data system, such as ozone and meteorology data. It can be used to look at raw, edited, clean, or averaged data so long as the station and data are set up in the GMD database.

There are two versions of CPX3, one which runs on a Linux or Macintosh computer and has a command line or graphical user interface (GUI). A second, purely GUI, version runs on a Windows computer and is entirely point and click. The CPD3 family of programs, including CPX3, are a work in progress and are currently being tested only at NOAA-operated stations (as of May, 2016).

Help for using any CPD3 program, including CPX3, is available by typing 'programname --help' at the command line where programname is the name of the program you want help with. Many CPD3 programs are listed on the webpage: <http://esrl.noaa.gov/gmd/aero/software/aerosols/cpd3doc.html>

### **CPX3 demo**

There is a demo available of the Windows version of the data editing software. The demo allows a user to view and edit an example dataset to get a feel for how CPX3 works and how powerful it is. The demo currently only works on Windows PCs running Windows versions 7 and newer. It can be downloaded at:

<ftp://aftp.cmdl.noaa.gov/aerosol/software/cpd3/demo/cpd3-demo-win32.zip>

*To start the demo*, unzip the file and then double click the file "\_demo.bat" in the resulting directory. This will bring up blank plots with the current week. To get the demo data plots you'll need to change the data range in the graphical window to the date range of the demo data (April 25-May 30, 2015). To do this change the start and end date in the plot time range cell at the top of the empty plots. You'll need to hit enter after updating the date for the date change to be applied. . It takes the data about a minute to load so be patient – there is a loading bar in the lower right of the window so you know how much of the data are loaded.

### **Getting Started <not applicable to demo/Windows version>**

To start a CPX3 session you merely need to type `cp3.ozone stn <enter>` where 'stn' is the 3-letter station identifier. For example to start cp3 for Mauna Loa, you would type:

```
cp3.ozone mlo<enter>
```

This opens and plots the most recent week of raw data from CPR. Note that it takes a few seconds to minutes to load the data in depending on how much data is being loaded – there is a progress bar in the lower right so you can see where it is in the loading process.

