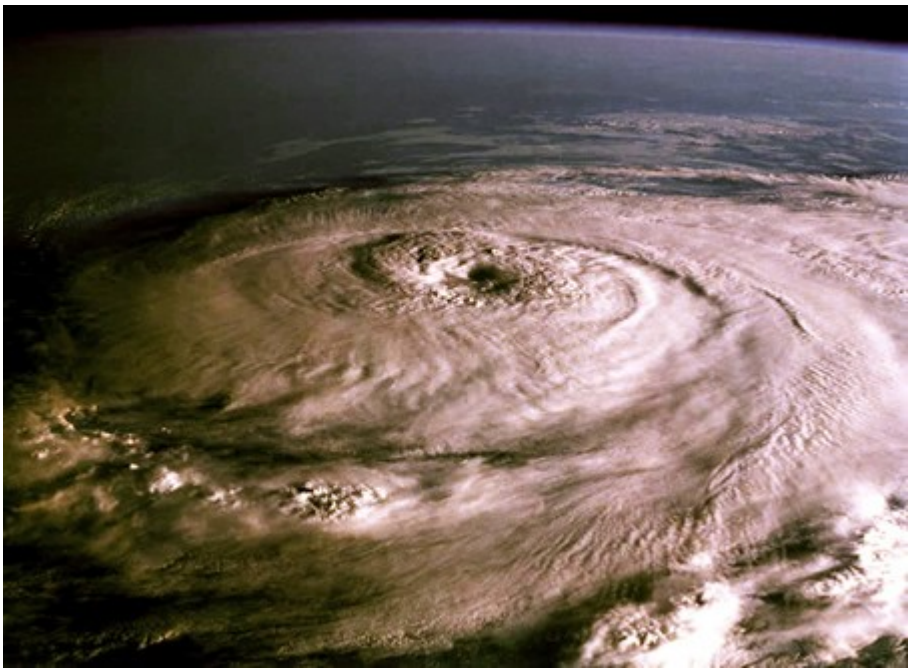
Weather Wizard
User Manual



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Preamble

This tool has been designed to superimpose weather and geographic data from different origins, like weather faxes, GRIB[1] files, charts, etc.

On top of that, you can also plot different data, like the boat position, a track, a suggested routing, whatever involves a latitude and a longitude.

It is designed to be used at sea as well as ashore. That means that the data to display can come from the Internet, from your local file system, and/or from the serial port of your computer, to get data from your NMEA[2] station.

It is written in Java, and as such it runs wherever Java runs, on several platforms, Windows, Linux, Mac OS.

This tool is ***not*** a fax viewer, there are already many other tools for that.

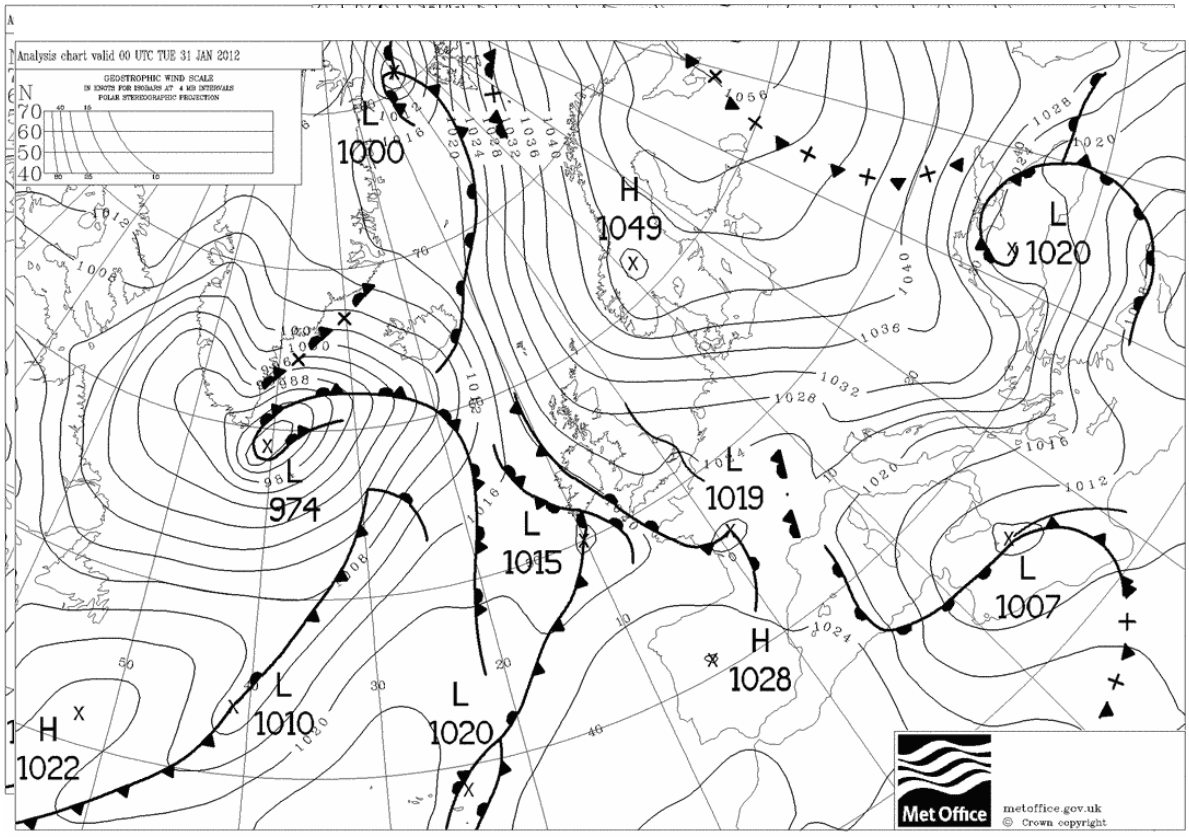
This is ***not*** a GRIB viewer either, many other tools can do it.

Again, the main goal of this tool is to stack several documents.

A fax is received as an image on the computer, several formats are used (gif[3], jpeg[4], tiff[5], png[6], etc).

Most of the faxes are pure black and white, some use gray scales, some other are colored.

Many projections are used for weather faxes. Mercator, Lambert, Anaximandre (aka square), Polar Stereographic are some of them.



Archived by www.wetter3.de *31-01-12 00 UTC*

MET Fax, Polar Stereographic projection, using gray scale

1 GRIB (GRIdded Binary)

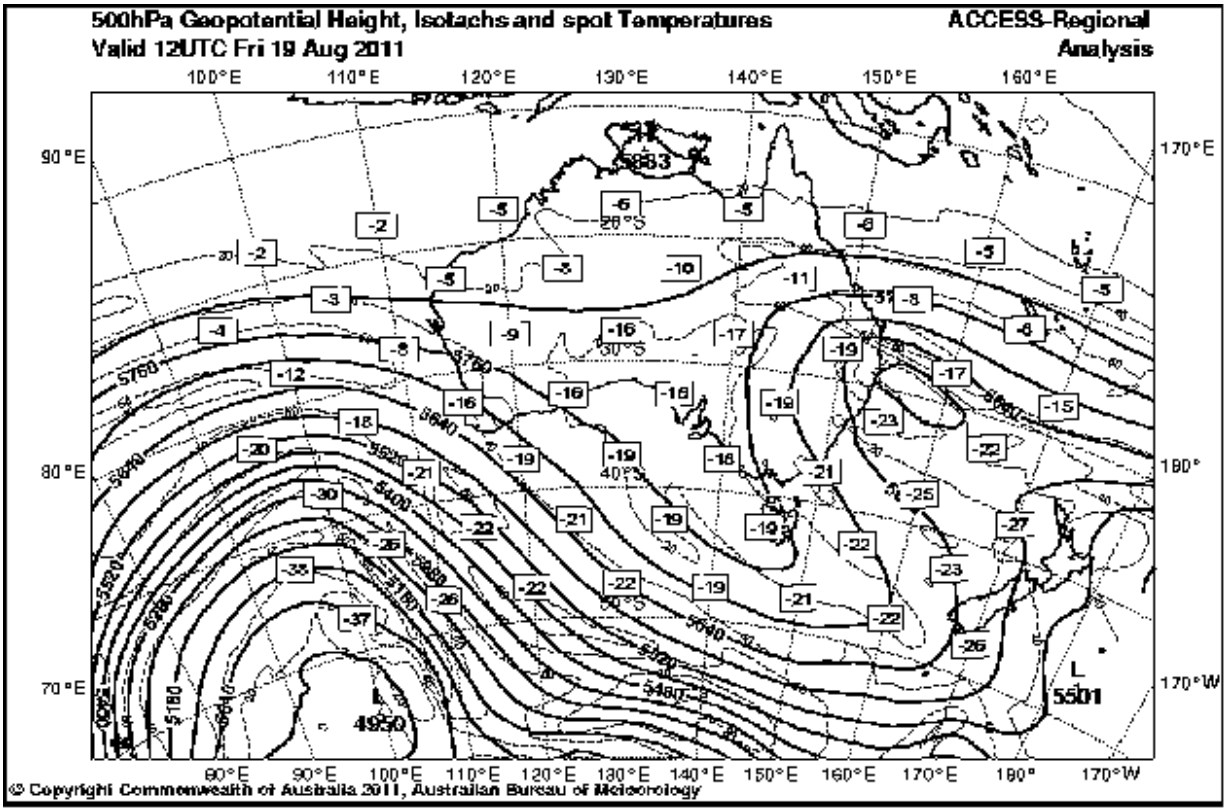
2 National Marine Electronic Association

3 Graphics Interchange Format

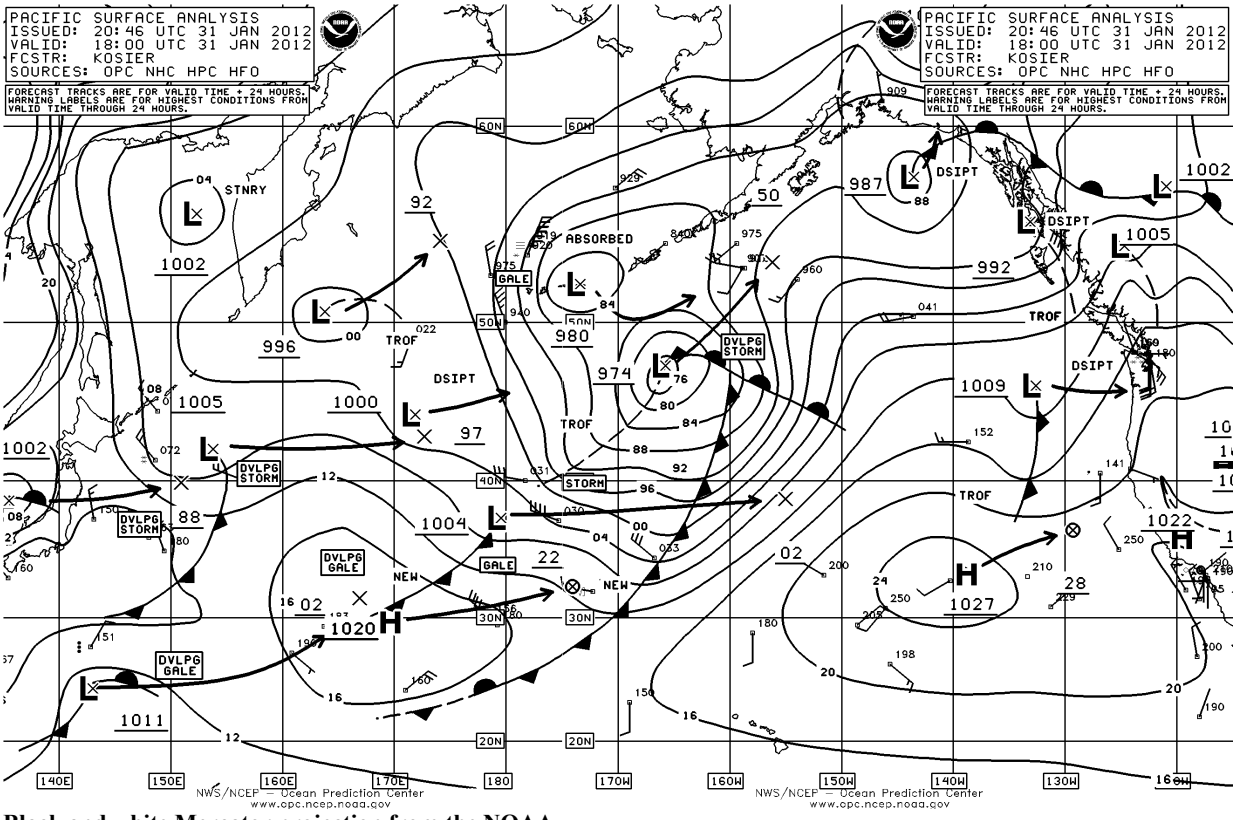
4 Joint Photographic Expert Group

5 Tagged Image File Format

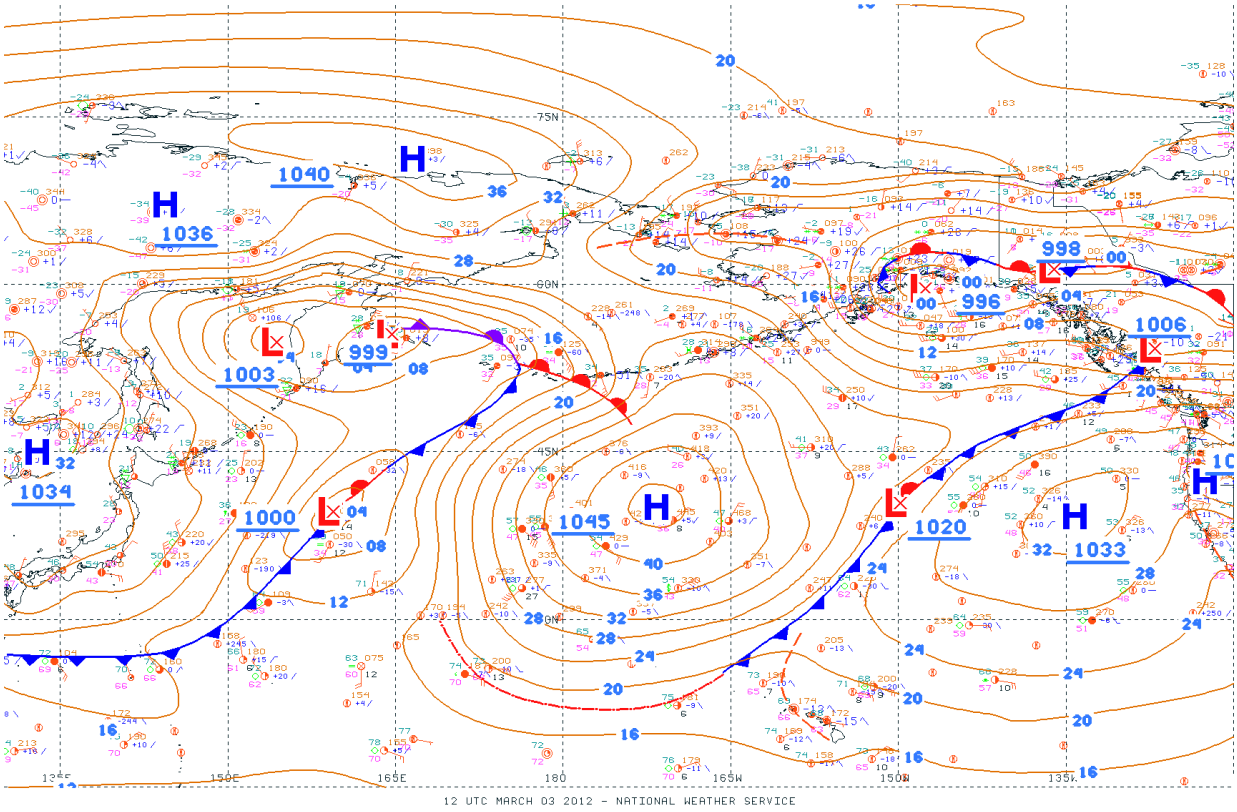
6 Portable Network Graphic



Black and white Lambert projection from the Australian Bureau of Meteorology



Black and white Mercator projection from the NOAA



Color fax using Anaximandre projection, US National Weather Service

Even if they are using the same projection and covering the same zone, faxes are not necessary using the same scale. Some faxes also arrive rotated on their side.

