

# ActiveGEM package (version 1.7.0)

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GEMPAK graphical interface software

MRG Interactive

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This manual describes how to use ActiveGEM version 1.7.0, a graphically-driven user interface for GEMPAK, the General Meteorological Package.

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# 1 Overview

The ActiveGEM package is currently under development at the University at Albany (SUNY) and at McGill University. The goal of the project is to fill the gap between the GEMPAK package and research users using current interfacing technology. The primary language of ActiveGEM is perl/Tk, a modular extension of the perl programming language developed by Nick Ing-Simmons and available on the CPAN servers and mirrors.

ActiveGEM is licensed open source software hosted by SourceForge.net, and is subject to the terms and conditions of its copyright (see [Appendix A \[Copying Conditions\]](#), page 21). Although its target audience is the meteorological community, suggestions for extensions of the package to address the needs of other groups is always welcome.

As noted in the licensing and copying agreement (see [Appendix A \[Copying Conditions\]](#), page 21) we encourage all users of this software to become developers and to contribute to the evolution of ActiveGEM. Please share any interfaces that you develop and bug fixes that you implement so that others may benefit from your efforts.

## 1.1 ActiveGEM Quick Start

This Quick Start portion of the ActiveGEM manual provides a basic set of instructions for installing and running some of the ActiveGEM utilities. It represents by no means a comprehensive list of the functionality of the various components of the ActiveGEM package. For full instructions, the user is encouraged to read the detailed sections of the manual before beginning to work extensively with ActiveGEM.

### 1.1.1 Installation of ActiveGEM

Before installing the ActiveGEM package, make sure that you have an up-to-date version of Perl5 (versions 5.6 and newer are preferred) and that the Perl/Tk module is installed and functional. For a description of Perl and Perl module installation, see the CPAN site at [www.cpan.org](http://www.cpan.org). You will also need a FORTRAN compiler. Although FORTRAN90 is preferred, FORTRAN77 is also supported by the limited FORTRAN utilities of the ActiveGEM package. A fully-functional, up-to-date version of the GEMPAK libraries is also required for ActiveGEM installation. ActiveGEM is known to work for GEMPAK versions 5.6 and newer, although a high degree of backwards-compatibility is likely.

Once these components are running on your system, and you have downloaded and unpacked your ActiveGEM distribution (`gunzip -c ActiveGEM-x.x.x.tar.gz | tar -xvf -`), enter the top level directory and run the configuration script (`./configure`). Note that there are many possible command-line options and environment variables for the configuration script, the most common of which is the `--prefix` option which allows the user to assign an installation path. Run `./configure --help` for a full list of options. If you have an older version of the ActiveGEM package installed on your system, be sure to run `make uninstall` in the old source directories before attempting to upgrade.

After successfully configuring the package for your system (you should watch the output from the configure script as it runs to be sure that it produces no warnings or errors), you can build and install the package simply by typing `make all; make install`. This

will be reasonably quick (depending on your machine) so be sure to follow the output and check that all of the components compile and install correctly. Once you have installed the package components, make sure that your executable destination path (`bin`) is in your path and you will be ready to get started with the ActiveGEM package.

### 1.1.2 plotGEM Quick Start

Once the ActiveGEM package is properly installed on your system, you will be able to run the plotGEM GEMPAK plotting interface. This is the first application in the ActiveGEM package, and provides a user-friendly graphical interface for the GEMPAK plotting utilities including plan, cross-sectional, and profile plotting. To get started, type `plotGEM` on the command line to start the interface. After loading, you will be presented with the main notebook window of plotGEM. The following instructions are highly simplified, and reflect only the simplest application of the plotGEM interface. In-depth instructions and tips are found in the remainder of this manual.

To select an input GEMPAK file for plotting, click on the **Browse** button on the right hand side of the screen (or use the `-file` command-line option - run `'plotGEM -h'` for a list of options). Select a data file from the browser, and click on **Accept** to import the file name to plotGEM. If this is the only data file that you wish to load, then press the **Load** button on the main window, and wait while the file is loaded by plotGEM. Once the load operation is complete, a "Field Selection Window" will open, providing a list of the fields available in the requested file. Use the left mouse button to highlight the field of choice, then press the **Generate Plan Plot** button in the top right-hand corner of the main window. Wait for a few seconds as GEMPAK works its magic, and you should be rewarded with an X-window showing the requested field. Note that the default map is for the United States (where else?), so you will wind up with a blank map if you do not have any data covering that area.

You can customize your plot by selecting the "Scalar Field" tab in the notebook on the main window. This page allows you to add colours, change contour properties and intervals, and pretty much anything else that GEMPAK is capable of. For more information on the other plotting functions available to you with plotGEM, please browse the remainder of this manual.

## 1.2 What is ActiveGEM?

The ActiveGEM package consists of a set of perl/Tk programs and modules which provide a graphical user environment for interaction with GEMPAK functions. Additionally, small Fortran90 and Fortran77 utilities are provided to enhance the error-tracking abilities of the ActiveGEM software. The primary functions of the ActiveGEM interfaces are to provide a high level of easily-accessible flexibility to the user, and to parse the user's input into appropriate options strings for the GEMPAK text interface. The GEMPAK text interface is addressed automatically by the ActiveGEM utilities, thereby completing the graphical abstraction layer for the user.

As with all open source software in the development phase, there will inevitably be bugs in the interface which will become apparent as more users attempt to use ActiveGEM for

more complex tasks. With the help of the user and developer community, these errors will be corrected over time, and will result in a set of stable, relatively bug-free GUIs. Continued development of the GEMPAK package will also lead to incompatibilities in spite of the developers' best attempts to foresee them. Continued error and fix reporting on the part of the users is essential for the success of any open source software.

### **1.3 What data formats are acceptable?**

As a graphical interface overlay, the ActiveGEM package does not itself do any data handling. The data formatting limitations of ActiveGEM are therefore identical to those of GEMPAK and can be found in the GEMPAK software documentation for gridded, station and image files.

## 2 The plotGEM Utility

The plotGEM utility is the ActiveGEM GUI for the GEMPAK plotting functions. The plotGEM implementation for version 1.7.0 provides access to the 2D plan plotting, cross-sectional, and profiling capabilities of GEMPAK

The plotGEM GUI is notebook-based, with six main (tabbed) pages: See Section 2.1 [File I/O], page 4, See Section 2.3 [Scalar Field], page 5, See Section 2.4 [Vector Field], page 6, and See Section 2.11 [Script Overrides], page 11. Each of these pages will be explained in greater detail in later portions of this chapter. In addition to the notebook, a menu bar across the top of the window provides file functions, map options, and advanced options. The file functions (including Save, Save As, Load, and Quit) allowing the user to save or load the session at any point. The `smooth` quitting option runs a GEMPAK cleanup script, and is the suggested method of terminating the interface. The map options provide the user with both simple and advanced map setup capabilities including area, projection, and colour options. The advanced options menu item allows the user to control output devices, superpositions, and to define additional data sources.