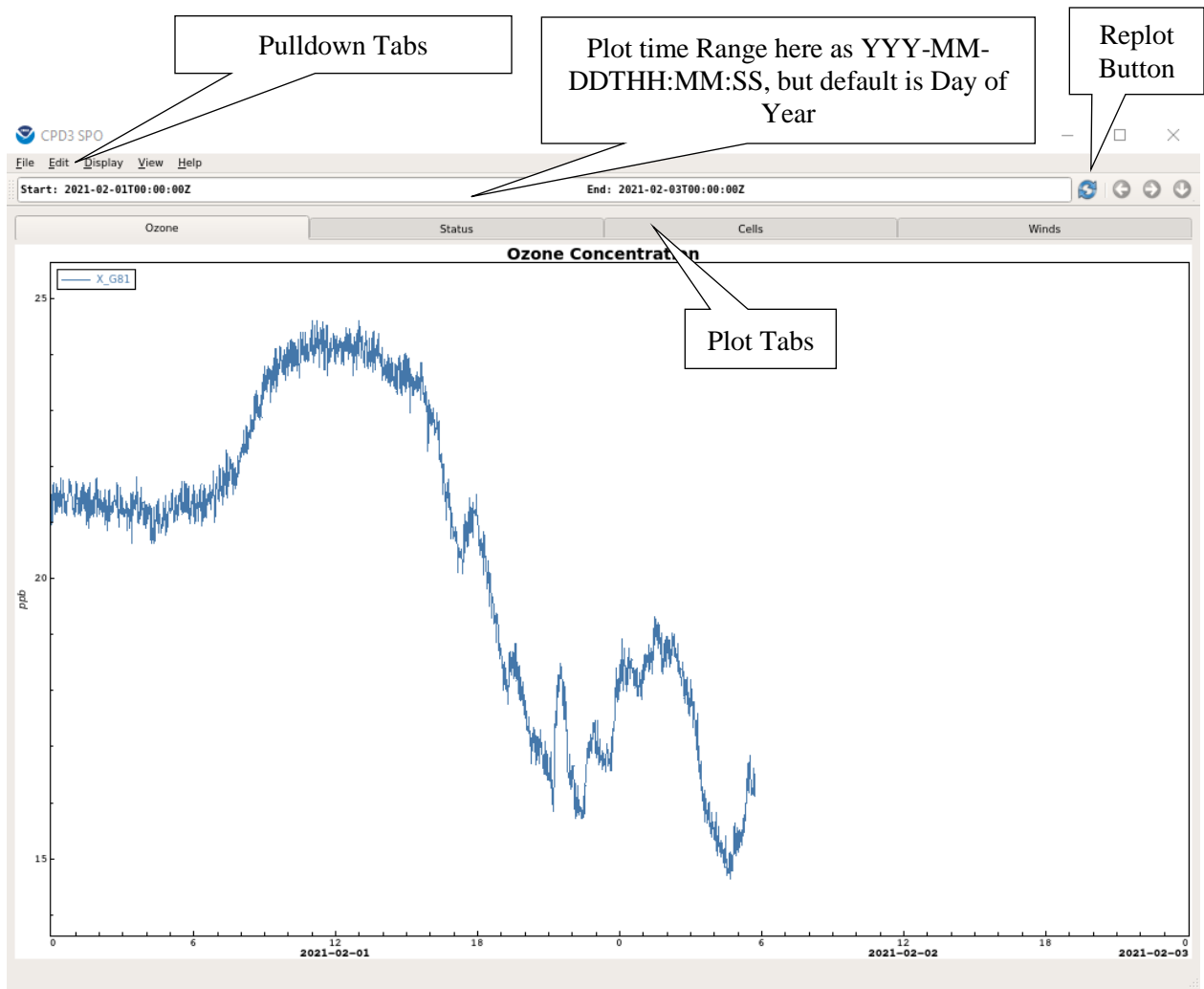
### **Quitting CPX3**

The last item on the CPX3 dropdown 'file' menu is 'quit'. Alternatively you can type `<control><q>` (`<Command>(Q)` on OSX) and CPX3 will quit.

## 2. CPX3 – The Basics

### The graphical window

CPX3 has lots of functionality and it is constantly being updated. Figure 1 highlights some of the basic functions that you will need for data viewing and editing.



### **Dropdown menus**

There are six dropdown menus at the top of the CPX3 plot window with various options. These are described in Table 1.

### **Plot Tabs**

There are plot tabs for different instruments and measured parameters. These vary from system to system depending on what measurements are being made. You can move from tab to tab by clicking on a tab with your mouse or by typing the 'n' (next) and 'p' (previous) keys. To toggle between two plots use the letter 'b' (back). You can also select a tab using the list of tabs under the 'View' dropdown menu (see Table 1).

## Replot Button

Clicking on the replot button will replot the data after a different time range is entered in the plot time range or after a specific region of a plot has been selected. You can also type the letter 'r'.