So, in order to display several faxes on top of each other – like a surface fax and a 500mb fax – you need to:

- Rotate then when necessary
- Re-scale the faxes so they all fit the chart to display them on
- Make them transparent so you can see all of them – not only the top one

And for clarity and readability

- Possibly change their color (turn the black into something else)

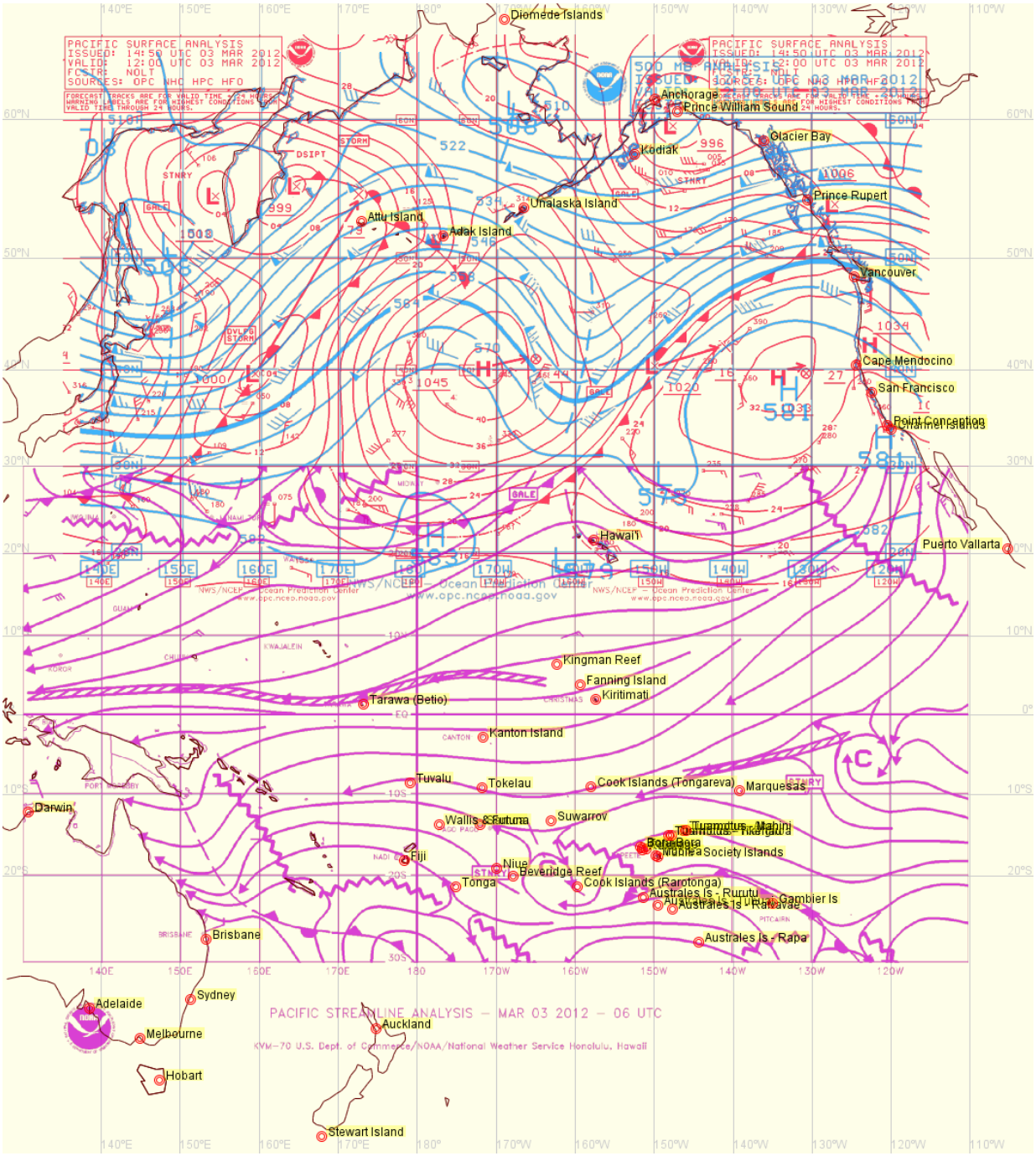


Chart of the Pacific, Mercator projection, Surface fax, 500mb fax, Tropical streamlines

On the image above, all the faxes arrive in black & white and opaque, the tropical streamline analysis one has been rotated by 90 degrees. A chart has been added, some places are displayed.

This is the kind of simple output the tool can produce.

It is also possible to add GRIB Data (like wind speed and direction, Pressure at the Mean Sea Level (PRMSL), 500mb isobar altitude, waves height, air temperature, precipitation rate...

Among other features, you can also plot the boat position and heading, along with its track. We'll see how in other sections.

Requirements

This software is written in Java. To run it, you need to have Java installed on your system

Java is available for free at `http://java.sun.com`. You need at least a JRE[7] for Java SE[8].

An Internet connection will allow you to access some features, but it is **not** mandatory.

Those features include:

- Automatic updates (of the product itself)
- Notifications (from the development team)
- Download faxes and GRIB files from the Internet

The amount of memory required is at least around 512Mb. The more you have, the more data you will be able to display simultaneously.

7 Java Runtime Environment

8 Java Standard Edition

Post installation

After installing the software, you need to make sure everything is OK. The most important is to make sure Java is available.

The java executable has to be available in the system path.

The software is started from a script, named `olivsoft.bat` on Windows, and `olivsoft` on other operating systems.

On Linux, a script named `olivmenu` is now available.

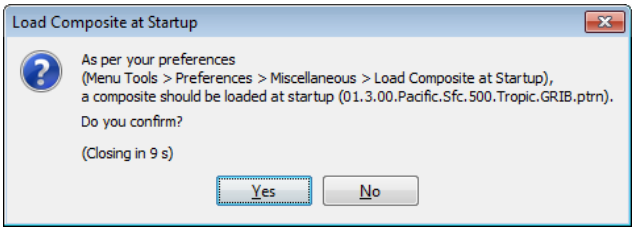
If you are experiencing problems at startup, you will probably need to edit and modify those scripts.

Get started, in one click

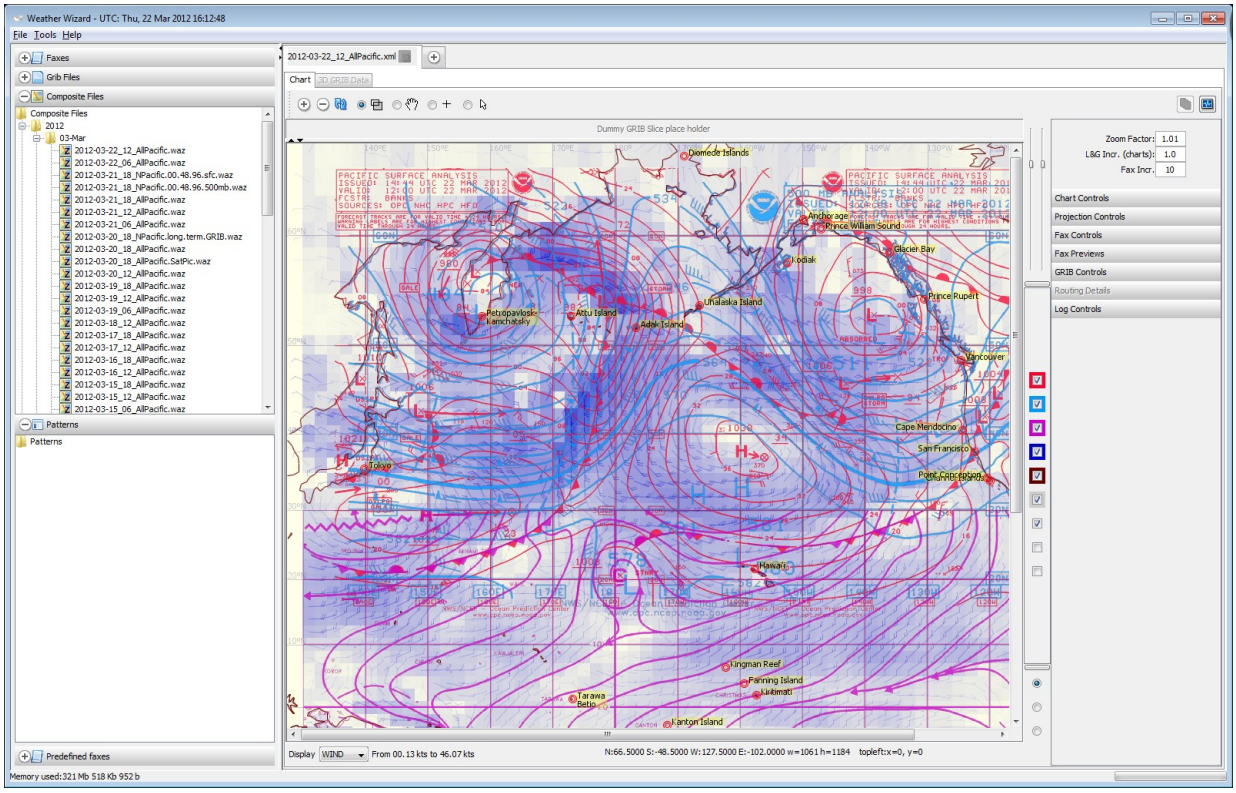
The easiest way to get started is probably to load and display the default composite.

To do so, *make sure you have access to an Internet connection*, and launch the software.

When prompted, accept to load the Default Composite.



This composite will display three faxes and one GRIB, for the Pacific, the projection is Mercator.



In a nutshell, this is what the software does.

Notice on the right side of the chart, check boxes are available. They can be used to display or hide the different components of the Composite, faxes and GRIB. You can also hide or show the chart's contours, its grid, some predefined places, SailMail stations, and Weather Stations.

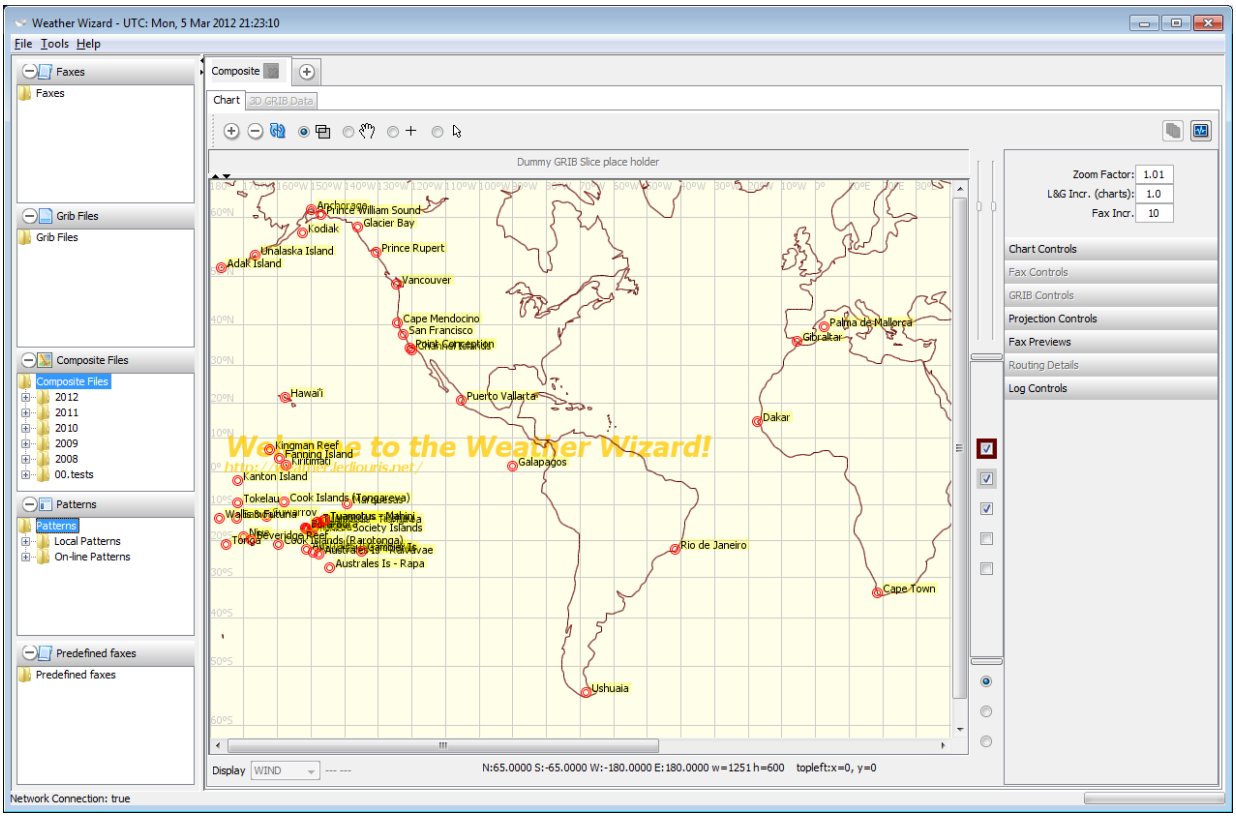
The default Composite is just a regular composite (like the ones you find in the Patterns tree pane, on the left side of the chart). What makes it the Default Composite is the fact that it is mentioned in a Preference.

Main Concepts

This document will detail the aspects of the software deserving more explanation than what you can get intuitively. It will not spend time describing all the elements of the graphical user interface (GUI). We assume everyone can guess that a button labeled "**Save**" will be use to save something...

If you believe any uncovered aspect of the software would deserve a section in this document, please request it using the Report a bug, request an enhancement section, on page 48.

The Graphical User Interface



The 3 main panes

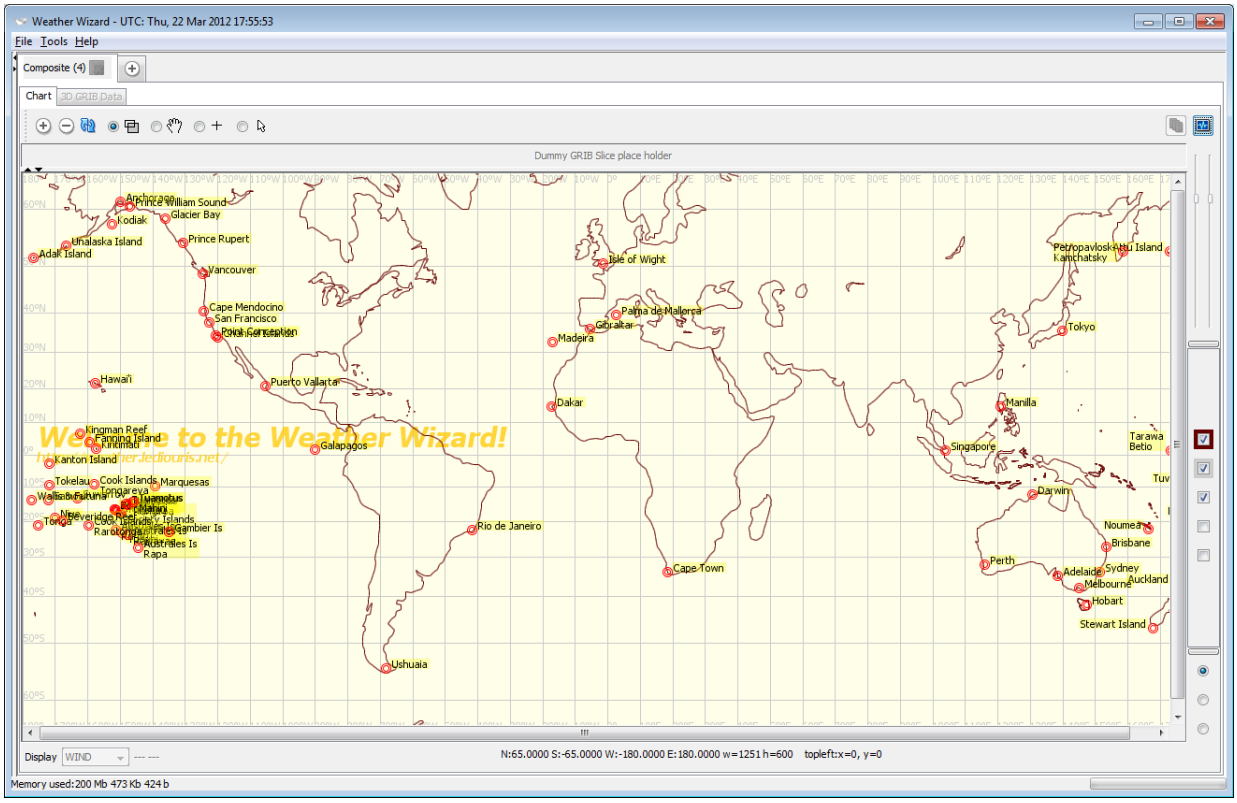
The Graphical User Interface (GUI) is made out of three principal zones:

- The tree pane on the left
- The chart panel in the center
- The control pane on the right.

We will constantly refer to those three zones in the document. The control pane can be shown or hidden by using the right-most icon of the toolbar .

Each section of the tree pane can be expanded or collapsed by clicking on its header.

The whole tree pane panel can be collapsed on the left, to leave more room for the chart.



Lateral panes collapsed, more room for the chart

Composite

This is probably the most important concept in this application. Whenever you display something, it is a composite. You can save a composite, you can restore a composite. What you see is a Composite, what you save, what you restore, is a Composite.

A composite can contain zero or more faxes, zero or one GRIB file, comments, the boat position, a track. The composite records the area on the chart you want to display, the projection to use, the scale of each fax, the color you want to display them with, their possible rotation or expansion, their zoom level, and their coordinates on the chart.

If you want to display just one fax, or just one GRIB file, you ***have*** to do it within a composite.

There are several ways to edit a composite. Ctrl-O, menu **File > Open File / Edit Composite...**, right-click on the chart, then **Composite Options > Open File / Edit Composite...**

Loading and Saving

A composite can be stored on your system as a "waz[9]" file. The waz file is an archive, and if you are curious, you can visualize its content with any archive tool (Winzip, 7z, etc).

The composite (waz file) can be sent to someone else to be reopened on another machine. It contains all it needs to be displayed.

Once it has been stored, the composite can be re-opened later on.

Pattern

If you start from scratch (and we will see later on that this is not mandatory), if you want to display a fax, you will have to:

9 **WA** used to stand for Weather Assistant, and the **Z** means it is an archive (a zip).

1. For the chart you want to display the fax on, choose boundaries and projection
2. Select the fax you want to display on the file system
3. Rescale the fax so it fits the chart (or vice-versa)
4. Set the offsets (X and Y) of the fax
5. Make it transparent (except if it is a satellite picture, maybe)
6. Change its color (if you want)

For each fax, redo the steps 2 to 6.

The pattern allows you to have all those settings stored, you you don't have to set them every time. You can think of it as the template for a composite.

When you have setup a composite of the North Pacific Ocean for example, it is very likely that next time you want to create a composite on the same area, the setting will be the same. That's what the pattern takes care of.