The **Generate Plot** button on the right side of the menu bar generates output from the GUI and calls the appropriate GEMPAK plotting function. In superposition mode, a second button appears on the menu bar, allowing the user to **Submit** the plotted fields to the final output one at a time. Deactivating superposition destroys this **Submit** button.

### 2.1 File I/O Notebook Page

The file input/output page of the plotGEM interface is the place for user handling of the gridded input files and the output image files. To open a single file for plotting, simply enter the file name in the **Input File** slot and press the **Load** button. The file name will appear as an active input file, and a few seconds (depending on the file size) will pass while the file is scanned by the Fortran loader. A field selection window is opened automatically upon file loading, and will be described later in this section. To open multiple input files for plotting, use the **Push** and **Pop** buttons to enter a stack of input file names in the active input file list before pressing the **Load** button. Alternatively, you can use the standard UNIX wildcards (`*` and `?`) to load sets of files simultaneously.

The output file or window name is also defined on this notebook page. The default value is **GEMPAK**, which corresponds to the GEMPAK defaults for the X-windows device. This name is given to all output image files produced by ActiveGEM and GEMPAK. This entry must not reference a subdirectory of the local directory (for example, if a **GEMPAK** directory exists locally, then the default will fail on plot execution). This entry should be modified to reflect the type of output being generated. For example, if the GIF generation device is being used to produce GIF images, then the output file can be changed to `someFileName.gif`, for any convenient file name.

The field selection window displays a listing of the fields available in the active input file(s) under a series of descriptive headings. Fields can be selected either by using the drop-down menus above the column headers, or by left-clicking over the field of choice in the display window. At the top of the selector, the user has choices between **Scalar Field** and **Vector Field** options (the default is scalar). As well, function or vector entries can be made manually in the entry boxes provided.

For example, to plot wind vectors, the **Vector Field** button should be highlighted at the top of the field selection window. This tells plotGEM to produce a vector expression. Next the desired expression is entered into the box to the left of the **Vector Function** label (this expression would be `WND` in our example). To ensure that the date and levelling information is set correctly for this field, it is probably a good idea to select one of the function's components (say, `UREL`) from the display window. This could equally be accomplished using the pull-down menus at the top of the display window, but the former method is by far the safer of the two. Either double-clicking the left mouse button over the highlighted field, or pressing the **Generate** button on the main window will result in a wind vector plot. The same can be done for scalar fields, with the function defined in the entry box beside the **Scalar Function** label and the **Scalar Field** button activated.

**Help** menus are provided to assist users in writing their own functions, and **Long** function inputs are available for the writing of extended compound functions. Also available in the window generated by pressing the **Long** buttons are the function expansion descriptions. By default, plotGEM expands the date, level, and coordinate for each variable in each function. This is a desirable quality since it allows for plotting and computation involving multiple times and levels; however, it can also result in long input lines for the GEMPAK applications, some of which are very restrictive on input line length. plotGEM will attempt to warn users of very long lines. If you see such a warning, removing some of the expansions using the options in the **Long** window is the best place to start for reducing the line length. Of course, resetting the maximum input line length parameter in GEMPAK and recompiling the package is another (permanent) answer if you have that kind of control. A description of this procedure is provided in the pop-up window as a user note.

## 2.2 Changing Plot Types

Three different types of plots can be plotted with plotGEM: 2D plan maps, 2D vertical cross-sections, and profiles. The default plotting mode is **Plan Plot**, which is displayed on the **Generate** button in the top right-hand corner of the display. To access either of the other plotting modes, use the **Type** menu to highlight the desired mode. Once the new mode is selected, the **Generate** widget will be modified to reflect the new plot type. For example, if you choose the **Profile** selection in the **Type** menu, then the **Generate** button changes to read **Generate Profile**. No settings or options are lost during the plot type changes, so even if you forget to switch until you have everything else set up, you will not have to redo any of your work.

Plot type switching while in superposition mode (discussed individually in each of the following subsections, and activated from the **Options** menu) is not allowed for obvious reasons. An attempt to switch during superpositions will be trapped and the user will be warned of his/her indiscretion.

## 2.3 Scalar Field Page

The scalar field page of the plotGEM notebook contains the line and colour filling display options. For a simple line plot, use either the old or the new **Contour** choices across the top of the page. To create a colour plot, select one of the **Fill** options. Note that any or all of the four plotting options can be selected for any given plot.



The line properties option section contains a set of reasonable defaults which will generally serve to provide a first look at any dataset. Both label and line characteristics are set in this section. The colour properties selection region is somewhat more complex, with two primary modes of operation. The first (default) produces a range of colours with appropriate gradation. The second, more involved, mode involves the specification of individual fill/dash values, and is accessible through a separate window (activated once the **Choose Fill/Dash Values** button is pressed). Note that this mode requires the specification of a semicolon-separated list of individual contour levels in the **Levels** entry of this region. The button with an ! (exclamation mark) to the right of the **Levels** entry is useful in conjunction with the colour level specifications (see [Section 2.10 \[Colour Plots\], page 9](#)). It propagates the colour **Levels** to the line **Levels**.

Once the user is satisfied with the selections on this page, he/she uses the **Generate Plot** button on the menu bar to create the desired plot. After changes to any of the values on this page, the **Generate Plot** button must be pressed to display the new plot.

## 2.4 Vector Field Page

The vector field page of the plotGEM notebook contains the vector (or barb) and reference vector display options. Default behavior is to plot wind barbs at every gridpoint, which is desirable only as a first guess.

The properties of the vector display are set in the top region of the page. Colour, size, type, and vector units can be changed quickly by modifying the appropriate entries. As well, the handling of stations (gridpoints) with calm winds is set in this selection area. If the vectors (barbs) appear too densely in the output, then set the **Skip Points** entries to non-zero values to plot vectors (barbs) only every **n** gridpoints.

The reference vector properties, displayed only when the **vector** option is chosen in the vector properties region, are set in the bottom half of the page. The location of the reference vector takes the form of semicolon-separated **x;y** coordinates, where **0;0** is the bottom-left corner of the page and **1;1** is the top right corner. Note that the use of **Hardware Font** for text is preferable on most systems.