**Table 1** – Description of dropdown menus

<p><b>(1) File</b></p> <ul style="list-style-type: none"><li>• Mentor Edits – <i>brings up list of existing edits (if any) and window for adding edits</i></li><li>• Full Screen – <i>toggles GUI to full screen</i></li><li>• View Data – <i>brings up a window so you can select a parameter and view numerical values</i></li><li>• View Event Log – <i>brings up timestamped list of notes from data acquisition computer and instrument reports (very useful for data editing)</i></li><li>• Save Image - <b>&lt;not yet implemented&gt;</b></li><li>• Print - <b>&lt;not yet implemented&gt;</b></li><li>• Export Data – <i>brings up a window so you can select a parameter and export to data file</i></li><li>• Quit – <i>quits CPX3</i></li></ul>
<p><b>(2) Edit</b></p> <ul style="list-style-type: none"><li>• Preferences – <i>allows user to choose timestamp type and EBAS flag prompting</i></li><li>• Display Settings – <b>&lt;not yet implemented&gt;</b> <i>will allow the user to add configuration for tabs, graphs such as changing colors, adding traces</i></li><li>• System Configuration – <b>&lt;not yet implemented&gt;</b> <i>configuration file for 'everything' e.g., where it sends EBAS files (to the scientist and/or to EBAS)</i></li></ul>
<p><b>(3) Display</b></p> <ul style="list-style-type: none"><li>• Raw – <i>displays raw measurement and housekeeping (i.e., flows, pressures, etc) data</i></li><li>• Editing – <i>displays multi-paned plots: top plot is raw data, bottom plot is edited data (mentor edits and corrections applied)</i></li><li>• Clean – <i>displays edited data that have been passed</i></li><li>• Averaged – <i>displays clean (i.e., passed), [hourly]-averaged data</i></li></ul>
<p><b>(4) Operations</b></p> <ul style="list-style-type: none"><li>• Manual – <i>brings up menu with options for manipulating and managing data through a GUI; these tasks can also be accomplished from the command line on a Linux or Macintosh system. Two important options are 'Pass' to pass data and 'Generate EBAS' to generate an EBAS formatted file from the data.</i></li></ul>
<p><b>(5) View</b></p> <ul style="list-style-type: none"><li>• <i>Brings up some options for moving amongst plot tabs (e.g., back, next, previous, etc)</i></li><li>• <i>Has toggle for turning plot legends on and off</i></li><li>• <i>Brings up list of plot tabs so you can go to a specific plot directly</i></li></ul>
<p><b>(6) Help</b></p> <ul style="list-style-type: none"><li>• Help – <b>&lt;not yet implemented&gt;</b></li><li>• Website – <i>takes you to GMD Aerosols software page, which has a section of Frequently Asked Questions for CPX3 (FAQ info is command-line oriented, so may not be useful for cpx3 running on Windows machines)</i></li><li>• Report bug – <b>&lt;not yet implemented&gt;</b></li></ul> <ul style="list-style-type: none"><li>• Show Debug – <i>shows code error messages</i></li></ul>

## Plot Time range

This text box shows the time range of data currently being plotted. A different time range can be typed into the text box and it will be plotted once the 'replot' button is clicked.