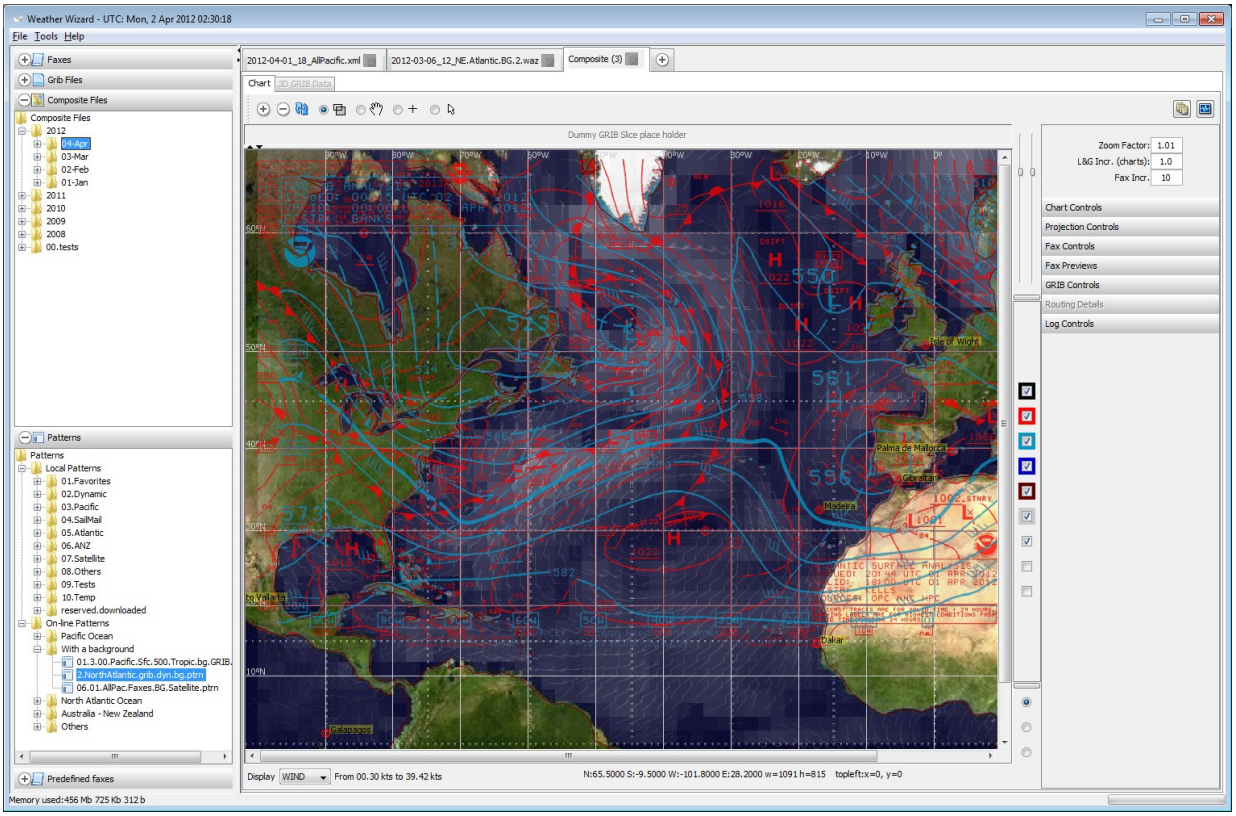
There are two main kinds of patterns, static patterns and dynamic patterns.

Static patterns will prompt you for the location of every resource (fax(es) and GRIB file).

Dynamic patterns will get the resources where they are, from the Internet, or from the file system (based on some criteria[10]).

A note about backgrounds

Some already available patterns provide a background. Some people like it.



The backgrounds are managed like satellite pictures, but they do not require an Internet connection.

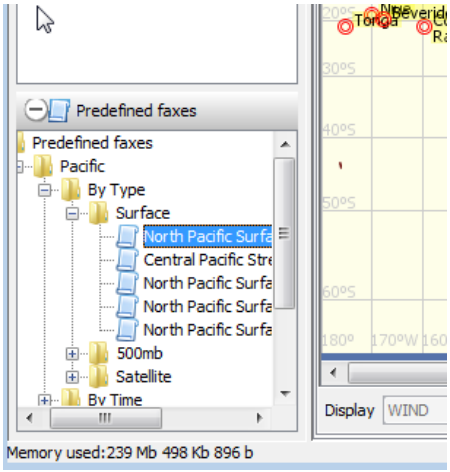
It could be an interesting feature, to produce the report of a trip, for example.

In that case, having a base color for the GRIB wind close to white could increase the readability of the Composite.

10 Typically when you are at sea, you might use your SSB to download faxes and GRIB files. There are some built-in utilities that will help you find the most recent document of a given sort, and grab it from the pattern. We'll talk more about that.

Pre-defined faxes

Even if you just want to display one fax - and one fax only, with no GRIB – in your Composite, you have to do it within a Composite. To facilitate this operation, you can use the pre-defined faxes.



Double-click on one pre-defined fax, and it will be displayed on the chart (if the area it represents matches the fax' one).

The definition of those pre-defined faxes is stored into a file named `dyn.fax.xml`. You can add your own pre-defined faxes in this file.

```
<dyn-fax-collection>
  <folder label="Pacific">
    <folder label="By Type">
      <folder label="Surface">
        <dyn-fax title="North Pacific Surface"
                 rotation="0.0"
                 origin="http://www.opc.ncep.noaa.gov/P_sfc_full_ocean.gif"
                 top="64.9545583188057"
                 left="135.0028275212064"
                 bottom="14.346382057020733"
                 right="-115.2836946277097"
                 transparent="true"
                 change-color="true"
                 color="255;0;0"/>
        <dyn-fax title="Central Pacific Streamline"
                 rotation="90.0"
                 origin="http://weather.noaa.gov/pub/fax/PWFA11.gif"
                 top="40.888477308459926"
                 left="130.08294062205468"
                 bottom="-44.69929101310054"
                 right="-110.24081055607917"
                 ...
```

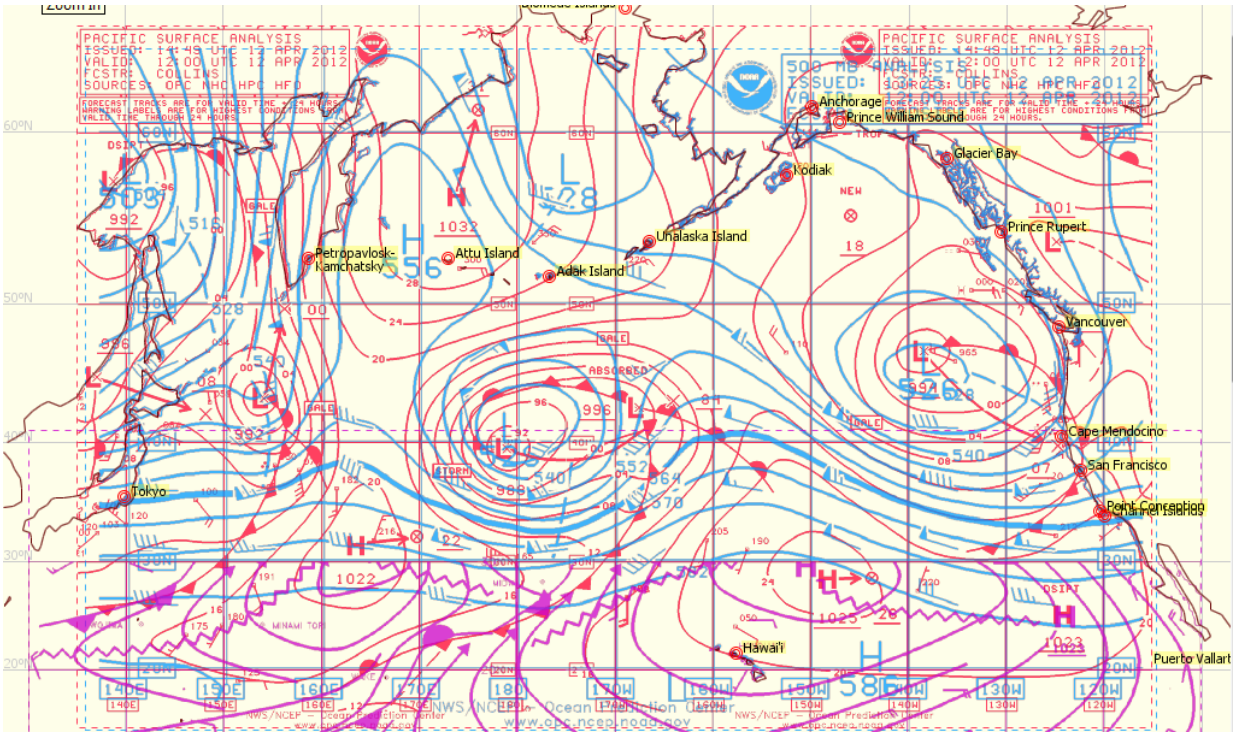
Notice in the snippet above that you need the precise coordinates of the faxes. To facilitate this step, you can run the program with a system variable named " `display.fax.coordinates`", you can modify the launching script `olivsoft[.bat]` like this:

```
java  -Ddisplay.fax.coordinates=true ... main.splash.Splasher
```

Whenever a fax is displayed in a composite, its coordinates will be spitted out in the console. Its boundaries will be enhanced with a dotted line on the chart.

```
<dyn-fax title="North Pacific Surface"
         rotation="0.0"
         origin="http://www.opc.ncep.noaa.gov/P_sfc_full_ocean.gif"
         top="64.9545583188057"
         left="135.0028275212064"
         bottom="14.346382057020733"
         right="-115.2836946277097"
         transparent="true"
```

```
         change-color="true"/>
<dyn-fax title="North Pacific 500mb"
         rotation="0.0"
         origin="http://www.opc.ncep.noaa.gov/shtml/P_06hr500bw.gif"
         top="63.94678818178383"
         left="135.86380772855796"
         bottom="14.107932806549755"
         right="-114.79170593779453"
         transparent="true"
         change-color="true"/>
<dyn-fax title="Central Pacific Streamline"
         rotation="90.0"
         origin="http://weather.noaa.gov/pub/fax/PWFA11.gif"
         ...
```

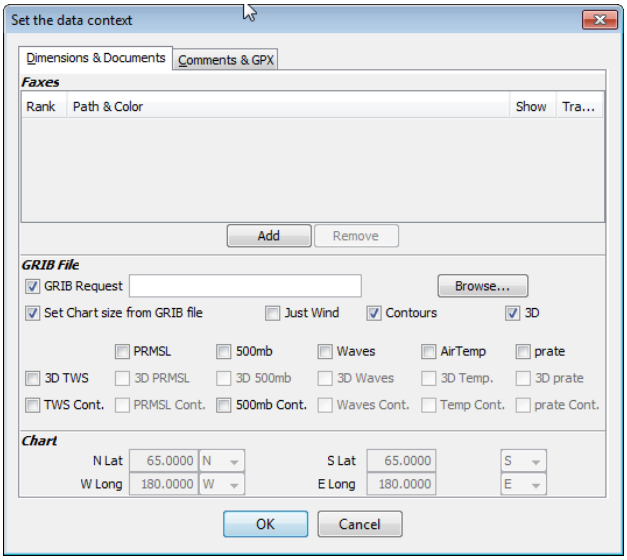


Dotted lines around the faxes

Pre-defined GRIB Requests

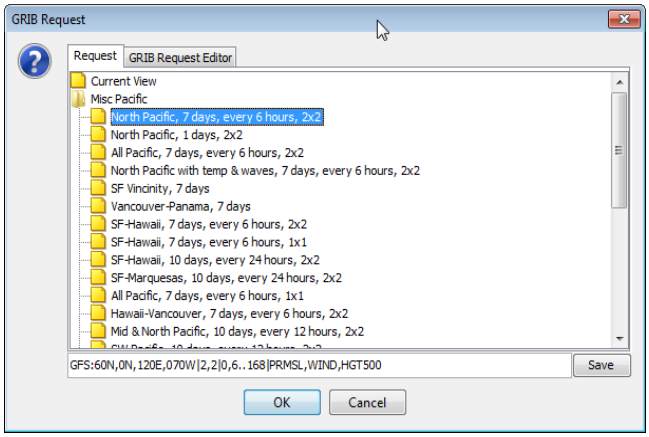
Similarly, an equivalent feature exists for the GRIB data.

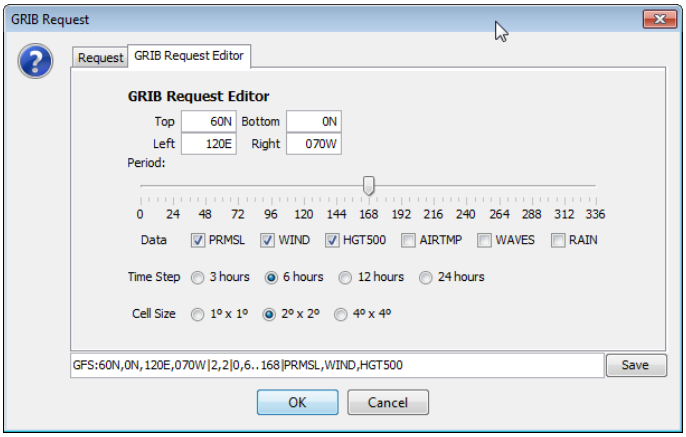
In the Composite editor dialog (Ctrl + O), check the box labeled "**GRIB Request**", and hit the "**Browse...**" button.



GRIB Request check box, and Browse button

The "**Browse**" button will lead you to those dialogs:





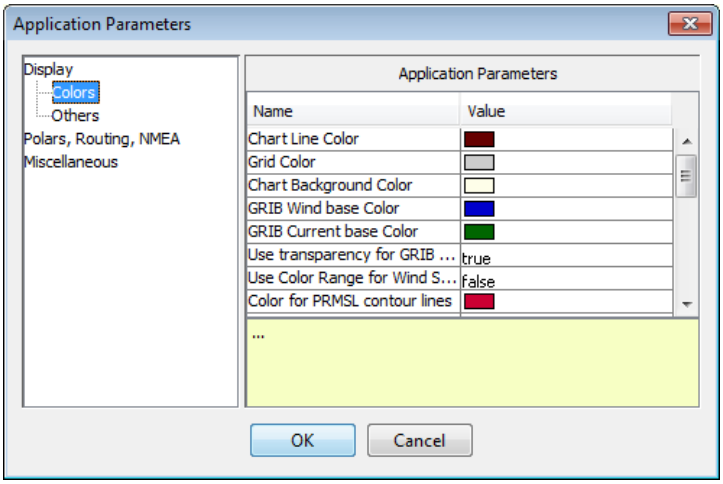
You can modify an existing request before executing it.

Create your own pre-defined GRIB Request

Once you have defined your own request in the GRIB Request Editor tab, you can use the "**Save**" button to store it, in order to reuse it later. You will be prompted for the folder you want to store it in.

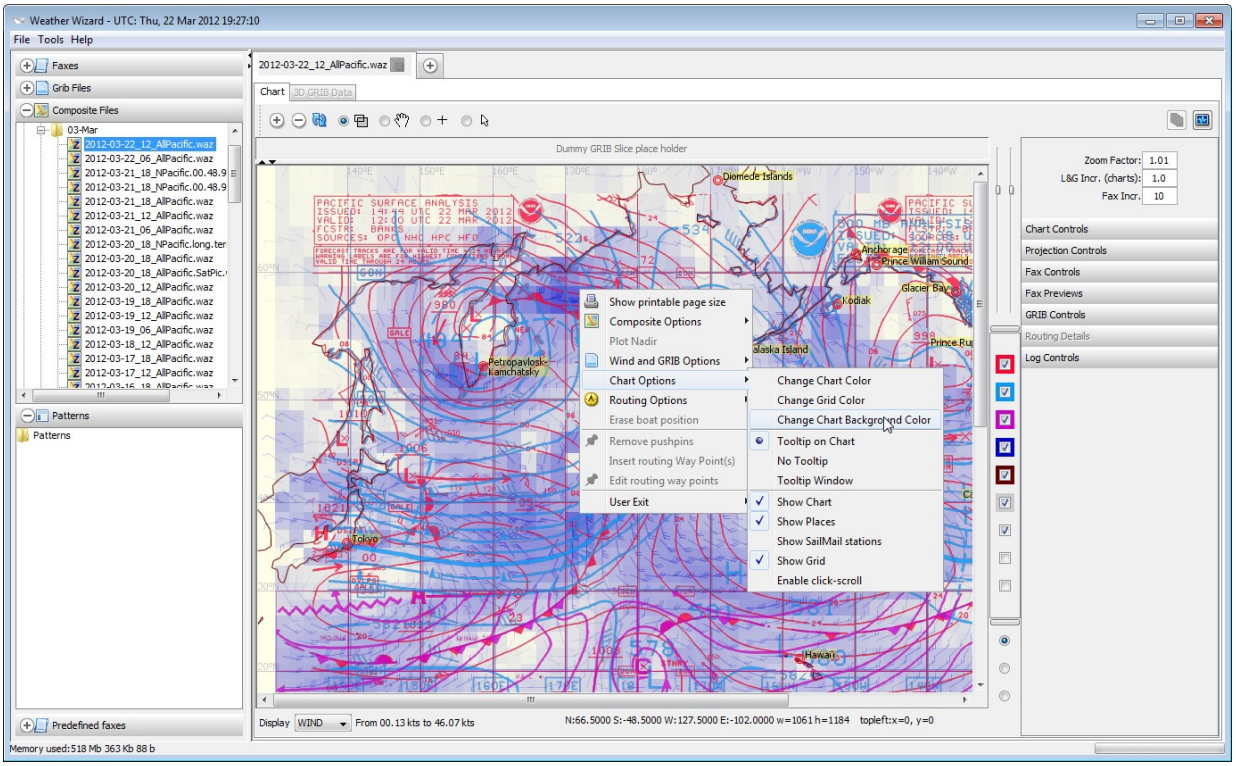
Choices & Options

There is a lot of ways to customize and modify the way a composite looks. Pretty much **all** colors can be customized through the Preferences



Whatever is set at the Preference level will become the default for further displays.

Those colors can also be modified for the current composite only, by right-clicking on the chart.



The "**Chart Options**" section allows you to do such changes, as well as the "**Wind and GRIB Options**" section.