## 2.5 Selecting Map Settings

All options for the plot domains and map setup are contained within the entries under the **Map** menu at the top of the main window. The map description is of course only meaningful in plan plotting mode (see [Section 2.2 \[Plot Types\], page 5](#)), and is necessarily ignored in both cross-sectional and profile plotting modes. The map domain may be selected using either the **Quick Area** selection list or the **Advanced Map and Area Settings** window. The quick list provides an easy way to look at data for different domains around the world without having to worry about specific grid specifications. The map settings window, however, provides complete access to the map projections and definitions available in GEMPAK.

General map attributes including map colour, line-style, and projection, are set in the **Map Plotting** region of the map settings window (note that **Defining Angles** are used only for some of the more advanced map projects - please refer to the GEMPAK users guide for more details). The map domain is defined in the **Domain Description** region of the window,

where one of six selections can be made. The **Native Data Grid** domain displays the actual domain of the gridded input dataset. The **Native Image Map** specifies that all fields are to be plotted on the domain of the satellite or radar image provided (see [Section 2.9 \[Sat/Radar Images\]](#), page 9) if this option is selected and no image is provided, then the **Geographical** specification (described below) is used by default. The **Lat/Long** specification allows the user to accurately define the corners of the region to be plotted. The default **Geographical** specification permits for the quick definition of a map centered on a particular area, as does the **Station** specification. The **Zoom** definition allows for the "zooming" of the current map to a user-defined region.

In general, the best way to zoom the map is to select the **Choose New Area** button **before** selecting the **Graphical** specification. This is because you will only be able to select a subregion from the currently active area, which is defined by the settings snapshot at the time that the **Choose New Area** button is activated. If you select the **Graphical** specification first, then you will only be able to choose a new area from your previously-zoomed region, which is likely not intention but may be considered a feature. Instead, leave the domain description at its current value (whatever that is) and select the **Choose New Area** button to get more predictable behavior. Zooming out returns the map settings to the last selected *non-zooming* projection.

The plotting of the latitude/longitude reference lines is defined in the **Lat/Long Plotting** region of the page (the colour of these lines may also be set directly from the **Map** menu), and specific options are set in the **Miscellaneous Options** region. The extent of the plan map on the page may be set in the latter region.

Additional map details may defined in the **Miscellaneous Options** section of the window. By default, only the **base** map is loaded, which contains information about coastal and major political boundaries. To add details such as lakes, rivers, and roads, select and add additional maps to the listing in this section. Several detailed maps are available through the pull-down menu, and others may be accessed by either entering the full path name of the map file into the **Custom Map** entry, or by selecting existing maps from the GEMPAK database using the **Browse** button. Each time a map is to be added to the current plot from the text entry the **Add** button must be selected (this is done automatically for the pull-down menu options). To remove a map from the current plot, simply highlight the plot name, and activate the **Remove** button to remove it from the list. Only maps which are on the list will be used in plotting the current panel.

## 2.6 Cross-section Page

The cross-section plotting page gives the user access to many of the common options employed uniquely during the plotting of cross-sectional views. The top panel on the page allows the user to define the transect path in one of four ways: using latitude/longitude specifications of the endpoints, using gridpoint entries for the endpoints, using station specifiers at the endpoints, or performing a graphical definition. The first three of these options are fairly simple, but the fourth (graphical definition of the transect) is the most powerful. Activating the **Choose** button will produce a new plot window (called **CursorChooseWindow** no matter what entry you have on the **File I/O** page) showing the plan view of your grid area. If the plotted region does not contain the area you're interested in, then try resetting the map options (using the **Map** menu item) before hitting the **Choose** button again. Once

the plan map has been plotted, simply click and drag the transect of your choice using the left mouse button. The next time the **Generate Cross-section** button (on the top menu bar) is pressed, the desired cross-section will be plotted on the main output window. Note that the **CursorChooseWindow** will not close, but you can drag it out of the way - this feature will optimize your next selection process.

The **Axis Formatting** panel provides control over the size, extent, and position of the vertical coordinate and the plot. For the cross-section, both **skew-T Axis Types** are invalid, since they are reserved for profile plotting, to be described in the next section. For control over the contour properties (for example, whether to use fill colours or not) and vector properties, use the **Scalar Field** and **Vector Field** pages. Similarly, title and colour bar plotting and description is accomplished using the appropriate entries from the **Options** menu at the top of the page.

Due to GEMPAK limitations, superposition in cross-section mode can be accomplished only for one scalar field and one vector field. If you wish to overlay multiple scalar (or vector) fields, you must use the **Overlay** option under the **Options** menu. More information can be found in See [Section 2.14 \[Multiple Fields\]](#), page 13.

## 2.7 Profiles Page

Profile plotting with plotGEM is accomplished using the options provided on the **Profile** page of the main notebook. As for the **Cross-section** page, the top panel provides entries for the location of the profile in latitude/longitude coordinates, grid coordinates, or as a station identifier. The profile location can also be chosen graphically in a manner very similar to that described in the previous section. Activating the **Choose** button will create a separate map window (entitled **CursorChooseWindow**) containing a plan plot of the selected field(s). Choosing a location on the map window is as simple as single-clicking the mouse button on the desired point. The next time that the **Generate Profile** button is pressed (this button is on the right-hand side of the menu row), the profile at the defined location will appear on the main window.

Axis formatting for profile plots is similar to that for the cross-sections as described in the previous section. The extents and details of each of the ordinate and abscissa axes can be set directly on the **Profile** page, as can the properties of the plot window. A **More** button to the right of the bound and interval entries allows for further description of the particulars of the axis labelling properties. Simple frame characteristics can be easily set in the **Profile Appearance** panel. For skew-T plotting options, and additional options for other plot types, a **Background/Markers** button on the right-hand side of the **Axis Formatting** panel generates a separate entry window which allows for detailed definition of the plot properties.

Superposition of profiles is not allowed in the current implementation. Instead, the **Overlay** button in the **Options** menu must be activated for multiple profiles to be shown on the same window. More information can be found in See [Section 2.14 \[Multiple Fields\]](#), page 13.

## 2.8 Plotting Surface Observational Data

Surface data can be plotted by only in **Plan Plot** form (see [Section 2.2 \[Plot Types\]](#), [page 5](#)) since soundings or cross-sections of surface data would have no real meaning. The controlling window for plotting surface data can be accessed through ‘Data’⇒‘Station Data’. The **Station Data Handling** window provides full control over the plotting of surface observational data. By default, no station information is plotted and the **Station Data File** entry is blank. To plot station data, simply provide the name of a valid surface data file in this entry and the date of the observing time in the **Obs Year/Month/Day/Hour/Min** entries at the bottom of the window.