## Previously plotted time range selectors

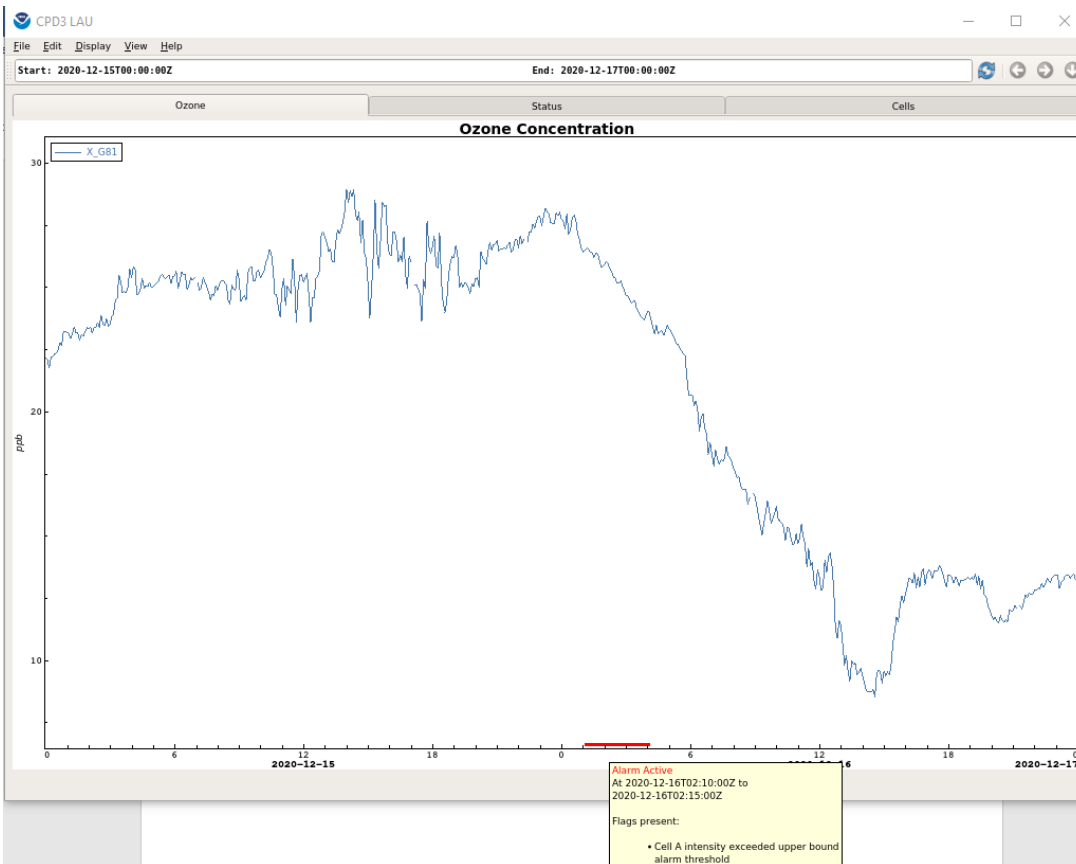
These arrows are similar to the back, forward and history arrows on a webpage.

Plot tabs

## Plot Tabs

Ozone	Plots Ozone concentration (X_XXX). Any instrument alarms will show up as a red line see figure 2 XXX is an instrument ID
Status	Plots (Top) Temperature: Bench Temp (T2_XXX) and Bench Lamp Temperature (T1_XXX) (bottom) Pressure (P_XXX)
Cells	Plots (Top) Flow Rates: Cell A Flow rate (Q1_XXX) and Cell B flow rate (Q2_XXX) (Bottom) Cell Counts/Intensities: Cell A (C1_XXX) and Cell B (C2_XXX)
Winds	Plots (Top) Ozone Concentration (X_XXX) (Middle) Wind Speed (WS1_XM1) (Bottom) Wind Direction (WD1_XXX)

Figure 2 showing instrument alarm



### 3. CPX3 – How to use it

#### Extracting data <not applicable to demo/Windows version>

There are two ways to extract specific data for viewing in CPX3.

- (1) One can begin by starting a CPX3 session and then editing the ‘Plot time range’ values at the top of the CPX3 window.
- (2) Alternatively, one can set the desired time range on the command line. There are multiple command line options to set the time range. Some of these are described in Table 2 below.

**Table 2** Telling CPX3 what data time range<sup>1</sup> to plot, examples are all for Bondville (bnd)

Command Line	Result
<code>cpx3.ozone bnd</code>	Most recent week of data
<code>cpx3.ozone bnd 24h now</code>	Data collected during the past 24 hours
<code>cpx3.ozone bnd 2009w15</code>	Data for week 15, 2009
<code>cpx3.ozone bnd 2009:103 2009:106</code>	Three days of 2009 data: DOY 103, 104 and 105
<code>cpx3.ozone bnd 2009:100 10d</code>	Ten days of data starting on DOY 100
<code>cpx3.oxone bnd 2008-01-15T12:00:00Z 2008-01- 16T15:00:00Z</code>	Data between 12pm Jan 15, 2008 and 3pm Jan 16, 2008
<code>cpx3.ozone bnd 2009.5 2009.75</code>	Fractional year – so data between ~July 1 – Sept 30, 2009
<code>cpx3.ozone bnd 2009-01-15 2009-01-30</code>	Data between Jan 15 and Jan 30, 2009

<sup>1</sup>Times are always in UTC. There are additional times stamp permutations, largely following the ISO8601 specification, which are described on the web:  
<http://www.esrl.noaa.gov/gmd/aero/software/aerosols/timeformat.html>.