Opacity, fuzziness

Opacity

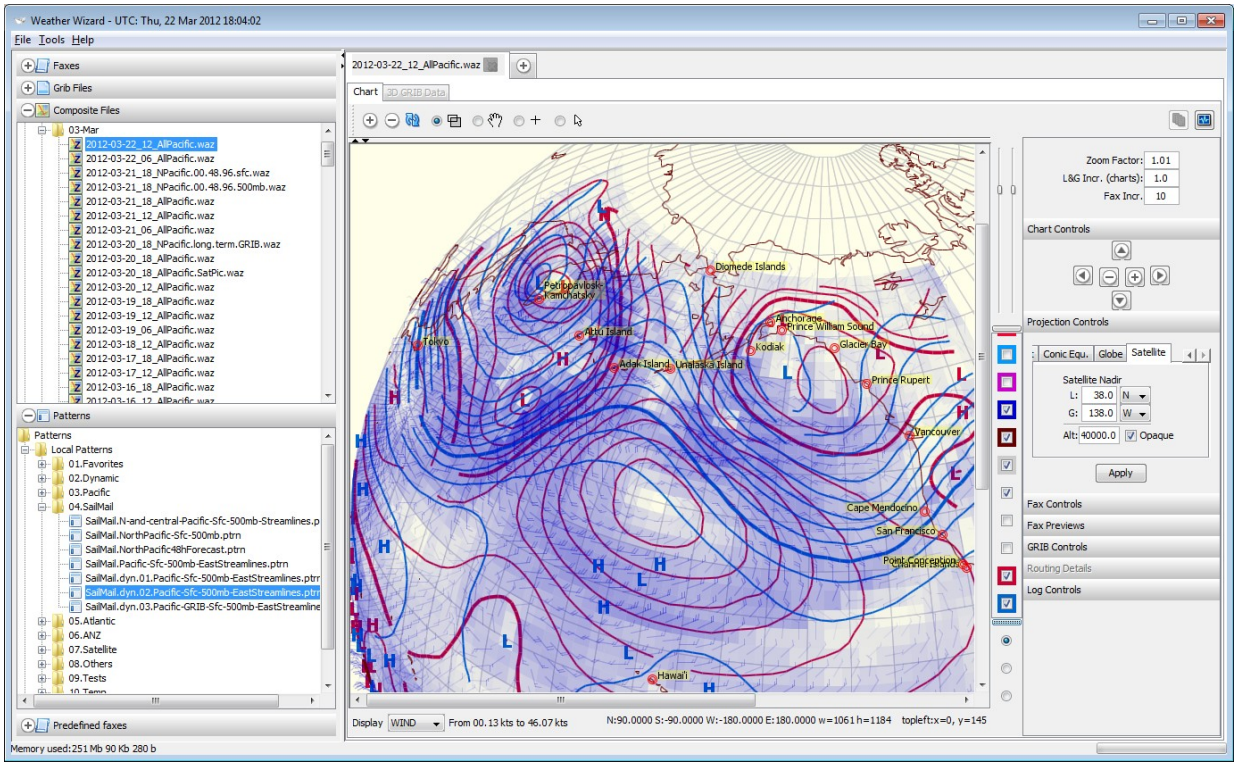
The opacity of the different components – namely faxes and GRIBs – can be adjusted using the two sliders right next to the chart, on top of the check boxes. There is one slider for the fax opacity, and the other is for the GRIB opacity. The default value for opacity is set at the Preferences level, **Display > Others > Fax transparency [0-1]**. 0 is transparent, 1 is opaque.

Fuzziness

The fuzziness of the faxes can be adjusted. This is done with the three radio buttons available on the right of the chart, at the bottom, under the check boxes. The available values are “Sharp”, “As is”, “Blur”. The default value is set at the Preferences level. **Display > Others > Default blur/sharp for faxes**.

Projections

Based on the different projections used by faxes and satellite images[11], several projections are available in the software.



Satellite view, used to render a GRIB, with contour detection.

The current list includes:

- Anaximandre
- Mercator
- Polar Stereographic
- Stereographic
- Lambert
- Conic Equidistant
- Globe
- Satellite view

11 Yes, satellite images are often reworked to match a given projection. As a result, it is not always a satellite view they produce. Mercator, Polar Stereographic are some of the projections used for satellite images.

The Projections Control Panel is available at the right of the chart, and is labeled "**Projection Controls**".

Options

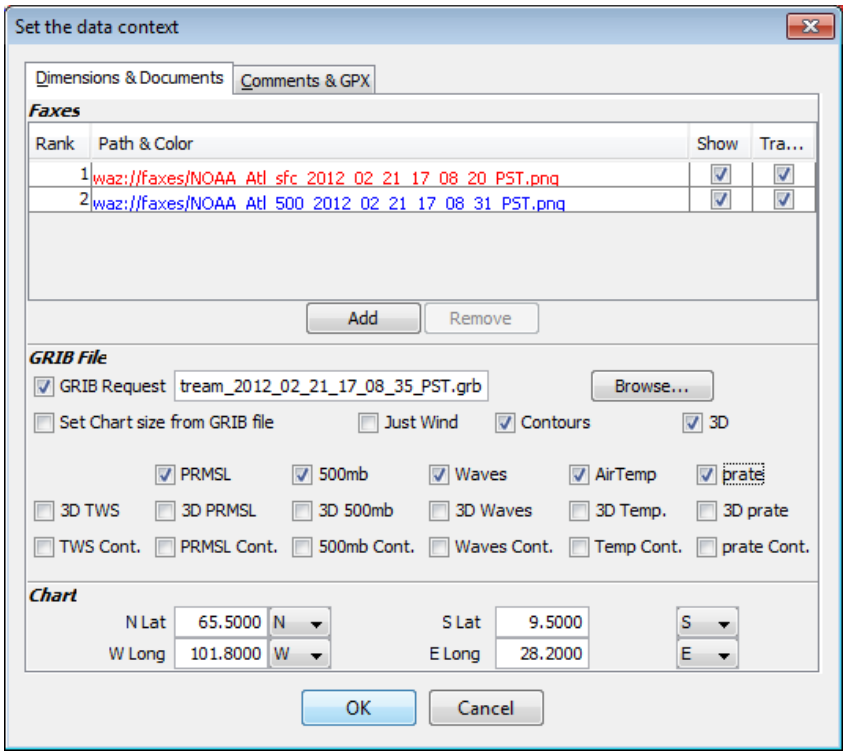
For the Wind and GRIB Data

GRIB files can contain many different types of data.

Currently, the following data are available for rendering:

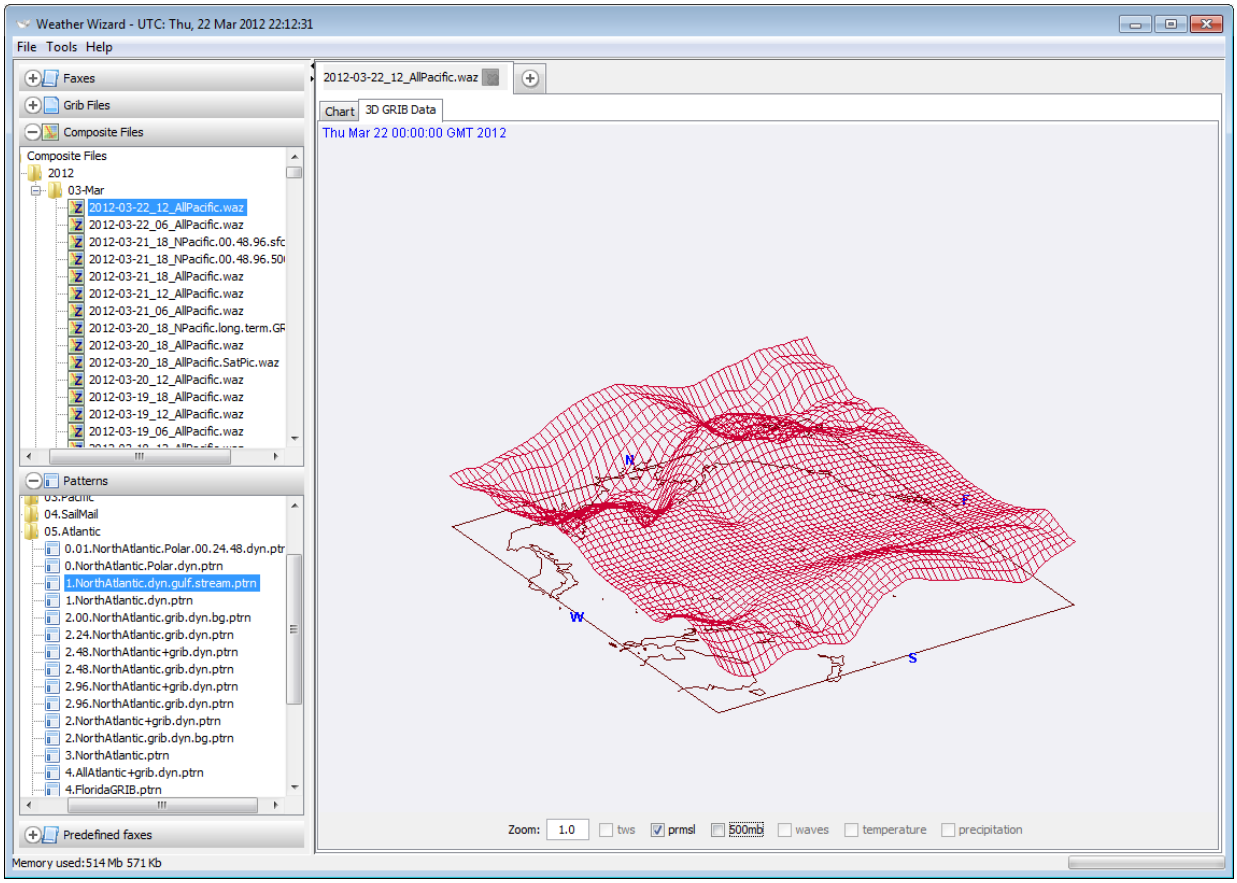
- WIND – Surface wind, force and direction
- PRMSL – Pressure at the Mean Sea Level
- 500HGT – Altitude of the 500mb isobar
- WAVES – Waves height
- TEMP – Air Temperature (at 10 meters of altitude)
- RAIN – Precipitation rate
- CURRENT – When available (RTOFS GRIB Requests), Gulf Stream speed and direction.

Those options are available in the Composite Editor dialog, and at the bottom left of the chart.



3D Panel

GRIB Data can also be visualized in 3D. The data you want to visualize this way have to be selected in the Composite Editor dialog. The data displayed are the ones corresponding to the time displayed on the chart. This time can be visualized in the GRIB Control pane, on the right of the chart.



3D rendering of PRMSL

User-Exits

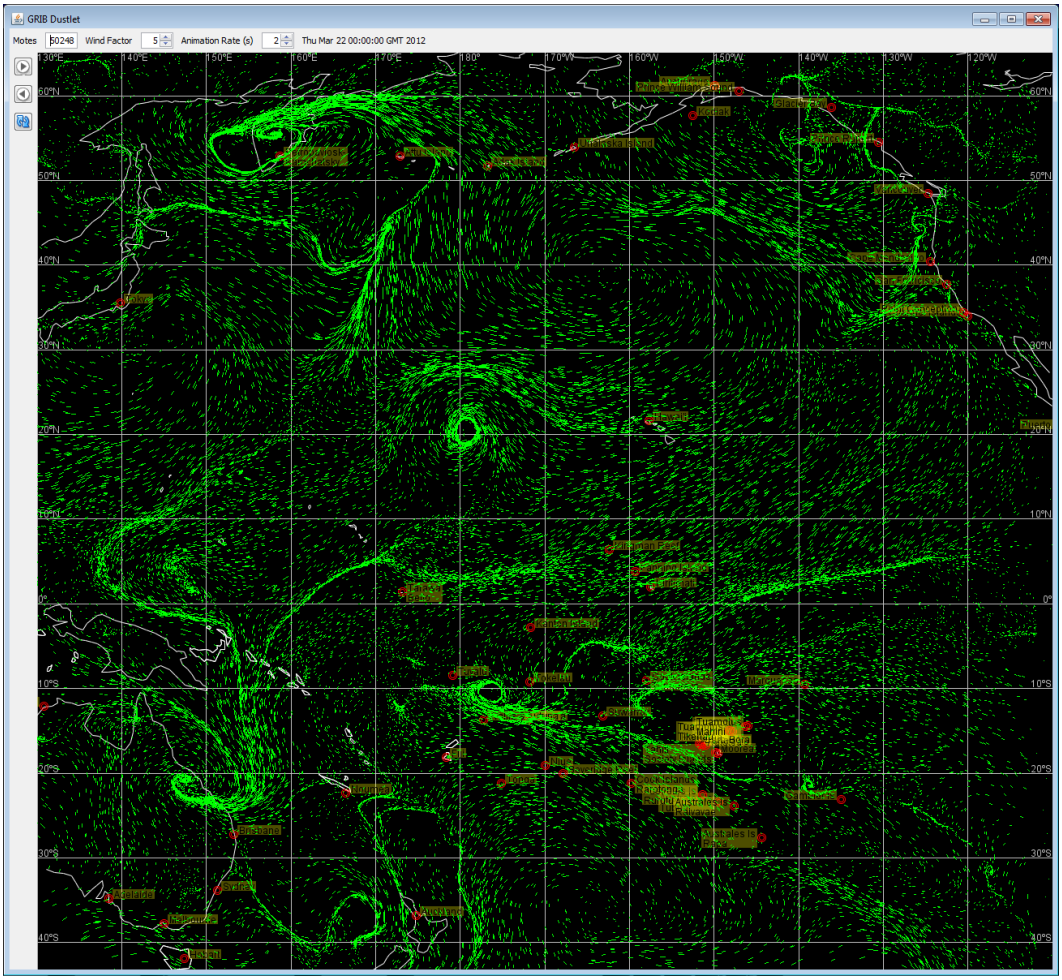
User-exits provide alternate choices for the rendering of the documents part of a composite (mostly GRIB files, as of now). Several examples are provided with the software.

User-exits can be managed by the menu **Tools > Administration Tools > Manage User-Exits...**

Dustlets User-Exit

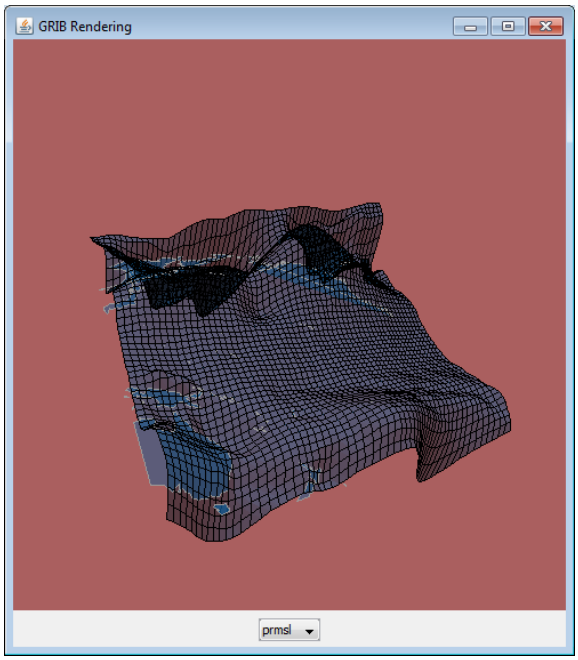
Dustlets is a concept elaborated by Nick Thompson, `http://nixweb.com`.

They provide an animated rendition of the wind in the GRIB files.



Processing User-Exit

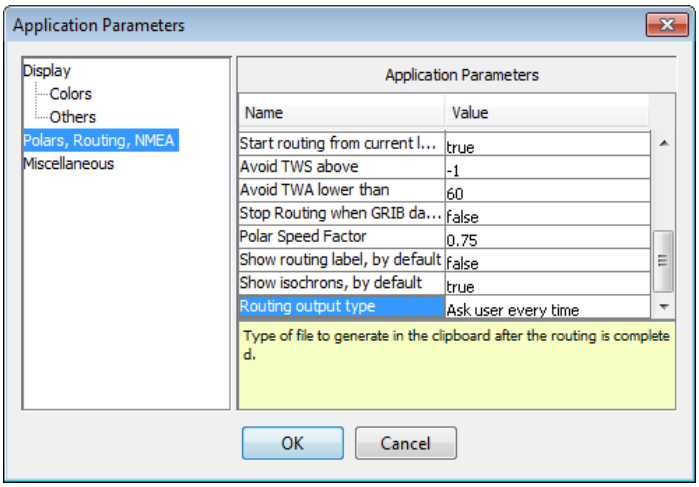
Processing is a development framework based on Java, available for free at `http://www.processing.org/`. The software comes with an example of a 3D animated GRIB rendering written with Processing.



Preferences

Many preferences can drive the way you use the software.

They are all available through the menu **Tools > Preferences**.



When a line is selected, some additional help about its meaning is displayed in the bottom pane.

Most preferences are self-explanatory, and will no deserve any entry in this document. Some others deserve some more details.

Default Composite

There is a preference labeled "**Load Composite at Startup**" that is used to automatically load the composite mentioned in this preference. A dialog box will be displayed to confirm this automatic load, during a time defined by the preference named "**On startup, wait for**".

If the pattern mentioned in this preference is a dynamic pattern, and if you have an Internet connection, you will download faxes from the Internet, automatically.

If this preference is left blank, none of the above happens.

Nothing is preventing you from deleting a pattern mentioned in this preference. If you do so, an error might happen at startup...

Auto save default Composite

Preference ***Default composite "Save as" pattern***

The goal here is to "auto-save" the default composite, the one that is suggested at startup. This preference will define the way to generate the name to use to save the default composite. If this field is not blank, then default composite will be saved automatically, as stated by the pattern. Pattern must look like

"directory | prefix | file-pattern | extension"

for example

"/yyyy/MM-MMM | Auto_ | yyyy_MM_dd_HH_mm_ss_z | waz"

Patterns follow the Java SimpleDateFormat specification, found at
`http://docs.oracle.com/javase/1.4.2/docs/api/java/text/SimpleDateFormat.html`.

Let's give a concrete example:

If the name pattern is defined as "**`/yyyy/MM-MMM | Auto_ | yyyy_MM_dd_HH_mm_ss_z | waz`**", and we are starting the program on Saturday, April the 7th, 2012, at 19:01:20 in San Francisco; the default composite will be saved under the Composite directory (preference "**Composite files location**"), in a file named

"`2012/04-Apr/Auto_2012_04_08_02_01_20_GMT.waz`".

See about this the section named The importance of naming conventions, page 38.

The default composite can also be reloaded and saved on a regular basis, driven by the preference "**Miscellaneous > Reload default composite every (in minutes)**".