The other options on the **Station Data Handling** page control the information plotted and its attributes. The details of the text and symbol characters are defined at the top of the window. In the middle of the window is a selection box that allows for the quick user-definition of the data to be plotted at the station location. When any of the buttons are selected (their configuration representing that of the final product), a **Station Parameter Selection** window for the requested slot appears. The entry and its individual attributes may be defined here (note that all symbol sizes and widths can also be set for all parameters using the **Reset Symbol Sizes** button).

Because surface data plotting is handled separately from contouring in GEMPAK, ‘Options’⇒‘Overlay’ mode must be used to add surface data to plots (see [Section 2.14 \[Multiple Fields\]](#), [page 13](#)). Moreover, if multiple sets of surface observations are to be plotted (for example, separate surface stations and ship/buoy observations), then ‘Overlay’ must be used since there is no ‘Superposition’ facility in the underlying GEMPAK application. The simple rule is that whenever producing surface observational plots, use ‘Overlay’.

## 2.9 Using Satellite and Radar Image Backgrounds

Satellite and radar images (properly-formatted, see the GEMPAK documentation for details) can be used as backgrounds by GEMPAK by defining the name of the image file through ‘Data’⇒‘Additional Data Sources’. The **Enhanced Data Handling** window permits the user-definition of the background image file (either satellite or radar) and provides access to the full range of enhancement tables. Note that the map projection is automatically changed to a satellite view if a **Satellite Input File** is defined and the checkbox beside it is active (the default). The grid area of the plot remains defined as before on the new projection; however, the user can also specify that the full domain of the image is to be shown using the **Native Image Map** button in the **Advanced Map Options** window (accessible through ‘Map’⇒‘Advanced Map Area and Settings’ (see [Section 2.5 \[Map Options\]](#), [page 6](#)).

## 2.10 Adding Colours and Colour Bars to Plots

All of the lines plotted on GEMPAK maps allow for the definition of specific line colours. Each of these is reflected in plotGEM with a pull-down menu of the available colour options. All scalar plots in GEMPAK (see [Section 2.3 \[Scalar Field\]](#), [page 5](#)) can also be

shaded/coloured using the **Fill** option on the main notebook's scalar field page. With fill selected (and defined by either the default **Colour Range**, **Fixed Range**, or **Colour Value** list - these options are described in greater detail below), a colour bar is easily added to the plot using 'Options'⇒'Colour Bars' (under the **Options** menu at the top of the main window). A popup window will allow you to set the properties of the colour bar in your current plot. Note that default is for the colour bar **not** to be displayed, so the first step in the definition of the colour bar is to select the **Show Colour Bar** option at the top of the colour bar window.

The positioning of the colour bar is somewhat tricky, but will be familiar to GEMPAK users. The bar location is defined in the view coordinates (x[0,1],y[0,1]), separated by a semicolon. For example, an entry of `.9;.2` would position the **Anchor** of the colour bar 90% of the width from the left edge, and 20% of the height from the bottom of the plot. The anchor is set using the pull-down menu directly to the right of the bar location entry [default lower-left (LL)]. The anchor is basically the position of the entered location relative to the colour bar itself. If the default lower-left is retained in this case the example, then the lower-left corner of the colour bar will be positioned at `(.9,.2)`. Of course, this will create a colour bar that extends well to the right of the plot window, so the **Orientation** of the colour bar may be changed to "Vertical". Control of the colour labels (along the colour bar) is also provided in this region of the colour bar window. Text attributes for the colour bar are defined in the separate **Text Settings** region.

There are three options for colour filling in on the **Scalar Field** notebook page. The default (**Colour Range**) allows the user to define a range of colour with which to fill the map as GEMPAK finds appropriate. This setting can be refined using the **Interval**, **Minimum**, and **Maximum** settings in the same section; however, the start and end field values of the colour range are still chosen based on the field itself. This can be a problem in time series generation where it is preferable that all colour ranges be the same.

For this purpose the **Fixed Range** colour style should be chosen, which allows for a quick-and-easy definition of the field values (levels) to shade based on the user-supplied (mandatory) **Minimum** and **Maximum** values. This fill style works best with the **Auto Fill Interval** enabled. If numerous colours are used, the length of the **Levels** line may exceed the recommended value. If this is the case, plotGEM will warn you of the possible problem, and offer to attempt to resolve it. Unless you are very sure of your custom GEMPAK build, you would be well advised to allow plotGEM to give you a hand in reducing the line length; otherwise, some of the higher colour levels will likely be lost. Note that increasing the **Fix Skip** value is an effective way of thinning the colour list and reducing the line length, although it also reduces the (colour) smoothness of the final product. Note that contours can be added to each colour level using the ! (exclamation mark) button in the **Line Properties** section of the page.

The **Colour Values** fill option allows for precise user control over the colour and fill type for specific levels. Each level given in the **Levels** list is treated separately in this fill mode, and both colour and fill values are provided by the user once the **Choose Fill/Dash Values** button is activated. Note that this pop-up window is one of the few in plotGEM that *must* be closed for changes within it to take effect.

The default colourmap in plotGEM mirrors that of GEMPAK so that users familiar with the GEMPAK colour naming scheme feel more comfortable with the initial values. However, one of the primary advantages of plotGEM is that the selection of multiple colour maps is



a very simple procedure. Activating the ‘Options’⇒‘Colour Mapping’ menu item results in the generation of a pop-up window that allows the user to quickly define both the background colour and the overall colour map to be applied to the current plot. By default, the `Use Default` checkbox is selected for the background colour, which means that all graphical plots will be generated with a black background, except for PostScript file, which have a white background. De-activating this checkbox will override all default backgrounds, including those for the PostScript driver. Note that this is *not* the best way to invert the image from white-on-black to black-on-white. The ‘Options’⇒‘Negative’ option is provided to assist with the production of negative prints (see below).

Changing the `General Colour Map` results in changes to all of the colour options available in plotGEM. It may also produce changes in some of the current settings as the new colour map is queried for your setup. For example, if you have the line colour set to `green` in the default `default` colour map, and change to the `rainbow` colour map, you will notice that the line colour has been reset to `redorange1`. If you change back to the `default` map, the line colour will change back to green. This remapping is performed numerically in that the colours are mapped in the order in which they appear in each map. Although most of the standard colours map predictably from one colour scheme to another, it is probably safer to set the colour map before proceeding too far with the production of the plot. The application of non-default colour maps will allow you to make images with smooth colour gradations across the range of your data using either the `Colour Range` or `Fixed Range` options on the `Scalar Field` page (see [Section 2.3 \[Scalar Field\], page 5](#)).