Station data editing is typically done in weekly increments where the week is defined as Monday through Sunday (thus editing for the previous week can commence on a Monday). Thus, for weekly editing, you will typically use the third example in Table 2.

#### Zooming in on a data feature

Once you have a CPX3 session open you may want to look at a specific time period within the period of time displayed, i.e., for editing you may want to look at a spike in the data. Again there are two ways to do this.

- (1) You can edit the ‘Plot time range’ values at the top of the CPX3 window with the appropriate start and end times.
- (2) Alternatively, you can use the mouse to select a range. To use the mouse, click on the left side of the time range you want to look at, then drag the mouse to the right and click again on the right side of the region of interest. CPX3 will put vertical bars at the two edges you have defined, which will turn into a box if the mouse cursor is displaced.

vertically from the starting position. To look at just that time period (or zoomed data), click on the ‘replot’ button.

Table 3 describes various options for using your mouse and the keyboard to select (or de-select) data and to change plot parameters for a better look at the data.

**Table 3** Using your mouse to select data and change plot parameters

<b>Selection action</b>	<b>Result</b>
Click	Selection box, may have vertical and horizontal constraints
Shift+click	Horizontal selection bars only, no x-axis constraint
Control+click	Vertical selection bars only, no y-axis constraint
<esc>	Gets rid of selection constraint
Right-click	Brings up menu of various options including: <ul style="list-style-type: none"> <li>• Manual zoom (so you can force axes to be desired range)</li> <li>• Data smoothing options (e.g., hourly, lowpass filters)</li> <li>• Trace specific options (e.g., add symbols, hide legend)</li> <li>• Show plot in pop-up window (good for comparing with other plots)</li> </ul>

### Returning to a previous data time range

Once you’ve inspected the small feature you were looking at, you may want to expand back to the previous wider time range. In the upper right corner are three arrow buttons. The ‘←’ and ‘→’ are similar in functionality to the forward and backward keys on webpages. The ‘↓’ key pops up a menu with a list of time ranges you’ve looked at recently and you can select the one you want. If you want to go back to the time range you began with when you started cpx3 (for example the whole week of data) you can use a keyboard shortcut and type ‘a’.

### Selecting a data display mode

Use the ‘Display’ dropdown menu to select the display mode.

- ‘Raw’ will show you the unedited, uncorrected data and all the ‘housekeeping’ variables (i.e., flows, temperatures, pressures, etc)
- ‘Editing’ will show you the raw data in the top pane and the edited data in the bottom pane. The edited data plot shows data with the corrections applied. Edited data differs from the ‘clean’ data in that it shows the effect of all edits in the ‘mentor edits’ list, not just the “passed” data edits. (These terms are explained more clearly below.) The housekeeping data are not visible in editing mode.
- ‘Clean’ will show you data with all the “passed” data edits applied

### Shortcut keys

CPX3 can be used entirely as a point-and-click program, however there are some short-cut keys (hotkeys) that may be useful. These are described in Table 4 below.

**Table 4** Shortcut keys (hotkeys)

n	Move to next (right) tab
p	Move to previous (left) tab
r	Replot graphs (same as replot button) i.e., use after you select a different time range
a	Go back to time range that cpx3 was started at (i.e., if you started editing a week of data this will set the x-axis back to the whole week)
b	Allows you to toggle back and forth between the two most recently looked at plot tabs

More shortcuts are described in Appendix A



## Appendix A – CPX3 short cuts

There are additional short cuts in CPX beyond those described in Table 4.

There are a few shortcuts which work regardless of where you are in the GUI.