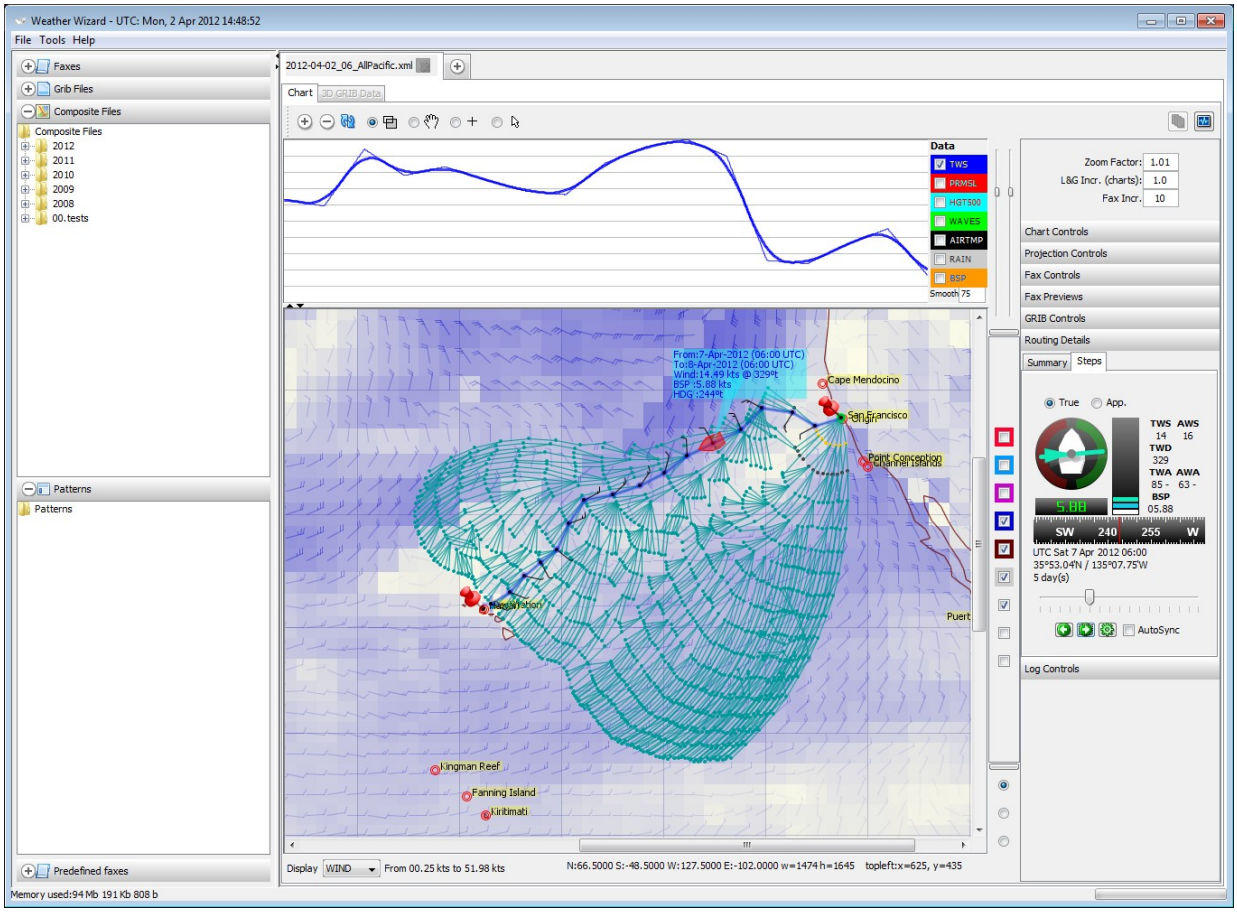
Routing

Routing is a vast topic, be prepared.

The routing calculation

Routing is this process that will find the best route for your boat, based on GRIB data and the polars of the boat.

From the starting point, based on the polars that will predict the boat speed for the different headings, using the GRIB data, the routing process will calculate all the points reachable in a given amount of time. The curve joining all those points reached in the same amount of time is called an *isochron*[12]. Then, from all the points of the isochron just calculated, the same process is started again, defining this way another isochron. As all those points are in different locations, the wind for each of them (speed and direction) is given by the GRIB. Like that, step by step, a series of several isochrons is calculated from the starting point to the arrival. From the position where the last isochron goes through the arrival point, it is then easy to back-track to the starting one, defining this way the best route from start to arrival.



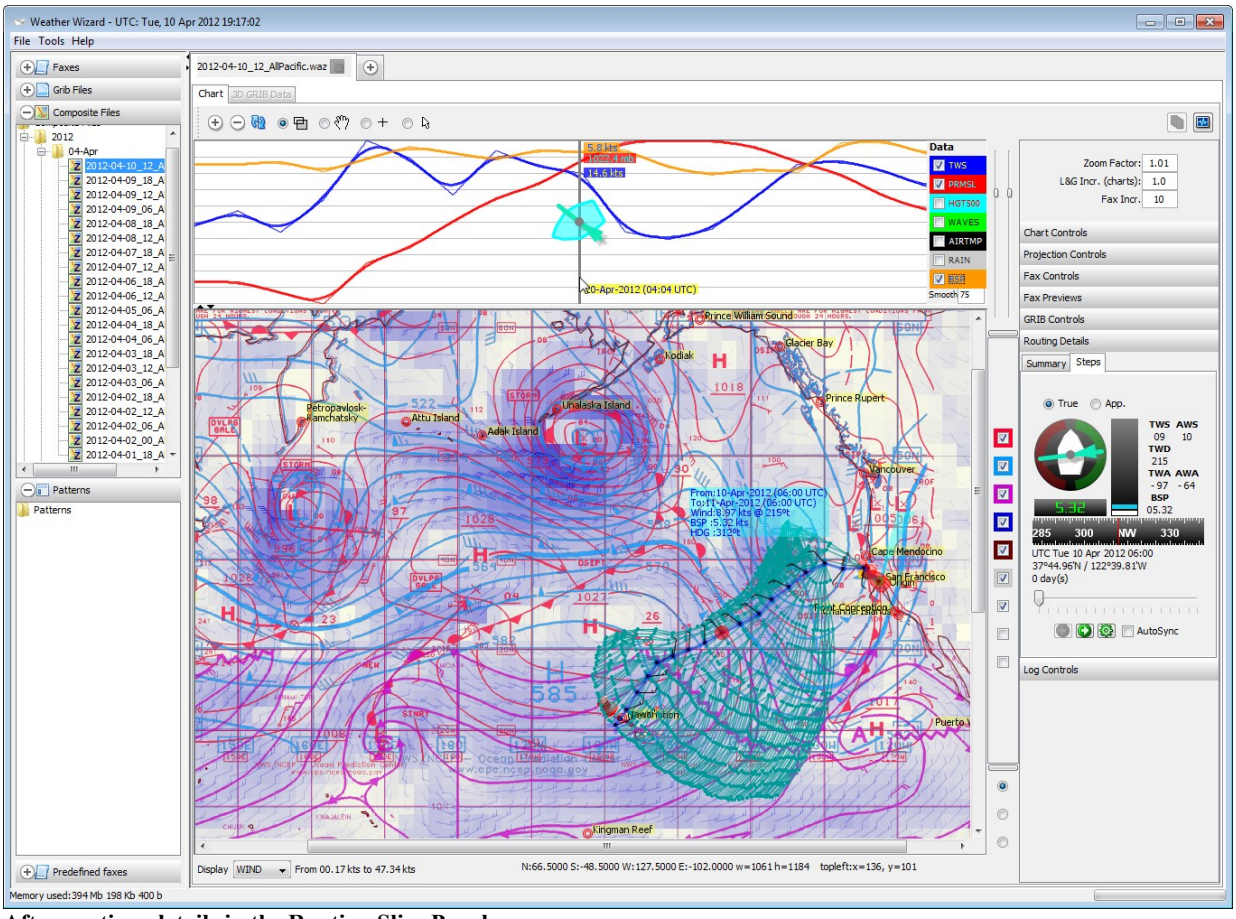
Completed routing, showing all the isochrons, and the best route

If done this way, the isochron calculation is an exponential process. If you calculate 10 reachable points from each starting point, the first isochron has 10 points, the second one 100, the third one 1000, the fourth one 10000, etc. This can put any computer on its knees if nothing else is done. A substantial part of the routing process consists in removing the unnecessary points of an isochron before starting the calculation of the next one.

To start a routing, you need to have a GRIB file available in the Composite, and click on the chart to define an origin and a destination (drop pushpins). Then go to **Tools > Routing > Routing...**

12 From the Greek *iso*, which means *same*, and *chronos*, which means *time*. An isochron contains all the points the boat can reach within the *same* amount of *time*, starting from the origin point.

Once the routing computation is completed, its details are available in the control panel on the right, under the tab labeled "**Routing Details**". A *routing slice panel* is also available above the chart, with the different data represented as a smoothed curves. Drag the mouse (with the left button clicked) on this panel to display details, at the mouse location.

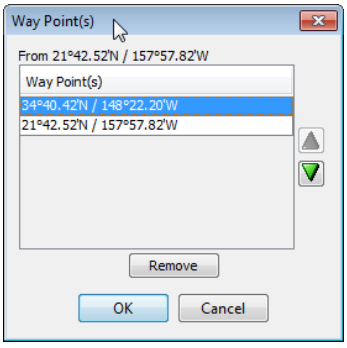


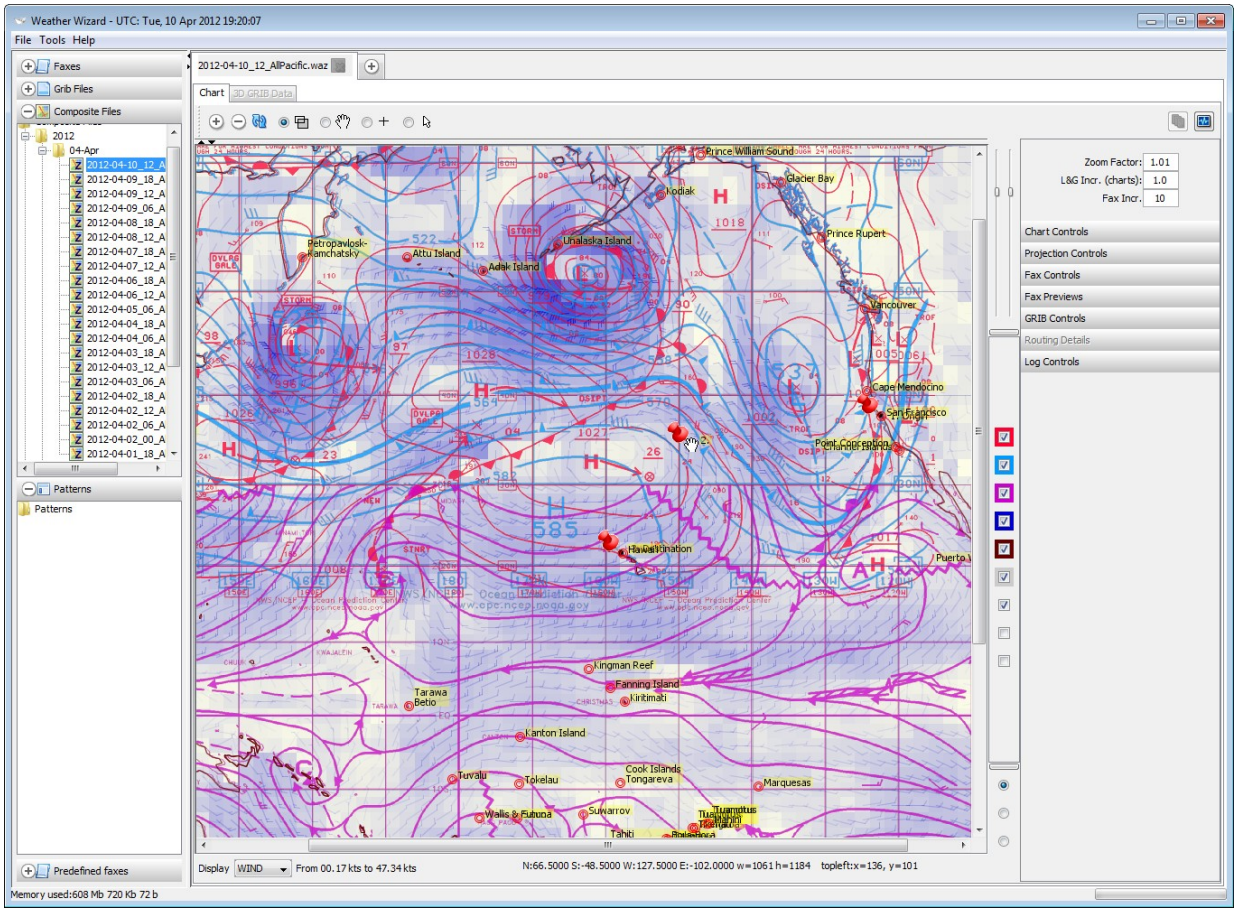
After routing, details in the Routing Slice Panel

More than two way points for the routing

You can force the routing to use mandatory way points. Once you have defined origin and destination, you can right-click on the chart, and "**Insert Routing Way Point(s)**". On the chart, all routing way points are draggable. Move the mouse cursor on the way point, and when it turns into an open hand, you can drag it from its original position, and drop it in its new one.

All those intermediate way points – other than origin – can be edited with a right-click on the chart, option "**Edit routing way points**". They can be reordered or deleted.





Dragging a way point

Command line interface

There is the possibility to compute a routing without using the Graphical User Interface (GUI).

There is a script named `cli.routing.bat` (on Windows) that gives an example of this feature.

A parameter "`-help`" tells you how to use it.

```
Prompt> java main.BlindRouting -help
Usage:
java main.BlindRouting -option value -option value ...
Mandatory options:
-fromL -fromG -toL -toG -startTime -grib -polars -output
Optional:
-verbose default false
-timeInterval default 24
-routingForkWidth default 140
-routingStep default 10
-limitTWS default -1
-limitTWA default -1
-speedCoeff default 1.0
-----------------------
Example: java main.BlindRouting -fromL 37.122 -fromG -122.5 -toL -9.75 -toG -139.10
-startTime "2012-03-10T12:00:00" -grib
".\GRIBFiles\2012\03\GRIB_2012_03_01_08_22_55_PST.grb" -polars ".\polars\cheoy-lee-
42.polar-coeff" -output "my.routing.gpx" -speedCoeff 0.75
```

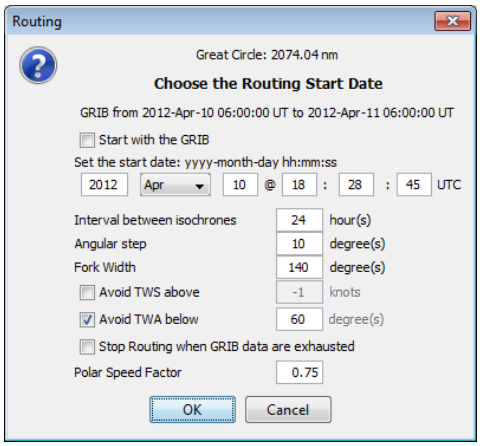
The output type is based on the extension of the file:

- .gpx for a GPX file (compatible with other softwares, like OpenCPN)
- .csv, comma separated values, compatible with spreadsheets

- .txt for a plain text output

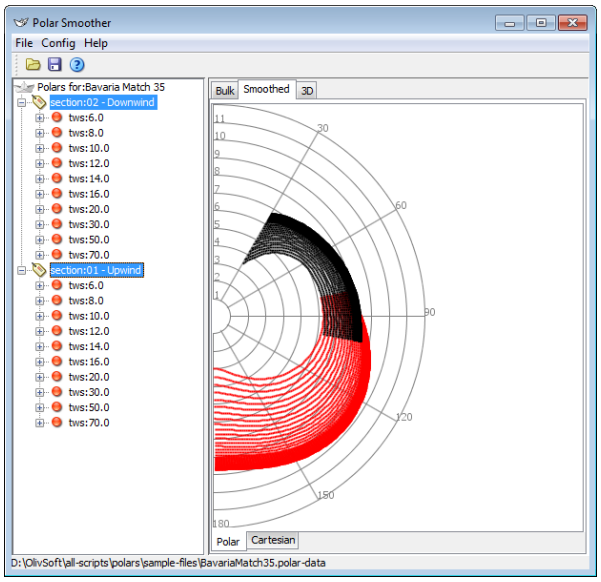
The `-startTime` parameter follows the specification of an XSD Duration, it is representing a UTC date and time.

You can notice that the parameters used from the command line are identical to the ones used from the GUI.

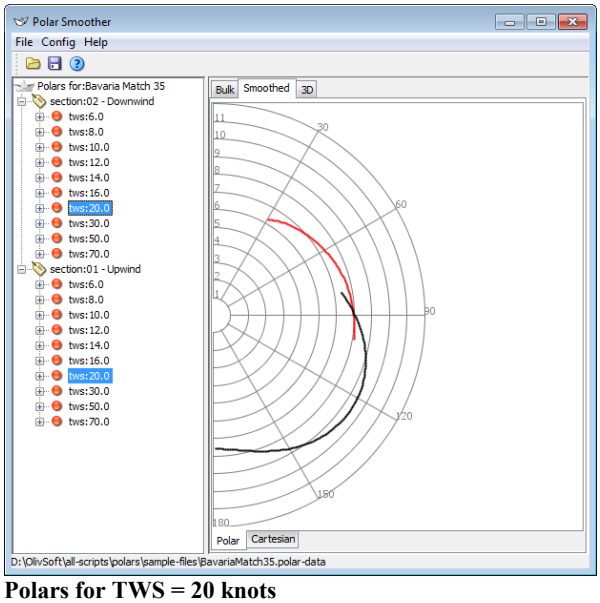


The polars

Polars are those curves predicting the speed of the boat (BSP or STW[13]) for given true wind speed (TWS) and true wind angle (TWA). Without the polars of your boat, there is no way to compute any routing, it is as simple as that.



Polars for all TWS



Polars for TWS = 20 knots

The Weather Wizard now comes with a tool to help you elaborate you own polars.

They are called polars, because they are represented around a pole (the center of the true wind angles), each point being defined by its angle and its radius. Another representation commonly used for curves is the Cartesian way, with abscissa (x) and ordinates (y). This representation is also available in this tool.

For a given TWS and TWA, the boat speed is represented by the distance between the center (the pole) and the curve.

Polars elaboration is the process that will smooth the logged points (provided by the designer of the boat, by some logging) so you can come up with a bunch of coefficients used to calculate the boat speed for *any* true wind speed and *any* true wind angle at *any* time.

Notice on the snapshot above that the polars can – and often will – be made out of different sections, typically one for upwind, and one for downwind. But anyway, there is no limit in the number of sections used for the polars of a given boat.

13 STW stands for Speed Through Water

But be warned, this is a long and uneasy process.