All colour maps contain both colour and black-and-white mappings. The latter can be selected using the ‘Options’⇒‘Output Colours’ `Greyscale` option. With `Greyscale` activated, all plots are generated using grey gradations instead of colours. In general, these gradations go from light to dark, or vice versa. There is no uniform attempt to maintain the intensity of the colours from `Full Colour` to `Greyscale` since many of the maps would result in a set of uniform, or indistinguishable, greys. Note that all of the colour options in plotGEM are updated to greys once `Greyscale` is selected. There is currently no `Monochrome` implementation in plotGEM, although the `Monochrome` option will be passed to the called GEMPAK application upon request.

For publication-type images, it is also sometimes useful to produce image types (other than postscript) on white backgrounds instead of the default black (for example, for import to FrameMaker software). (The postscript driver does this automatically so that your sysadmin doesn’t have to replace printer toner every hour or two.) This can be achieved in plotGEM through the selection of the ‘Negative’ option from the ‘Options’ menu. All white/vanilla lines in the standard white-on-black mode will be converted to black lines, and the background will be switched from dark to light. Note that all other colours remain unaffected by the negative mode switch. Because this mode requires that an extra command be executed in the GEMPAK output buffer, generation of the images may be a bit slower. It is therefore advisable to build the plot using standard white-on-black mode in the X-Window, and to make activate negative plotting only as the final step.

## 2.11 Script Overrides Page

The script overrides page of the plotGEM notebook provides the highest level of flexibility for the experienced GEMPAK user. A complete set of option types is provided, each of which

can be set manually and selected to override any values generated by plotGEM at execution time. Note that only those filled entries whose options are highlighted (by clicking on the selection box next to the entry) will be used to override the plotGEM values. A full set of overrides (inactive) containing a snapshot of the current settings is generated each time that the **Generate Plot** button is pressed. Similarly, the **Generate Overrides** button can be used to produce overrides without re-plotting.

A dynamically-generated help index can be accessed using the **Help** button. Complete information on each of the entries is provided so that the user can quickly and easily set the override values of his/her choosing. Keep in mind that almost all of the options available to the user are included on the other pages and windows of plotGEM. The overrides page should be used as a last resort only, since error checking is necessarily virtually nonexistent for the user-specified entries. To remove a user override, simply de-select the appropriate option button, and press **Generate Overrides** to accept the current plotGEM values.

## 2.12 Save/Load Plot Values

Saving and loading of the full set of plot values (everything that you can see in plotGEM) is accomplished using the **Save**, **Save As**, and **Load** options of the **File** menu. Selecting either the **Save As** or **Load** option opens a file browser from which to choose the desired save/load file. If a save file has already been selected, then **Save** simply replaces its current contents with a snapshot of the plotGEM options. Once you have created a complicated plot that suits your needs, it is a very good idea to save the plotGEM settings just in case you need to reproduce it quickly. Loading and running a previously-saved set of plot settings should result in a plot identical to the one generated the first time, provided that the datafiles are still present and unchanged.

As the ActiveGEM package goes through upgrades, an internal plotGEM version number is incremented. This version information is also stored in the saved files, so that the software knows, at load time, how old the information in the save file is expected to be. If plotGEM detects a save file written by an older version of the software, it will warn the user as to the severity of the possible conflict. As much as possible, wrappers are written to implement the loading of files written by older versions; however, keep in mind that any options implemented between the versions will be set to their (usually very reasonable) default values.

In an effort to permit simple organization of the saved files, the ActiveGEM programs recognize the **ACTIVESAVE** environment variable as pointing to the users's storage directory. Each time a file selection menu appears (for saving and loading), it will default to this directory. In this way, it is simple for the user to keep all of his/her settings in the same location for easier recovery at a later time. If the **ACTIVESAVE** variable is unset, then the file browser will default to the current directory.

## 2.13 Exporting Scripts with plotGEM

Although plotGEM provides a wide range of functionality for the user, there will undoubtedly be times when advanced users wish to make use of GEMPAK scripts directly

(remembering that within plotGEM there are both Scripting Override options (see [Section 2.11 \[Script Overrides\]](#), page 11) and ‘Data’⇒‘Multiple Times’ capabilities). If this is the case, then the GEMPAK script used by plotGEM to generate the most recent output can be produced using the ‘File’⇒‘Export’ option. Upon export selection, the user is prompted for a script file name: the script will be generated into this file. The generated script comes plug-and-play, but may require the user to apply user-executable attributes, in an effort to maintain platform independence. Once executable, the script may be run simply by typing its name on the command line to reproduce the latest output of plotGEM. Due to plotGEM internal usage of the `gpend` GEMPAK buffer-clearing utility, it is advisable to quit plotGEM **before** running the exported script. Especially for graphical devices (X-windows), however, this is not necessary. It is for the user to remember to run the `gpend` utility to generate hard-copy output as necessary.

## 2.14 Plotting Multiple Fields with plotGEM

Plotting multiple fields on a single map with plotGEM is accomplished primarily through the use of the ‘Superposition’ option. In plan plotting mode, simply activate the ‘Options’⇒‘Superposition’ button to begin the process of developing a multiple-field graphic. In superposition mode, a second button and (red) menu set appears next to the **Generate Plan Plot** button. This **Submit** button and menu allows you to add and remove superposition layers to your plot.

To generate the first superposition layer, select the desired field from the field selection window, and give it the attributes that you would like this field to have. Once you are happy with the result (you can generate the map as many times as you want), press the **Submit** button to store the first layer into memory. The second layer of the plot now becomes available for you to manipulate. You may (and probably will want to) choose a different field to plot with entirely different attributes. Each time that you press the **Generate Plan Plot** button, both layers are replotted; however, only the attributes of the active layer (now the second layer) may be modified. In this way, any number of fields may be superposed upon each other.

If, after submitting a field, you realize that you have made a mistake on one of the layers underneath it (anything but the active field), you can select the ‘Withdraw’ option from the red ‘Superposition’ menu. This will withdraw the currently-active field, and make the previously-submitted field active. You can withdraw as many times as necessary to get back to the field you wish to modify. In the default memory mode, a withdrawn field is purged from memory and must be reconstructed manually; however, enhanced handling of fields is possible using the plotGEM data manager (see [Section 2.16 \[Data Manager\]](#), page 14).