<Control><q> quits CPX3  
 <Control><s> save image <not yet implemented>  
 <Control><p> print image <not yet implemented>

There are also short cuts based on using <alt><letter> to allow you to move through the different dropdown menus. *On Mac OSX systems you may have to use the command key rather than <alt>.*

Top level 1 – <alt> short cuts

<alt><f> - opens File dropdown menu  
 <alt><e> - opens Edit dropdown menu  
 <alt><d> - opens Display dropdown menu  
 <alt><o> - opens Operations dropdown menu  
 <alt><v> - opens View dropdown menu  
 <alt><h> - opens help dropdown menu

Once you are in a menu using the <letter> shortcut you can continue to choose using <alt> <letter>

*Shortcuts for <alt><f> File dropdown menu*

<e> - open mentor edits window  
 <f> - changes CPX3 to full screen  
 <d> - view and select variables to show numerical values  
 <l> - view event log (i.e., station message log)  
 <s> - save image <not yet implemented>  
 <p> - print image <not yet implemented>  
 <x> - export data  
 <q> - quits CPX3

So for example if you wanted to use shortcuts to see the station message log:

<Alt><x> then <l>

*Shortcuts for <alt><d> Display dropdown menu*

Use the up/down arrow keys and space bar to chose a display mode

*Shortcuts for <alt><e> Edit dropdown menu*

<p> - allows you to chose the time format (e.g. Year DOY, or yy-mm-dd)

**Table A** Shortcut keys (hotkeys) (same as Table 4 in main text)

n	Move to next (right) tab
p	Move to previous (left) tab
r	Replot graphs (same as replot button) i.e., use after you select a different time range
a	Go back to time range that cpx3 was started at (i.e., if you started editing a week of data this will set the x-axis back to the whole week)
b	Allows you to toggle back and forth between the two most recently looked at plot tabs

## Appendix B – Getting help

There are three ways to get help with cpx3

1. From a command line prompt. At the command line type:

```
cpx3 --help <enter>
```

This will list out some cpx3 options as shown in box below

```
Usage: cpx 3 [s w i t c h e s] [s t a t i o n] [t i m e s] [m o d e]
```

This is the main graphical display for CPD3. This shows various plots of available data. By default it will display the last week of raw data

starting at the previous midnight UTC. The display mode can be switched to display data that has been passed by the station mentor or to a view that allows for comparison of data so that the mentor can make appropriate edits.

Switches can be given at any point in the command line, however a simple "--" terminates switch processing and all further arguments are treated as bare words.

Arguments:

station The station to show

Default: Inferred from the current directory

times The time range of data to display

mode The display mode

Default: "raw" mode

--ignore-station Ignore saved window station

--profile Display profile

Default: aerosol

Examples:

General usage:

```
cpx 3 br w 2010: 1 2010: 2
```

This displays data for the station "br w" from 2010- 01- 01 to 2010- 01- 02.

Default one week of data:

```
cpx 3 sgp
```

This displays the last seven days of data for the station "sgp" starting at the previous midnight UTC.

Explicit mode:

```
cpx 3 t h d 2012w3 c l e a n
```

This displays the third week of 2012 (2012- 01- 16 to 2012- 01- 23) using the "clean" display mode. That is, this will show only data that has been passed by the station mentor .

2. On the web. Help for the command line interface to CPX3 is here: <http://esrl.noaa.gov/gmd/aero/software/aerosols/cpd3faq.html> but there is not really

- online CPX3 help for the graphical interface other than a link to a pdf of this document at [ftp://aftp.cmdl.noaa.gov/aerosol/doc/software/Using\\_CPX3.pdf](ftp://aftp.cmdl.noaa.gov/aerosol/doc/software/Using_CPX3.pdf).
3. Within CPX3. You can get help from within CPX3 (this document) by clicking on the Help dropdown menu <not yet available>.

## **Appendix C – Configuring CPX3 plots**

The CPX3 program is very flexible and allows you to change how the plots look both temporarily and more permanently. <not yet available>