MaxSea has its own polar format, the Weather Wizard polar tool is aware of it, and can digest those data.

The polars used by the Weather Wizard are stored as XML files containing the coefficients of the polynomials that can be used to represent the polars.

For a given TWS, the STW is given for any TWA by a polynomial function like

$$STW = f^{TWS}(TWA)$$

where f^{TWS} is a polynomial function of degree *n*, like

$$f^{TWS}(TWA) = (Coeff_0 * TWA^0) + (Coeff_1 * TWA^1) + (Coeff_2 * TWA^2) + \ldots + (Coeff_n * TWA^n)$$

also written

$$f^{TWS}(TWA) = \sum_{i=0}^{n} (Coeff_i * TWA^i)$$

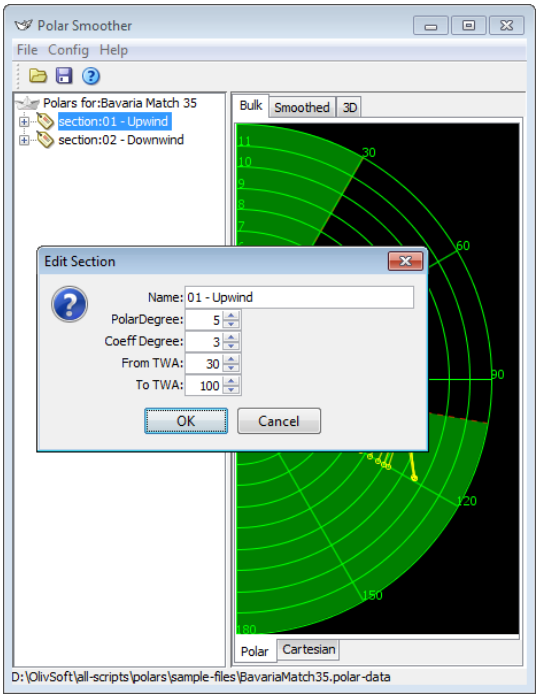
Those coefficients are obtained from raw data, by using the least squares method.

Those coefficients can themselves be smoothed across the true wind speed, with the same least square method, to obtain a function that would compute the coefficients for any TWS.

This way, a boat speed can be obtained for *any* true wind speed and true wind angle.

Some boats can have very different behaviors depending on their point of sail. This is why we have here the possibility to have several sections in the polars. Like one for upwind, and one for downwind, when the kite is up. You can have as many sections as you want.

The smoothing is done section by section, the parameters of the smoothing are set at this level, they are accessible with a right-click on the section in the tree in the left pane (**Edit Node**).



Notice the two degrees, one for the polar curves, and another one used to smooth the coefficients of the curves. The sections are sorted in the tree by name. It is your responsibility to name them so they're displayed in a significant order.

Two kinds of files are managed by this tool.

The files that contain the data to smooth, namely the boat speed for given tuples (TWS, TWA), have an extension like "`polar-data`".

The files that contained the final coefficients, needed by the Weather Wizard, have an extension like "`polar-coeff`".

Those two sorts of files are XML files, and can be read and edited in any editor. Each of them will be validated against an XML Schema. This means that if you have modified those files with an editor, if they're not valid (i.e. screwed up during the modification), you will have an error message when re-opening them using this tool.

To produce the "`polar-coeff`" file, ultimately used in the Weather Wizard, you modify the points and parameters of the smoothing until you are happy with the representation, and you use the menu **File > Generate Polar Coeff...**

You will be prompted to give this file a name, and then you will need to mention this file in the Weather Wizard preferences, section "**Polars, Routing, NMEA**", preference "**Polar file location**".

This tool also understands the format used by MaxSea, the files with a "`.pol`" extension. The can be read (**File > Import from MaxSea...**), or produced (**File > Export to MaxSea...**).

Those files are text files, looking like this:

```
TWA    2      3      4      5      6      7      8      9      10     11     …
45     2.0    3.0    3.0    4.0    5.0    6.0    6.0    9.0    12.0   13.0   …
50     2.0    3.0    4.0    5.0    6.0    7.0    7.0    10.0   13.0   14.0   …
55     2.0    3.0    4.0    5.0    6.0    7.0    8.0    11.0   13.0   14.0   …
…
```

Advanced topics

At sea

At sea, you will probably not have access to an Internet connection. Faxes and GRIB files will be downloaded through the SSB and stored on the file system.

This is where you would be tempted to use static patterns, they would prompt you for each document, and you would be able to refer to the document you've downloaded with the SSB so they'd be part of a Composite. This is certainly possible, but this is time consuming. It is also error prone, you can easily pick up the wrong fax when prompted by the pattern.

The idea here is to mimic the behavior of a dynamic pattern, but instead of pulling the documents from the Internet, we will grab them from the file system, based on some criteria, like "*the most recent surface fax for the pacific found in the X:\XXX directory*". We are going to see how to express such criteria.

When creating or editing a pattern, in the URL cell, you have the possibility to use an expression like this:

```
search:chartview.util.SearchUtil.findMostRecentFax(".*Tropical Surface Analysis.*",
                                                   "${fax.path}")
```

This example is searching the faxes downloaded with SailMail. When SailMail is downloading a fax, it stores it as an image (usually a tif file), along with a header (a file with an .hdr extension) describing its content.

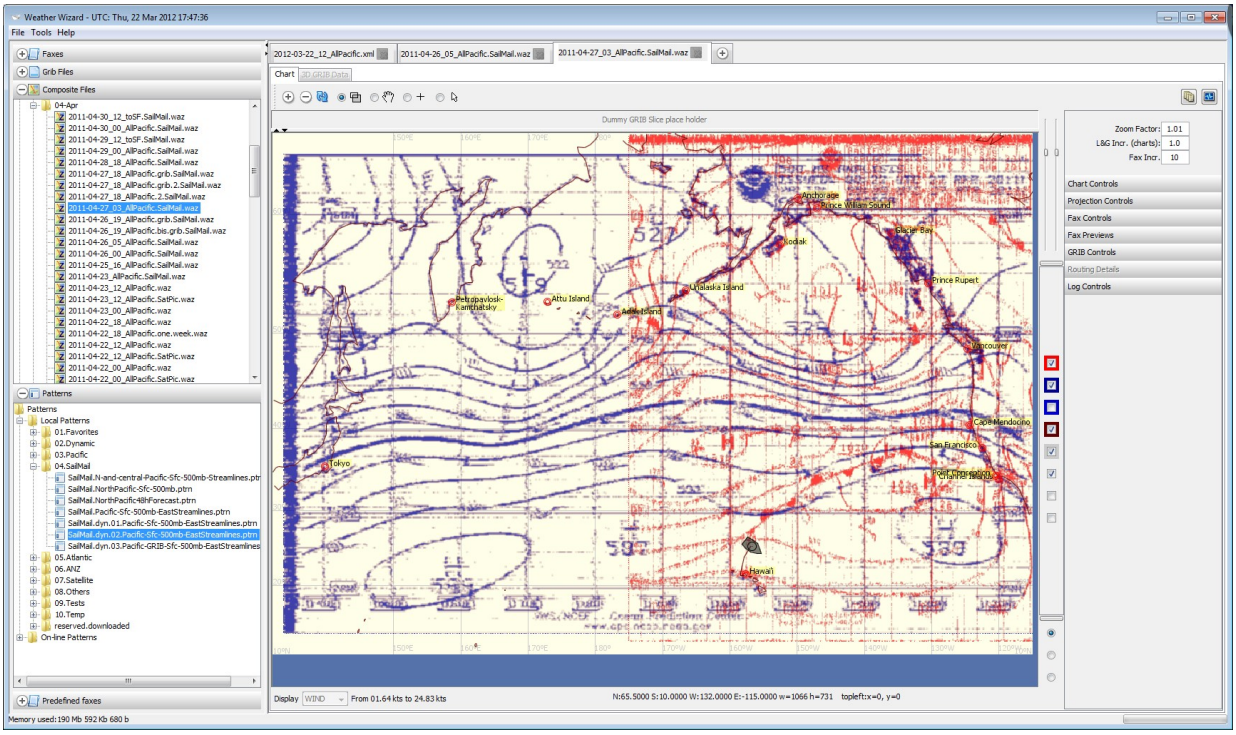
Here is an example of a SailMail header:

```
DecoderMode=Fax
SizeLimit=2200
Start=2010/02/24 15:18:15
StartMode=Auto
FileName=C:\Program files\Airmail\Faxfiles\1002241518.tif
Freq= 4346.00
Comment=NMC 15:18 Prelim Surface Analysis (Part 2 - NW Pac)
Skew=0.0000
Timer=Auto
LPM=120
IOC=576
Stop=2010/02/24 15:30:53
StopMode=Auto
```

The search string above is scanning the directories mentioned in the Preference named "Fax files location", which is a path, made out of one or more directories, looking for the most recent fax that has a header having the "Comment" property matching the regular expression `".*Tropical Surface Analysis.*"`.

You can write your own search utilities (in Java). We will discuss this in another section.

One of the advantages of this software is that even fuzzy faxes – like the ones you sometimes receive at sea – can make sense.



Faxes received at sea, with the SSB

GRIB files size, smoothing

Depending of the data you request and the area you want to cover, GRIB files can be pretty big, and the time they take to get downloaded with the SSB can reach unacceptable amounts.

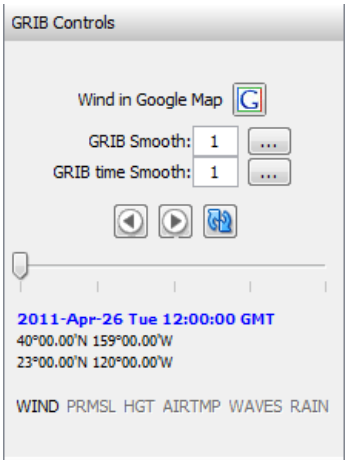
Reducing the GRIB cells size has quite an impact on the document size. Going from 1°x1° to 2°x2° will reduce the document size by 4, and the time it takes to download it as well. The inconvenient of such a downsizing is that we lose the precision given by fine cells.

In order to restore this precision without having to download too big files, the software provides some smoothing features.

Two smoothing axis exist, geographical smoothing, and time smoothing.

If you receive a GRIB defining 2°x2° cells, you can smooth them so it will render 1°x1° cells.

As well, if the GRIB contains a frame every 24 hours, you can display a frame every 6 hours (again, this makes the document size 4 times smaller, in this case).



It is a mathematical smoothing. It is of course not as valid as the real GRIB, but at sea, that is generally good enough. Actually, the GRIB generation itself involves some smoothing algorithms.

In short, if you have a GRIB, with 2°x2° cells, with a frame every 24 hours, you can render it as if it had 1°x1° cells, with a frame every 6 hours. The document in that case is 16 times smaller than what it would be. The download time is proportional to the document size.

Think of it like this: a document that would take 16 minutes to download can be obtained in about one minute. That could make some sense...

The smoothing is available from the GRIB Control Panel (on the right of the chart).

The temp directory

The "`temp`" directory under "`all-scripts`" is used by different components of the Weather Wizard to generate temporary data. This directory is to be cleaned up from time to time.

Design you own patterns

Once you have disposed the faxes in your composite, using the fax and charts control (on the right side of the chart), you have the possibility to generate a pattern out of it.

Use the menu "**File > Create Pattern...**".

You will be prompted to save the pattern in a directory you choose.

If you want to make it a dynamic pattern, you will need to edit the file you have just saved.

You need to add the `dynamic-resource` element at the `fax` level.

```
<pattern>
   <fax-collection>
      <fax hint="North Pacific Surface" color="255;0;51" transparent="true">
         <faxScale>0.33790467906521593</faxScale>
         <faxXoffset>183</faxXoffset>
         <faxYoffset>94</faxYoffset>
         <faxRotation>0.0</faxRotation>
         <dynamic-resource url="http://www.opc.ncep.noaa.gov/P_sfc_full_ocean.gif"
                           dir="./WeatherFaxes/yyyy/MM/sfc"
                           prefix="NOAA_sfc_"
                           pattern="yyyy_MM_dd_HH_mm_ss_z"
                           extension="png"/>
      </fax>
      ...
```

Similarly, for the dynamic GRIB requests, you have to add the `dynamic-grib` element:

```
<grib display-TWS-Data="true"
      display-PRMSL-Data="true"
      display-500HGT-Data="true"
      display-WAVES-Data="false"
      display-TEMP-Data="false"
      display-PRATE-Data="false"
      display-TWS-contour="false"
      display-PRMSL-contour="false"
      display-500HGT-contour="false"
      display-WAVES-contour="false"
      display-TEMP-contour="false"
      display-PRATE-contour="false"
      display-TWS-3D="false"
      display-PRMSL-3D="false"
      display-500HGT-3D="false"
      display-WAVES-3D="false"
      display-TEMP-3D="false"
      display-PRATE-3D="false">
  <dynamic-grib hint="Zone covered by the faxes above (All Pacific)"
       request="GFS:65N,45S,130E,110W|2,2|0,6..24|PRMSL,WIND,HGT500,TEMP,WAVES,RAIN"
                dir="./GRIBFiles/yyyy/MM"
                prefix="GRIB_"
                pattern="yyyy_MM_dd_HH_mm_ss_z"
                extension="grb"/>
</grib>
```

In both cases, notice the "`dir`" attributes, they can dynamically generate sub-directories. The names follow the conventions described at `http://docs.oracle.com/javase/6/docs/api/java/text/SimpleDateFormat.html`.

Take a look at the already existing patterns, to see how it goes.

An graphical editor is also available.

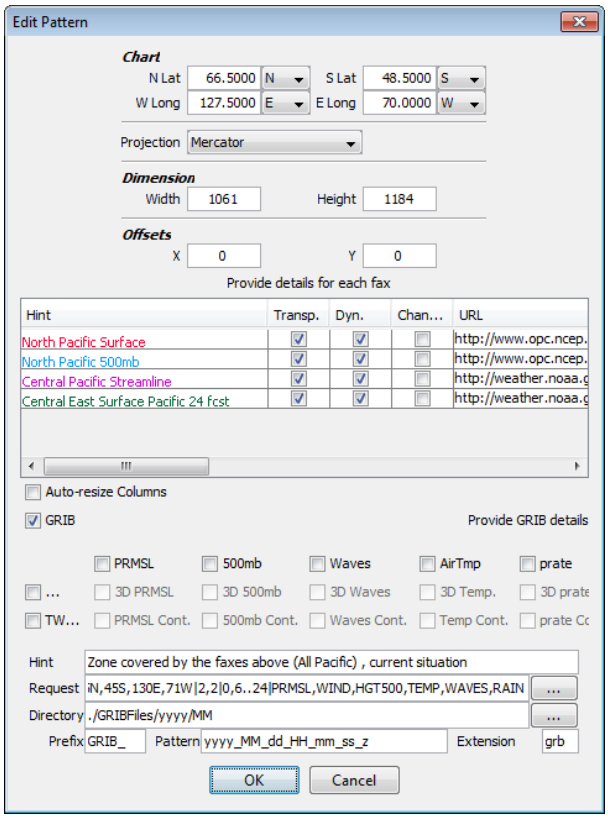
Using the Graphical User Interface

There is now a Wizard to do this kind of operation. The first step remains the same, you create a pattern after an existing Composite. Then, you can edit this pattern by right-clicking (**Edit** menu item) on it in the pattern tree, in the left pane.

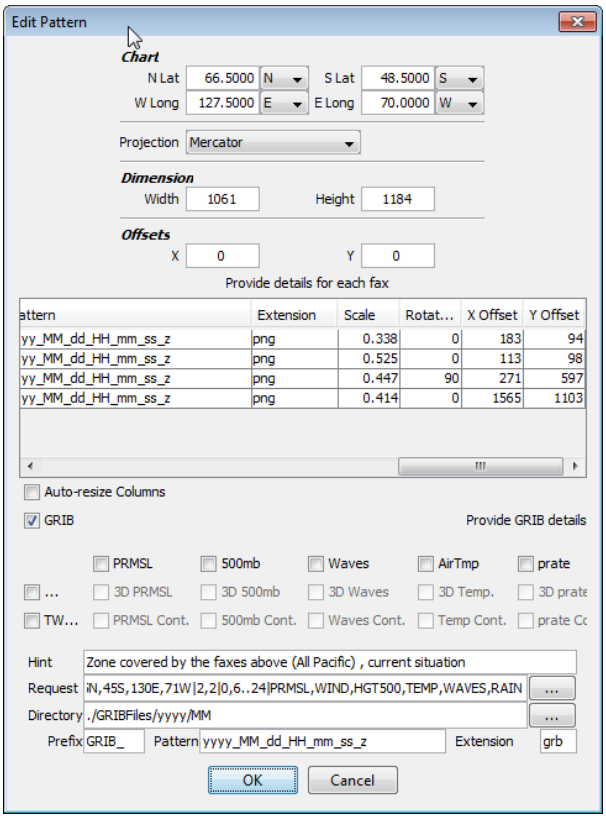
When created, a pattern is a static one (i.e. non dynamic), meaning that when you use it, you will be prompted to enter the location on the disc for each resource of the composite, faxes and GRIB..

The editor will allow you to turn a static pattern into a dynamic one, by entering the on-line location (URL) for each fax, as well as the GRIB request you want to make.

You will also have to enter a generic name for each resource, so they can be saved on disc after having been downloaded.



Dynamic Patterns



Other fax properties

Notice the naming conventions for the directories and resource names. They follow the standards mentioned above.

Also notice that the data displayed in the dialogs above match the ones mentioned in the XML files, in the previous section.