In cross-section and profile plotting modes, internal GEMPAK limitations limit the usefulness of the ‘Superposition’ option. On cross-sections, only one scalar field and one vector field may be overlaid, and profile plots do not support superposition at all. A work-around is provided using the ‘Options’⇒‘Overlay’ button instead of superposition. In overlay mode, a separate button and (red) menu appear, with the current layer number displayed on the button. In terms of end-user functionality, this mode is very much like superposition, as layers may be added and removed using either the button or the special menu; however, output file sizes are increased dramatically in overlay mode since all background lines are replotted for each layer. For this reason, the use of overlay mode for superposing fields



should be limited to applications in cross-section and profile plotting modes **only**. In plan plotting, all field layers should be added using superposition.

If multiple layer plots of surface observational data are required (or if station data is to be layered onto another field), the the only option for creating the layers is ‘Options’⇒‘Overlay’. Applying ‘Superposition’ in this case will **not** work since there is no support for station plotting in the gridded data programs of GEMPAK and there is no superposition ability in the package’s surface mapping utilities.

## 2.15 Plotting Multiple Panels with plotGEM

Multi-panel plots are easily generated using the plotGEM interface. To select a panel region, use the window produced by activating ‘Options’⇒‘Multi-Panel’ to highlight the desired layout and panel. Note that the active panel displays the word **Active** once selected. Once a panel is selected, all plotting occurs in that region until a new panel selection is set (note that the default is an active 1-panel plot). Within each panel, plotting is exactly the same as for a 1-panel plot. Fields may be superposed to generate multi-field plots, colours may be added, colour bars and titles may be defined, *et cetera*.

Once the active panel displays the desired fields, activate ‘Options’⇒‘Overlay’ mode and add the layer by pressing the newly-generated button (or by selecting the ‘Add Layer’ option from the special menu). This will save the current panel and allow you to begin processing the next one. Back in the Multi-Panel window, select another panel for plotting, and begin to construct the fields for the new plot. Each time you generate the plot, all of the fields and panels will be replotted, but only the top layer will be active for modification. In this way, any number of panels may be added to a plot; however, only a limited number of layout options are available in the Multi-Panel window. Others must be added using Script Overrides (see [Section 2.11 \[Script Overrides\]](#), page 11).

As for superposition mode, layers added in overlay mode may be removed if changes are required in a layer (panel) that has already been added. Under the special overlay (red) menu, select the ‘Remove Layer’ option to remove the active layer and activate the next-most-recently submitted panel. This process may continue until you reach the layer in which changes are required. Again, the plotGEM data manager (see [Section 2.16 \[Data Manager\]](#), page 14) will come in useful when changes are to be made in a deeply-layered panel.

## 2.16 Using the plotGEM Data Manager

The plotGEM data manager is a system which allows for the recovery of removed fields. It is useful in both ‘Superposition’ and ‘Overlay’ modes, or with a combination of the two (for example, a multi-panel plan plot with multiple fields in each panel). The data manager is always active in the background of the application, but only intervenes when the ‘Data’⇒‘Data Manager’ button is selected. While the Data Manager is active, no new fields may be submitted or overlaid. However, any attribute of any previously-submitted or overlaid field may be changed. This makes the Data Manager a powerful tool when modifications are required for deeply-layered plots.

For example, suppose that superposition mode is used to generate two layers on a plan plot, the first of which has colour but no colour bar. After submitting the first layer and modifying the second to his/her liking, the user decides that a colour bar would be pretty (after all, isn't that what science is all about?). The user selects 'Data'⇒'Data Manager' to help with this modification. A window appears, showing the currently-submitted fields (two, in this case) in the order in which they were submitted. Either double-clicking on the desired field, or selecting the field and activating the 'Modify' button will activate the field in question. All of the fields attributes are now modifiable in the usual plotGEM windows. Once the colour bar has been added, the user simply presses the 'Exit' button on the Data Manager popup window (or de-select the 'Data'⇒'Memory Manager' menu entry) to continue editing the top level field.

In fact, a the development of a basic layout may prove to be the easiest way to begin a complex plot. Arrange fields into panels using superposition (on the same panel) and overlays (for different panels), all with the default colour and line settings. Once the desired layout is obtained, the Data Manager can be used to apply settings to the individual fields. Note that new fields **cannot** be added with the Data Manager active, and that all superposition and overlay options are deactivated once the manager is invoked. Of course, more fields can be added (or fields removed) once the Data Manager is turned off.

If multiple fields appear the same in the abbreviated field summary presented by the Data Manager in the popup window, additional details can be obtained by highlighting a field and pressing the 'Details' button. This pops a separate window to provide additional information about the selected field.

## 2.17 The GEMPAK Output Shell

The GEMPAK output shell is simply a window on the **Shell** notebook page that displays the runtime output from the GEMPAK applications executed by plotGEM. Instead of writing to the STDOUT of the shell from which the plotGEM application was launched, the output from GEMPAK children is redirected to this notebook page, allowing for quick reference to any informational, warning, or error messages that the applications return. The output shell window is *not* interactive, so no input is allowed in the output shell buffer. The the **Shell** notebook page will be most useful when the plot generated by plotGEM and GEMPAK fails to display the requested field.

## 2.18 Frequently Asked Questions

This section contains a list of frequently asked questions about the plotGEM utility. If you are having trouble, and are unable to find answers in this list, feel free to post questions to the plotGEM mailing lists on the package distribution page (<http://sourceforge.net/projects/activegem>).

- **What version of plotGEM am I running?**

This information will be displayed at load-time. As well, you can access up-to-date information by selecting 'File'⇒'Info'. Lastly, from the command line you can type `plotGEM -v`. In this case, the utility is not started, but the version information is printed to STDOUT.