Interfaces

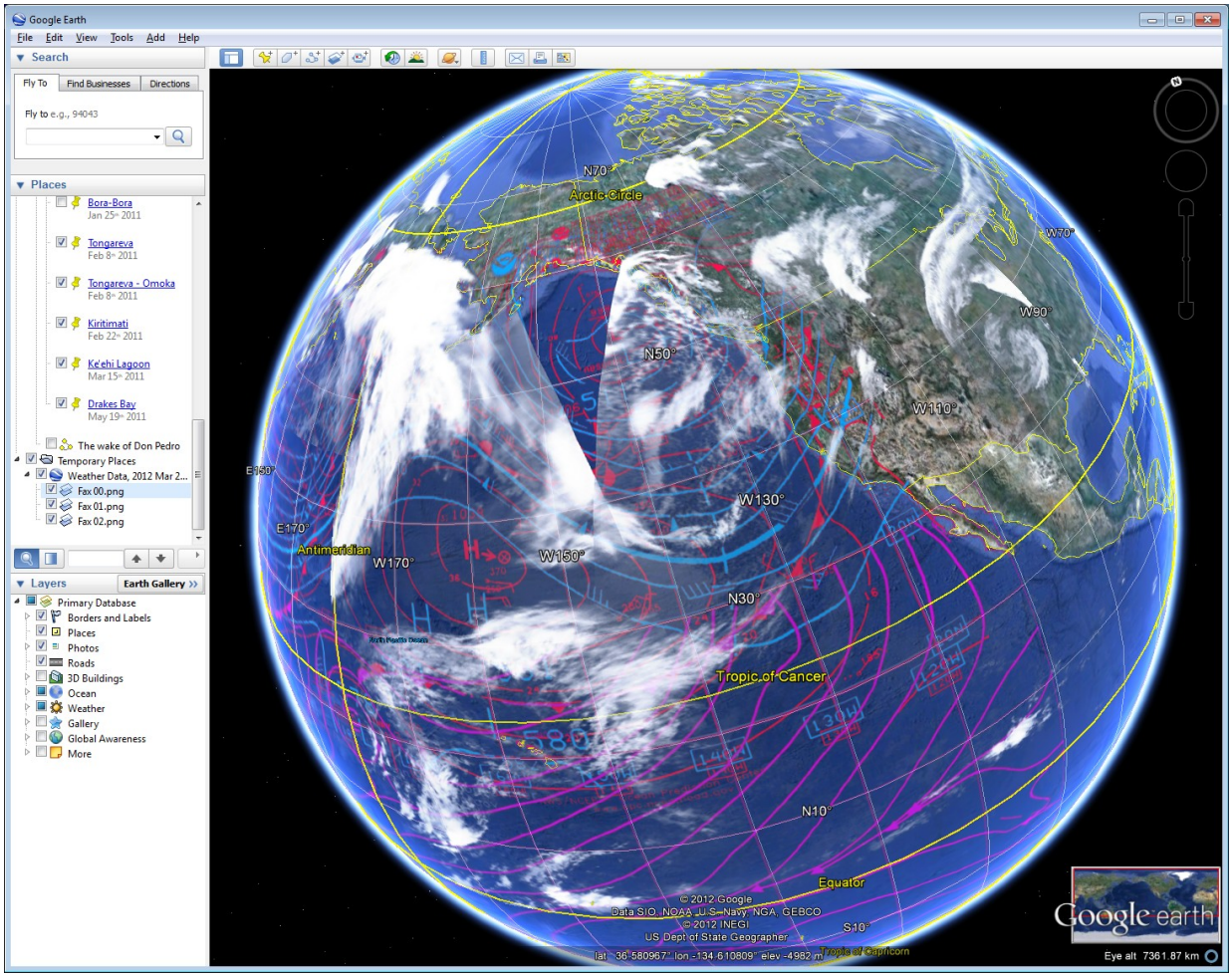
With Google Map & Earth

Once a Composite is loaded, and when you can access an Internet connection, you can render it in Google Earth or Google Map.

The fax rendering in Google is available when the faxes use a Mercator projection.

This interface with Google is available

- Through the menu **File > View Composite in Google**
- Through the popup menu on the chart (right-click) **Composite Options > View Composite in Google**



Three faxes in Google Earth, with cloud layer

In the Google case (Earth and Maps), some files have to be generated (KML or KMZ for Google Earth, JavaScript for Google Maps). This generation happens in the temp directory, under the all-scripts directory, part of the directory where you installed the software. This directory has to be cleaned up from time to time.

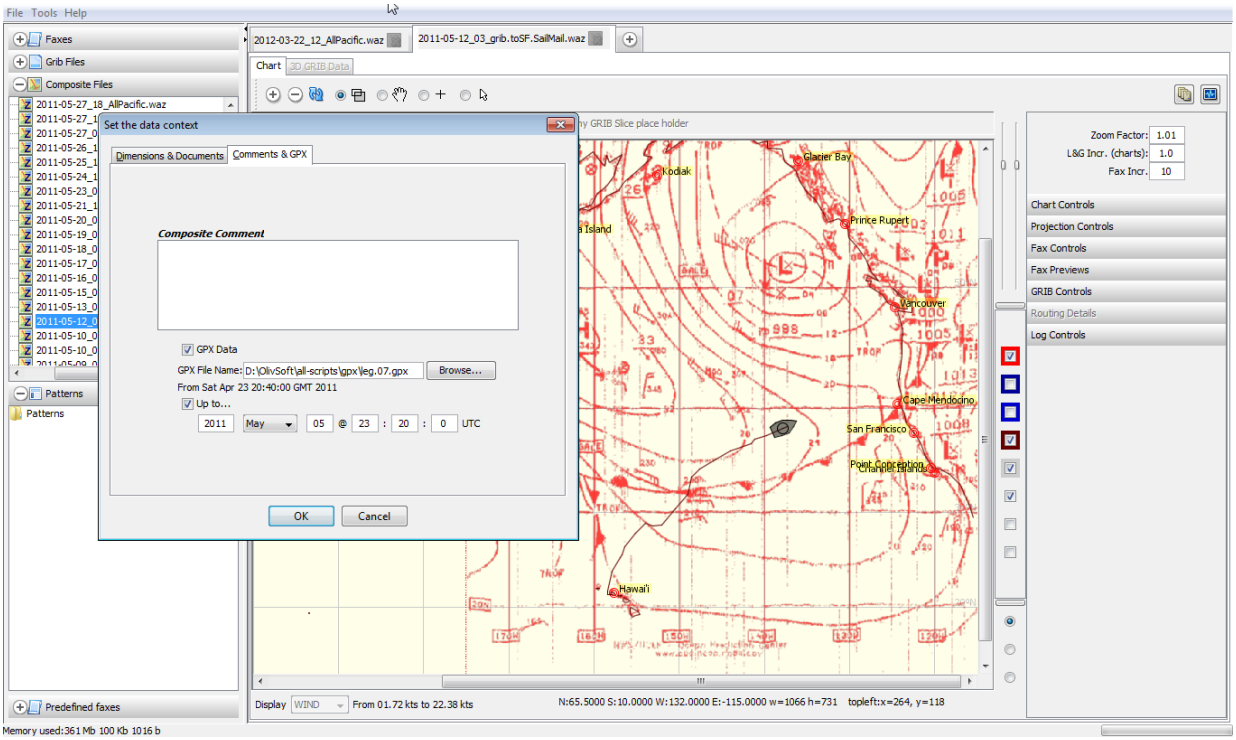
GPX

GPX[14] is an XML[15] Standard, used by many navigation softwares.

The Weather Wizard can both consume and produce GPX data.

You can display a GPX route as part of a Composite.

You can generate a GPX route after a routing computation, to display it – for example – in your navigation software[16] (if it supports GPX, of course).

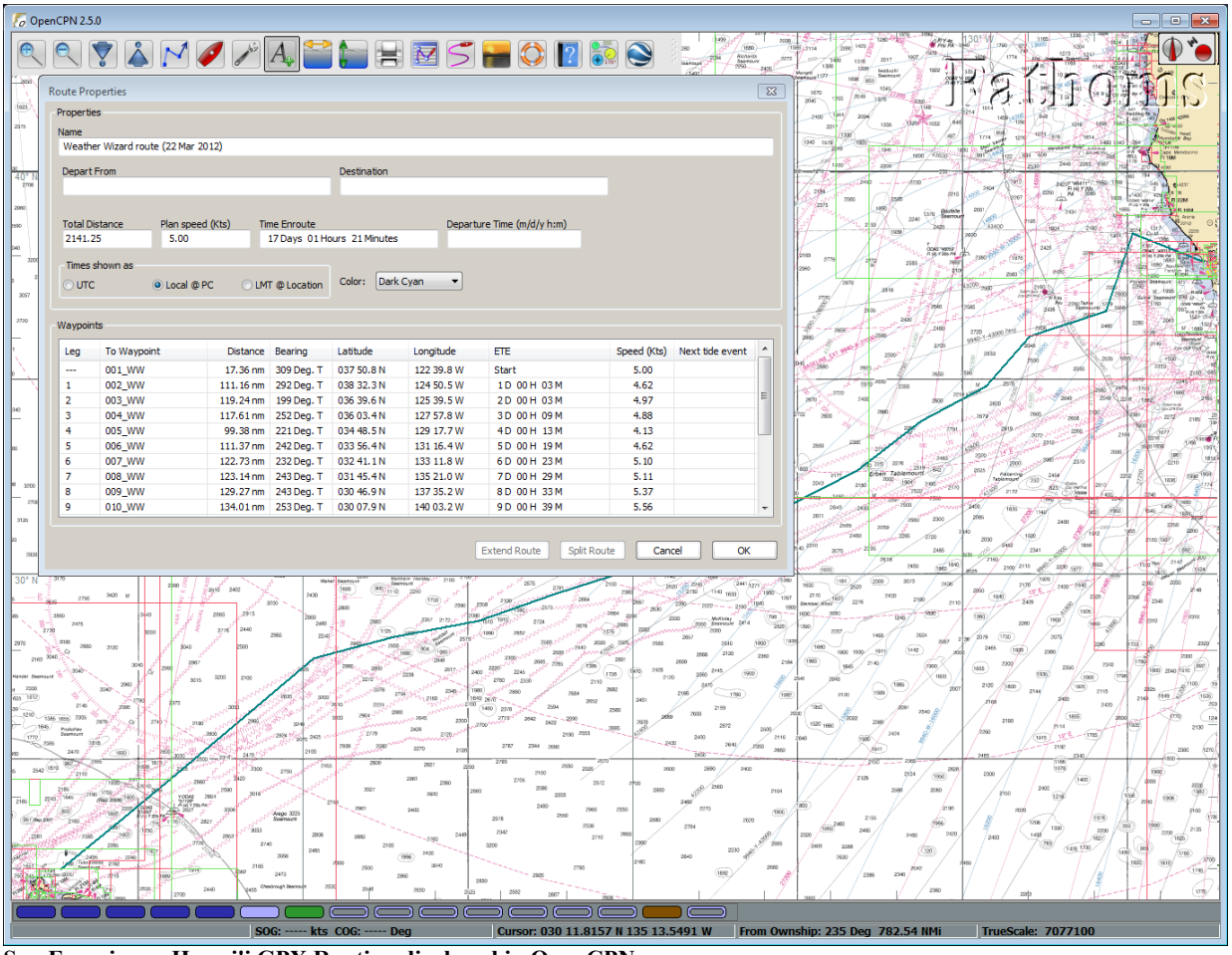


Rendering of a GPX Track, en route to San Francisco

14 GPs eXchange format.

15 eXtensible Markup Language

16 OpenCPN works like a charm.



San Francisco – Hawai'i GPX Routing displayed in OpenCPN

User exits

You can write your own user-exits, in Java.

That is definitely the job of a Java developer.

A user-exit has to implement a Java interface named `chartview.util.UserExitInterface`.

You can also request a user exit, using the “Issues” section of the project home web site, see the section “Report a bug, request an enhancement”, page 48.

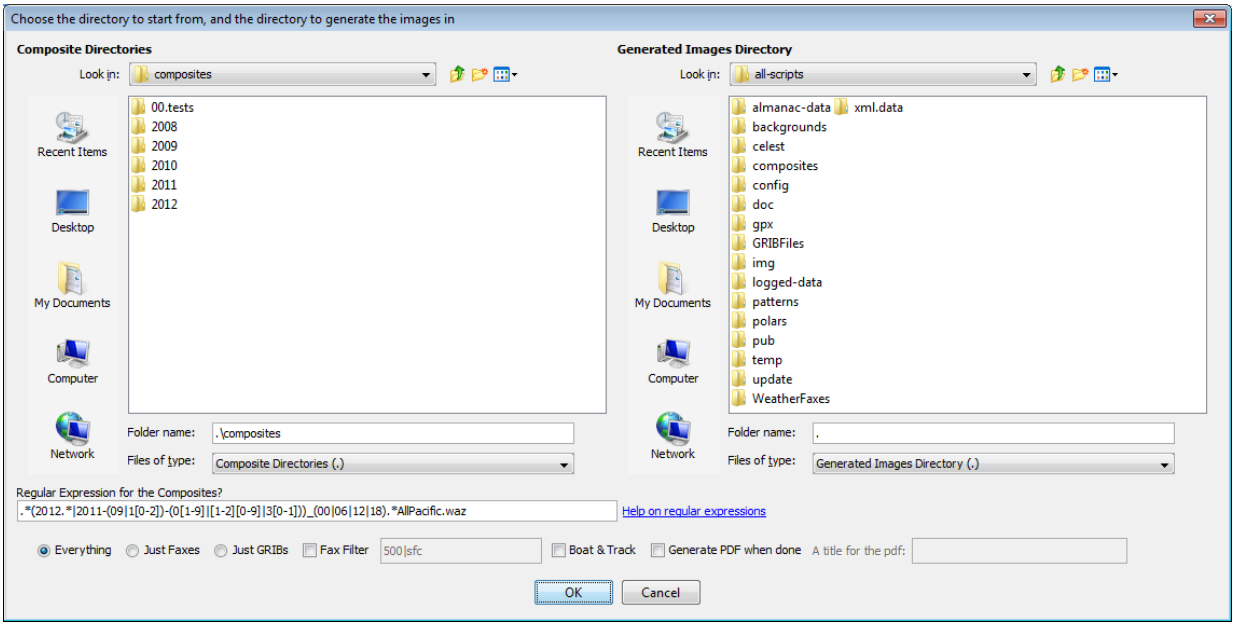
Archiving

There are several things that can be done on Composites, for reporting or analysis purposes.

Generating images

Going to the menu **File > Generate Image** will allow you to generate an image file from the rendering of a Composite. You will be prompted to provide a location for the image file to generate.

You can also generate images from the Composites stored under some given directory, by going to the menu **Tools > Administration Tools > Generate Images from Composites**.



This utility will scan a directory you provide, will find all the composites having a name matching a regular expression you provide; you can choose to display all or parts of the matching composites, and images will be generated in a directory, located where you want. Optionally, you can generate a pdf file, holding the generated images.

The last regular expression you used will be stored, to be re-displayed next time you come to that screen..., just in case.

The importance of naming conventions

Sticking to a naming convention will allow further analysis of your weather data. The regular expression mentioned above applies to the Composite file names. Having a strict naming convention describing the date and the content of the Composite will allow you to search and find them appropriately. The next section is enhancing this aspect.

Regular expressions

OK, it is a bit technical, it sounds a bit like some computer geek stuff, agreed. But that is an extremely powerful tool. The syntax of a regular expression can look very scary.

```
/^[0-9a-zA-Z]([-.\w]*[0-9a-zA-Z_+]*@(0-9a-zA-Z][-\w]*[0-9a-zA-Z]\.)+[a-zA-Z]{2,9}$/
```

The one above can be used to validate the syntax of an email address...

It's based on pattern matching. You apply a regular expression on a text, and you will know if it matches, or if it does not match.

Many software are available – and most of them for free – to help you with regular expressions[17].

A dot "." means "any character". A star "*" means "any number of times".

17 We would recommend Expresso, available for free at http://www.ultrapico.com

An expression like ".*Tropical Surface Analysis.*" would match any character string containing “Tropical Surface Analysis”, whatever is before or after.

When you want to generate images after some composites generated at some given dates, an expression like

```
.*(2012.*|2011-(?<Month>09|1[0-2])-(?<Day>0[1-9]|[1-2][0-9]|3[0-1]))_(?<Hour>00|06|
12|18).*AllPacific.waz
```

will find all the composites having a name containing “2012”, or containing “2011” followed by a dash “-”, then by 09, 10, 11 or 12, another dash “-”, then a sequence of two digits, from 01 to 31, an underscore “_”, a two digit sequence like 00, 06, 12 or 18, any number of any character, and finally finishing with “AllPacific.waz”.

That brings us back to the importance of naming conventions for your composites. The expression above will eventually find all the composites of the All Pacific, generated in 2012, or between September 1st 2011 and December 31st 2011. The expression is a bit cryptic, but it works well!

Hints

Change the mouse behavior.

There are four predefined behaviors for the mouse on the chart, set by the radio buttons available in the toolbar on top of the chart.

The four behaviors are:

- Drag & Drop Zoom. You click on the chart to define the top left corner of a rectangle, and drag to the bottom right of it. When you release the mouse, it zooms on the just defined rectangle (the confirmation of the zoom is driven by a preference, you can turn it off).
- Grab-Scroll. Drag the chart itself to move it.
- Draw Line. Click to define a start, drag to the arrival. This will draw rhumbline and great circle, a bubble giving the different data. A dialog will summarize the operation.
- Just Pointer (and nothing specific)

The default behavior is Drag & Drop Zoom.

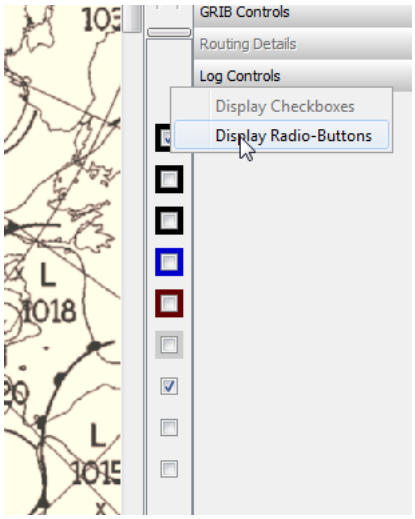
When the Drag & Drop Zoom radio button is selected, you can turn the mouse behavior to *Grab-Scroll* by pressing the **Shift** key when dragging the mouse. Pressing the **Ctrl** key will turn the *Draw Line* behavior on. Releasing Shift or Ctrl keys will return to the Drag & Drop Zoom.

Display faxes – now – 24h forecast – 48h forecast – 96h forecast – one by one

Some Composites are containing faxes that are not to be displayed on top of each others, because they are not representing the same slot of time.

In this case, it is possible to turn the check boxes displayed on the right side of the chart into radio-buttons. A right-click on the panel will do the job.

This option will be stored in the Composite.