- **What command-line arguments can I give plotGEM?**  
 To obtain a list of command-line arguments accepted by your version of the package, type `plotGEM -h` at the prompt. The utility will not be started, but a list of valid options will be printed to STDOUT.
- **What is the difference between ‘Load’ in the ‘File’ menu and the ‘Load’ button on the File Selection page?**  
 The ‘File’⇒‘Load’ button allows you to load settings that have been previously saved by plotGEM. This is **not** the way to load your data files. The ‘Load’ button on the (entry) File Selection page is the way to load your data files once you have selected them on the Input File line.
- **Why do I get an error when I load multiple files?**  
 Some versions of the GEMPAK plotting program (`gdplot2`) appear to have broken multi-file loading capabilities. If you get something that looks like `cannot open fileA+fileB`, then chances are that you’ll have to apply the appropriate patch (provided with the activeGEM distribution) before continuing. For more information on how to install patches, see [Section 3.1 \[GEMPAK Patches\], page 20](#). The appropriate patch in this case is the `activeGEM-multiFile.patch` patch.
- **What does this ‘File’⇒‘Export’ button do?**  
 The ‘File’⇒‘Export’ button allows you to produce a GEMPAK script directly from plotGEM for use on the command line. When you select ‘Export’, you will be prompted for an export file name, and the current settings in plotGEM will be translated into a GEMPAK-ready script.
- **But I want a whole series of plots for different times - can I do that?**  
 Sequences of plots can be produced simultaneously using the ‘Data’⇒‘Multiple Times’ option. When this option is selected, a window appears from which you can choose any number of times available in your input file(s). Once you have selected the desired times, hit the ‘Generate Series’ button at the bottom of the popup window to create the plots. Note that the plots will be generated with the date encoded into the output file to prevent overwriting of subsequent times. Time sequences work for any type of output device.
- **What does ‘Native Grid’ mean?**  
 The ‘Native Grid’ is the grid on which the data is defined. Usually, GEMPAK interpolates data from the native grid onto the projection selected by the user. However, it is sometimes useful to look at data directly on its defining domain (for example, if one is looking at output from a limited-area model and wants to know exactly where the lateral boundaries lie). For this reason, the option of plotting the data on its native grid is provided on the ‘Advanced Map Area and Settings’ page under the ‘Map’ menu.
- **I just zoomed-in on the map, now how do I zoom-out?**  
 The only way to zoom out from a graphically-selected area (from the ‘Map’⇒‘Advanced Map Area and Settings’ page) is to choose a different grid specification (for example, ‘Native Grid’ or ‘Lat/Long Definition’).
- **I just zoomed-out, and now I want to zoom-in on a different area, but plotGEM keeps giving me only my original zoom to choose from?**  
 The "memory" of your zoomed area is a feature in plotGEM, since it allows you to quickly switch between areas of dramatically different scales without redefining the

grid each time. However, it also means that you have to be careful when choosing a different zoom region. In plan-plotting mode, hitting the ‘Choose New Area’ button on the ‘Map’⇒‘Advanced Map Area and Settings’ page will cause plotGEM to present the user with the **selected** grid from which to choose a subdomain. If the user selects the ‘Graphical Definition’ option **before** clicking on the ‘Choose New Area’ button, then the old zoomed area is displayed; however, if a different (for example, hemispheric) grid is selected, then the subdomain can be chosen from the displayed grid. In short, to zoom for a second time in a different area, hit the ‘Choose New Area’ button **before** selecting ‘Graphical Definition’. In fact, plotGEM will choose ‘Graphical Definition’ for you once you have chosen your new area.

- **What is the difference between ‘Options’⇒‘Superposition’ and ‘Options’⇒‘Overlay’?**

In terms of GEMPAK, superposed fields are those which are plotted using a single setup and multiple fields separated by the ! character. Options are multiple instances of GEMPAK scripts. More simply, any time that you want to put multiple fields on the same map, you should use ‘Superposition’, and any time that you want to put multiple maps on a single layout, use the ‘Overlay’ option. The rules are somewhat different if you are in either the ‘Cross-Section’ or the ‘Profile’ plotting modes due to various internal GEMPAK limitations. In ‘Cross-Section’ mode, only a single scalar and a single vector field may be superposed; however, any number of fields may be overlaid. The situation is even more dire in ‘Profile’ mode, where no superposition is allowed (plotGEM will warn you about this) but again many fields may be overlaid. Also, the plotting and layering of station data on a ‘Plan Plot’ field requires the use of ‘Overlay’ because a different GEMPAK application is invoked to accomplish the station data plotting tasks. These are **not** good enough reasons to always use ‘Overlay’ instead of ‘Superposition’ since the overwriting of backgrounds in ‘Overlay’ mode can lead to **huge** output files which will make you very unpopular with anyone sharing a printer with you. For more information on this topic, please see [Section 2.14 \[Multiple Fields\], page 13](#) and see [Section 2.15 \[Multiple Panels\], page 14](#).

- **What does ‘Submit’ do in ‘Superposition’?**

Superposition of fields occurs in a layered sense. Each time you hit the ‘Submit’ button (which appears automatically once you enter ‘Superposition’ mode), you add another layer to your map or cross-section (remember that you cannot superpose profiles, and must use the ‘Overlay’ option). The active layer is the latest layer that you have not yet submitted. You can also remove superposed layers to get to layers beneath them by selecting the ‘Superposition’⇒‘Withdraw’ option from the red ‘Superposition’ menu which appears when you enter ‘Superposition’ mode.

- **What does the numbered button mean in ‘Overlay’ mode?**

When you enter ‘Overlay’ mode, a menu item (‘Layer’) will appear, as will a numbered button beside it. Selecting this button will add the current layer to the plot and allow you to begin editing a new layer. For example, if you are working on a map in the top-right corner of a multi-panel plot and are happy with the fields that you see, then click on the ‘Layer’ button to proceed to the next layer. If, for some reason, you need to go back and modify a layer that you have already added, use the ‘Layer’⇒‘Remove Layer’ option from the red ‘Layer’ menu which appears when you enter ‘Overlay’ mode.

- **Can I use ‘Superposition’ and ‘Overlay’ simultaneously?**

Absolutely. Say for example that you want to plot a two-panel chart with heights and winds at 500 hPa on the left, and 1000-500 hPa thickness and sea level pressure on the right. In this case, you would enter both ‘Options’⇒‘Superposition’ and ‘Options’⇒‘Overlay’ modes and begin plotting. First you might plot the heights on the left-hand panel. Once you are happy with how they look, hit the ‘Submit’ button to submit a superposed layer. Then you will proceed to plot the 500 hPa winds on the same map (superposed). Once you are satisfied with the left-hand panel, hit the ‘Layer’ button to go to the next (right-hand panel) layer. Once you’re selected the right-hand panel (using the ‘Options’⇒‘Multi-Panel’ option), you will be able to plot the thickness, then ‘Submit’ (superposition), and then finish with the sea level pressure. In the end, you will have created a figure with two overlays (one for each panel), each with two superposed fields.
- **I’ve just removed a couple of superposed/overlaid layers to modify a buried value - can I get them back?**

Buried layers should be modified using the plotGEM data manager. Layers that are removed are permanently purged from the plotGEM memory stack. To activate the Data Manager, select the ‘Data’⇒‘Data Manager’ button. And select the field to be modified from the resulting popup window. For more information on plotGEM’s data manager, see [Section 2.16 \[Data Manager\]](#), page 14.
- **Can’t I just use ‘Options’⇒‘Clear Panel’ instead of ‘Superposition’ and ‘Overlay’?**

You should not ever need to use the ‘Options’⇒‘Clear’ option - its use is deprecated and it is likely to be removed from newer versions of plotGEM. The ‘Superposition’ and ‘Overlay’ options under the ‘Options’ menu provide far-superior error-checking and internal memory structures, both of which translate into ease of use for the user.
- **I just created a bunch of superpositions, but how do I make the title legible?**

First, you should make sure that you have asked for a readable title format. The best way to do this is to with the ‘Options’⇒‘Plot Titles’ window. The default GEMPAK title (shown as a blank in the window) is plotted with each superposition layer unless you select the ‘One Title’ button (default is ‘Multi Title’). With ‘One Title’ selected, you will be able to fill in the desired value in the entry space at the top of the window, and this will be plotted as the only title for the figure. However, if you have multiple superpositions and a long title, it is possible that the total line length of the input string to GEMPAK will exceed that package’s maximum line length. In this case, a truncated string will appear and overwrite the ‘One Title’ string, causing it to become unreadable. At this point, you have two choices: shorten the title length or increase the allowable line length in GEMPAK and recompile that package. The choice I leave to you.
- **Can I create multi-panel plots in plotGEM?**

Access to multiple panel plotting is done through ‘Options’⇒‘Multi-Panel’. Selecting this option will result in a popup window displaying your current layout configuration. Selecting from the drop-down menu near the top of the window will allow you to select from a set of pre-defined layouts. For more complex layouts, you will need to invoke an override. To select the active panel, simply click on the desired representation in the diagrammatic layout. Multiple panels should be plotted in ‘Overlay’ mode, which can

be activated either on the Panel Selection window or through the ‘Options’⇒‘Overlay’ menu item.

- **Can I plot on a white background instead of black?**

The ‘Options’⇒‘Negative’ mode allows for black/white inversion of your plot. Because of the requirement for resetting the background colour, it is usually preferable to go through the process of setting up all of the desired fields first, and then selecting the ‘Options’⇒‘Negative’ option for final output. The only exception for this is if you are using contour fill (colour) plots, in which case you either have to remember that the final background colour will be white, or plot in ‘Negative’ mode directly. Note that you should **not** attempt to invert line and map colours prior to entering ‘Negative’ mode. Instead, simply proceed as you would for a black background, and invert as a final step.

- **I’m using a colour range, but the colours are truncated?**

If you have either defined a large number of colour bins or (more likely) are using the Fixed Range colour option with a large range and many colours, you may have hit the limit of the GEMPAK line length (typically around 128). The plotGEM utility will warn you about the long line, and will attempt to trim it on request (by reducing the precision of the increment); however, extensions beyond the 128-letter boundary may occur. In this case, it will be necessary to apply one of the patches [see [Section 3.1 \[GEMPAK Patches\], page 20](#)]. Specifically, the `activeGEM-lineLength.patch` patch will allow you to extend the line to your heart’s content (up to 512 characters). For more information on installing the patches, please refer to the appropriate section.

- **Why does it ask me about overwriting my file twice when I’m in ‘Negative’ mode?**

A pair of GEMPAK scripts are run in negative mode (that is why it is a bit slower than running in standard - black background - mode). The first sets the background colour, and the second produces the plot. Each of these is written to the same queue, and therefore seems (to plotGEM) like a possible overwrite. Future versions of plotGEM may rectify this; for now, simply hit the ‘Ok’ button twice in negative mode.

- **Do I need to use these overrides?**

The overrides (defined on the Script Overrides page) are present for users who wish to exert an extremely high level of control over GEMPAK plotting. They are not intended for users new to GEMPAK and should be used sparingly by all. By their nature, they preclude internal plotGEM error-checking and can result in numerous errors if used incorrectly. However, for those occasional times when plotGEM cannot do exactly what is required, the overrides can be extremely useful.

- **How do I set the overrides?**

To set an override, select the appropriate override button on the Script Overrides page, and enter the desired value for the corresponding GEMPAK variable. For help with how to generate these definitions, click on the ‘Help’ button on the Script Overrides page, and select the desired variable name. The help page is generated dynamically using your version of GEMPAK and is therefore just as up-to-date as the GEMPAK help pages are.



## 3 Other Tools

The plotGEM GEMPAK plotting graphical interface is the only application packaged with version 1.7.0 of ActiveGEM. However, several activeGEM-oriented GEMPAK patches are included to enhance the performance of gempak in specific circumstances.

### 3.1 Patches for GEMPAK Distribution

The GEMPAK patches are contained in the `patches/GEMPAK` subdirectory of the ActiveGEM distribution. They are not automatically installed at build-time since their application will depend on the needs of the user, the GEMPAK version in use, and the permissions required for GEMPAK configuration. All of the patches in the activeGEM distribution are applied in the same way. First, copy the patch (`activeGEM-foo.patch` where `foo` represents the patch name) to the top-level directory of the GEMPAK distribution (you may need special privileges to do this). (The top-level directory of the GEMPAK distribution is the one that contains the Gemenviron setup script.) Then, enter the following commands (again replacing `foo` with the name of the patch):

```
patch -p 0 -b -z .orig <${GEMPAK}/../activeGEM-foo.patch
make distclean
make all >&make.out
make install >&install.out
```

If you wish to apply multiple patches, then repeat the first (patching) step of this sequence for each patch *before* rebuilding the GEMPAK distribution. This will save you from rebuilding GEMPAK multiple times. A list of available patches, along with a brief description of each, is provided here.

`activeGEM-lineLength.patch` : This patch increases the allowable line-length for input arguments to GEMPAK variables. This is useful if you find that your colour ranges are being truncated below the maximum value, and arises from the fact that there are several places in the GEMPAK code where the maximum line length is set to 128 characters (don't be fooled, it isn't only in GEMPRM.PRM). If you have missing colours at either the top or the bottom of your colour range, this patch is for you. The `activeGEM-lineLength.patch` patch was created for GEMPAK version 5.7.2p2, but should work with many recent GEMPAK releases.

`activeGEM-multiFile.patch` : This patch allows the user to read from multiple files for plotting. If you ever want to open multiple input files in activeGEM, then you will need to apply this patch to GEMPAK. If you do not have this patch installed and attempt to open multiple files, you will get GEMPAK errors that warn of things like `cannot find fileA+fileB`. The `activeGEM-multiFile.patch` patch was created for GEMPAK version 5.7.2p2, but should work with many recent GEMPAK releases. Note that there seems to be a deficiency in GEMPAK at the root of this problem; hopefully new releases of the GEMPAK package will not require this hack. Try loading multiple files before blindly applying this patch.

# Appendix A Copying Conditions

## A.1 GNU Free Documentation License

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