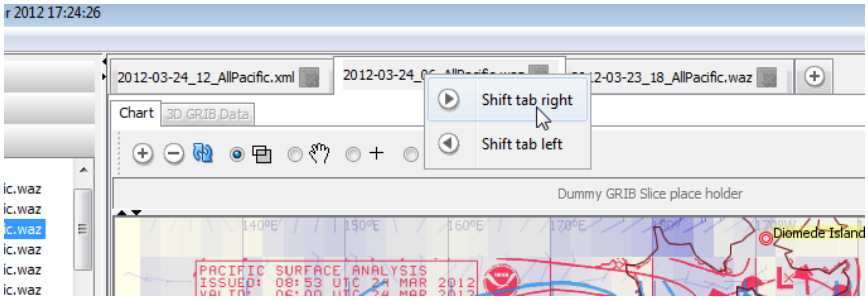


Scroll through several Composites

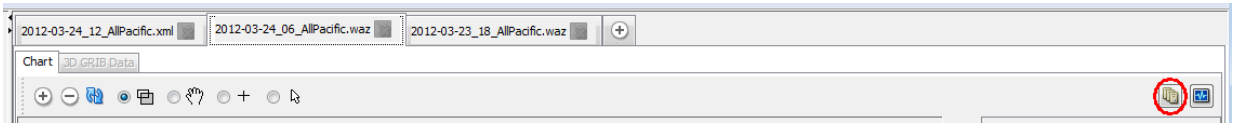
Along the same lines as the section before, it could be interesting to see the evolution of a situation, by scrolling through several Composites, elaborated from the same pattern on a regular base. For example, you have saved a Composite based on the same pattern, every 6 hours.

To visualize how the situation is evolving, open those composites, by double-clicking on them in the Composite tree panel on the left of the chart.

You can re-order those Composites if necessary, with a right-click on their corresponding tab.



Once the Composites are chronologically ordered, you can "animate" the sequence with the button located next to the Expand/Collapse button, at the right of the Composite toolbar.



This will display the tabs one by one, every 2 seconds. Clicking the same button again will stop the process.

Export the result of a routing computation to another software

The result of a routing computation can be re-used. Beside what is displayed on the chart, you can generate the data in three formats:

- Text
- CSV (Comma Separated Values), compatible with spreadsheets.
- GPX

After the routing is completed, the result is copied in the clip-board, using the format you specified in the preferences, **Tools > Preferences > Polars, Routing, NMEA > Routing Output Type**. You also have the possibility to ask the user every time a routing calculation is completed. In this last case, the result of the computation can be stored into a file on the file system.

As it is also in the clip-board, a Ctrl+V in any editor will also do the job.

Show on the File System

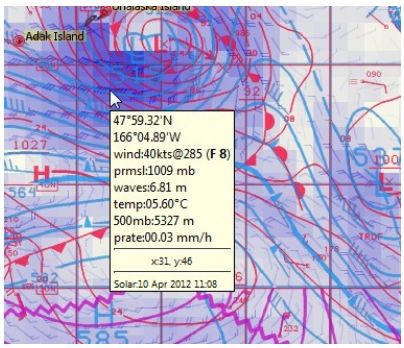
All the tree panes on the left reflect the structure of the directories and files on the File System. There is in the software nothing to rename or delete those files, this is to be done at the File System level. For that reason, there is an option labeled "Show on the File System", available through a right-click on in those tree pane. This will lead you to the location of the files or directories you right-clicked on, so you can manipulate those elements to your convenience.

Along the same lines, there is also a "Refresh Tree" option, available at the root of each tree, that will refresh the data, after one of the manipulations mentioned above.

Alternate tooltips on the chart

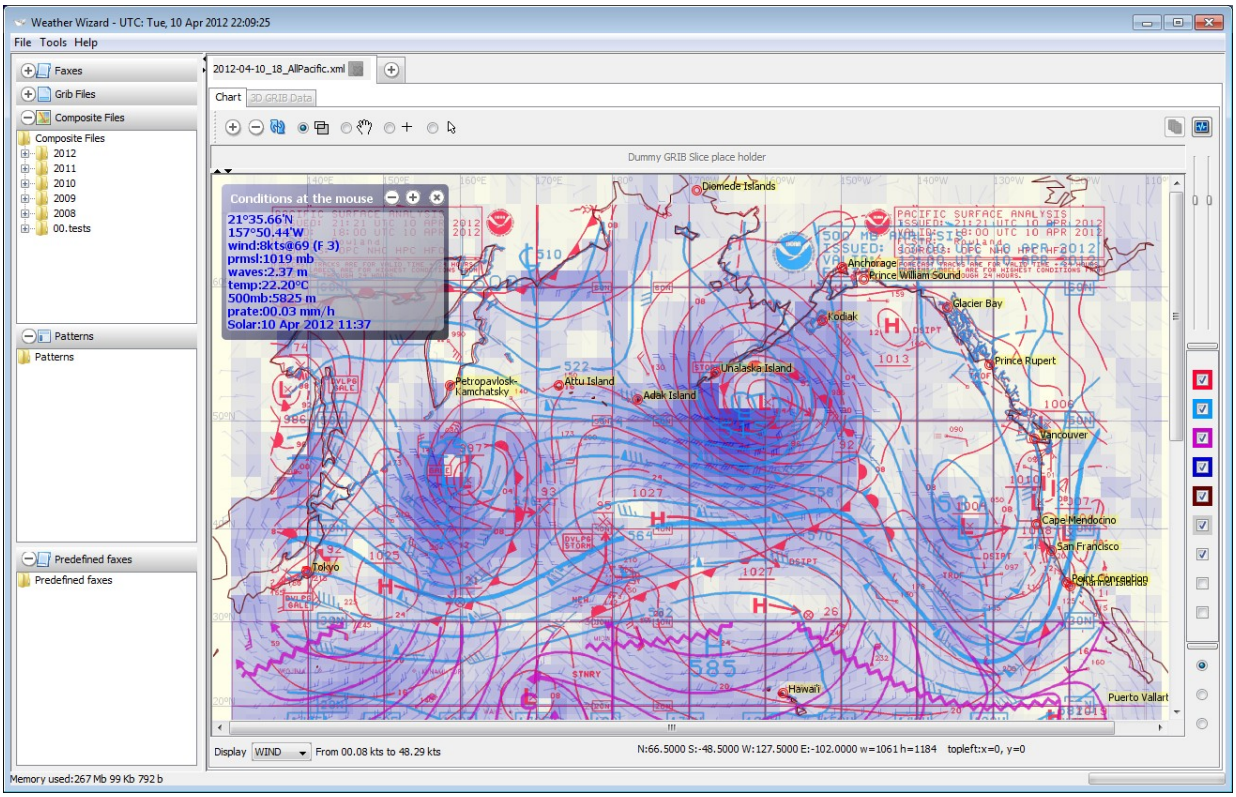
A right-click on the chart gives you access to **Chart Options**.

The default is to have the usual bubble (option **Tooltip on Chart**).



You can remove the tooltip (option **No Tooltip**)

You can also have a **Tooltip Window**.



Tooltip Window

You can also enlarge or shrink it, as you wish.

It displays the GRIB data at the mouse location

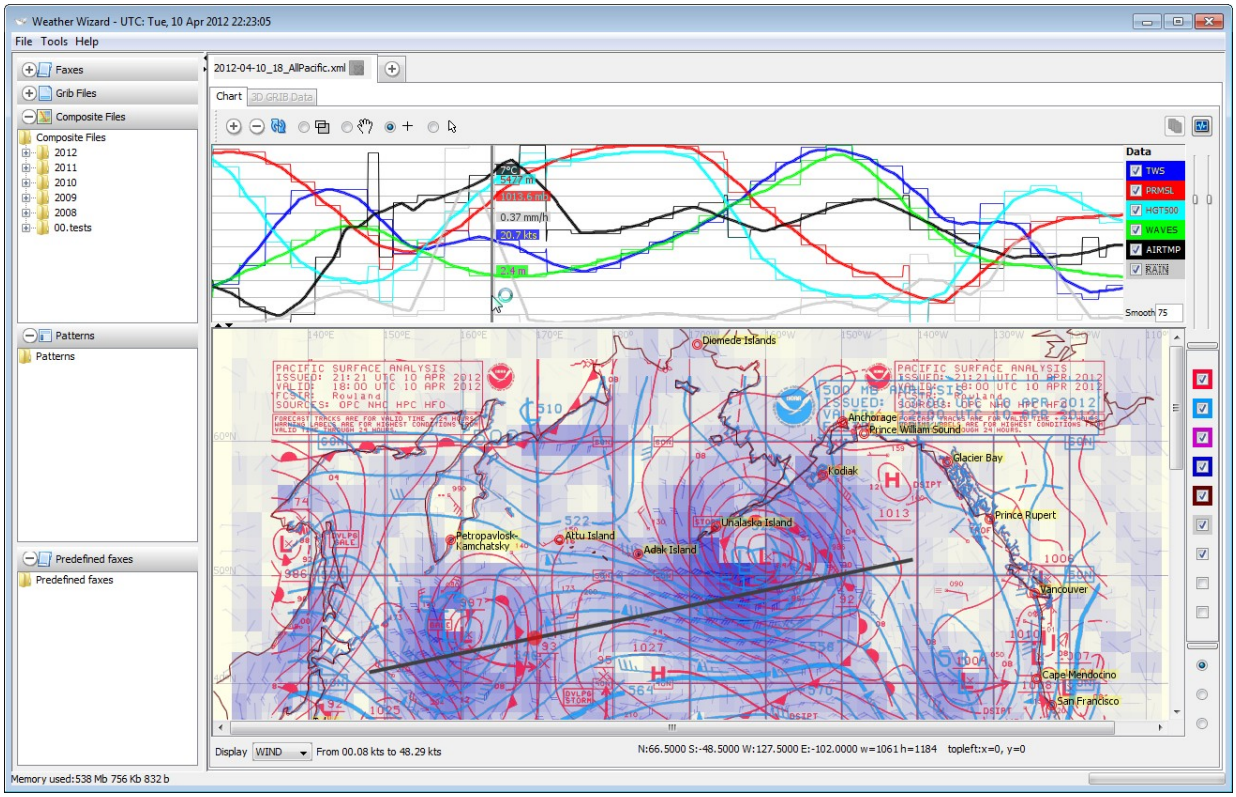
When you close the tooltip window using its "**Close**" button, the option is set to "**No tooltip**". You have to use the menu to set it back to any other option you want.

GRIB Slicing

With a right-click on the chart, you can use the menu "**Wind and GRIB Options > Enable GRIB Slicing**".

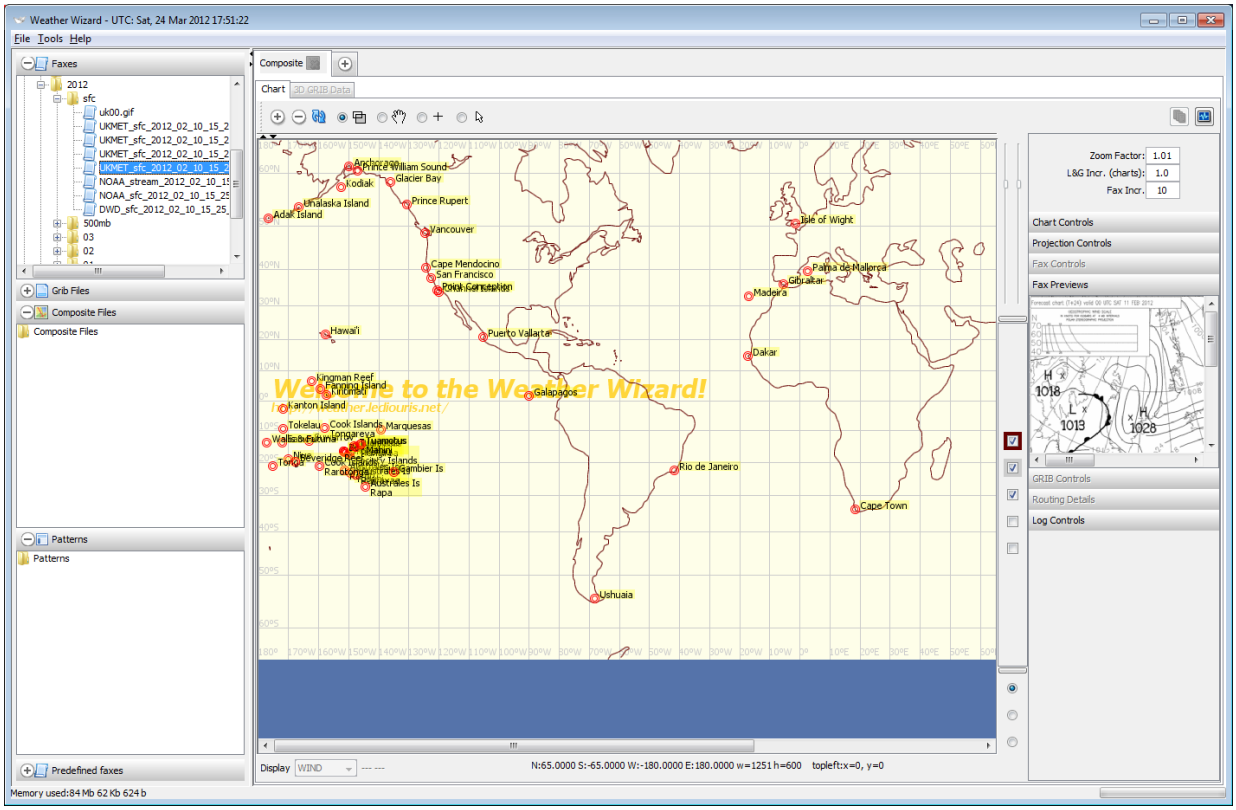
This will switch the mouse behavior to "**Draw Line**". And use the mouse to draw a line on the chart, this will display the values of the GRIB along this line.

If you hold the left button clicked on the GRIB Slice panel, the values will be displayed on the graphic, and the corresponding position will be plotted on the chart.



Use the “Fax Preview” control pane

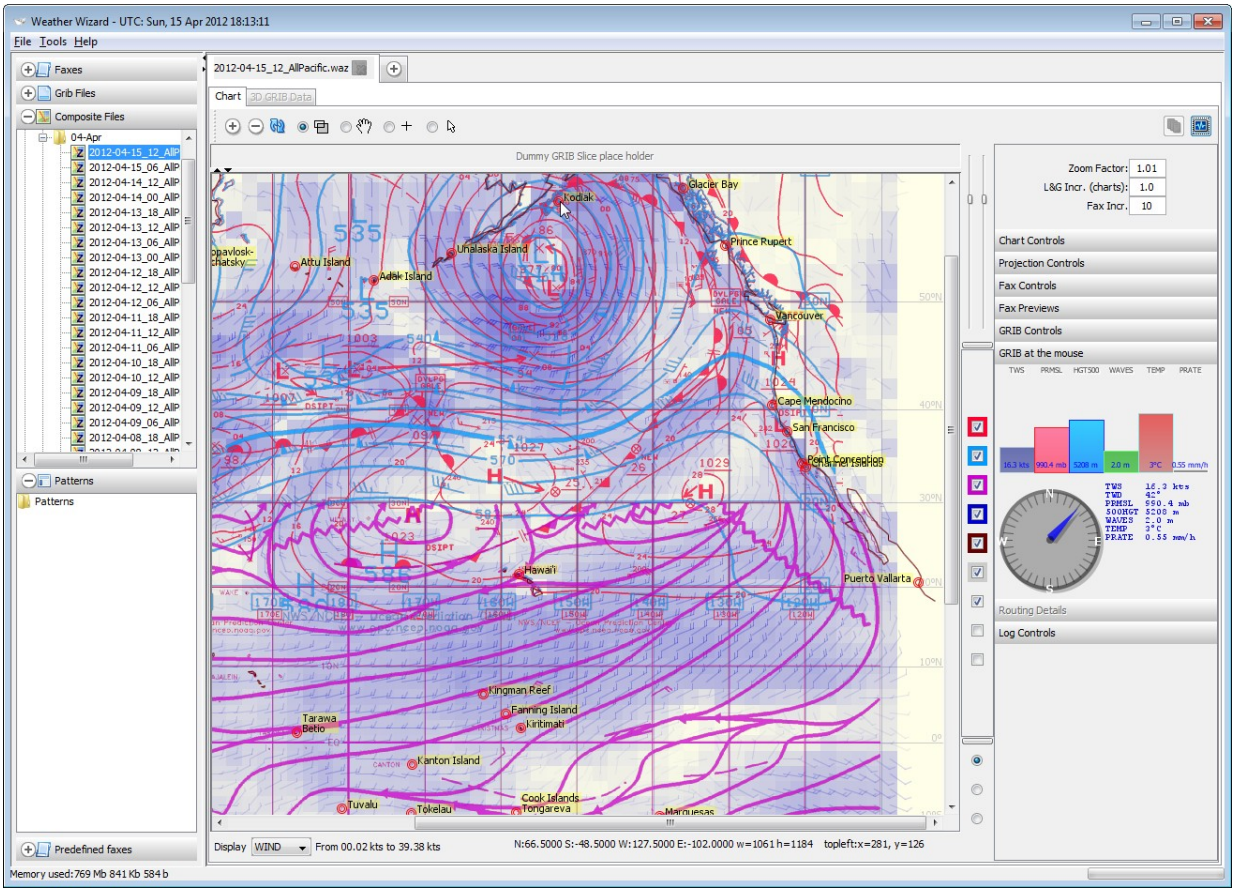
This feature is here to preview a fax, before loading it into a Composite. You have a “**Fax Preview**” section in the Control Pane, at the right of the chart. To view the faxes, expand it, and select a fax already stored on your computer, available in the “Faxes” tree pane on the left of the chart.



This will allow you to see if the fax you want to display is the right one. A right-click on the fax preview will give you access to some zoom options.

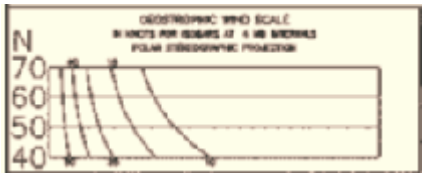
Use the "GRIB at the mouse" feature

When a GRIB is available in the composite, there is a pane in the Control Panel that displays the GRIB conditions at the mouse. It changes when the mouse moves.



Use the Geostrophic Wind feature

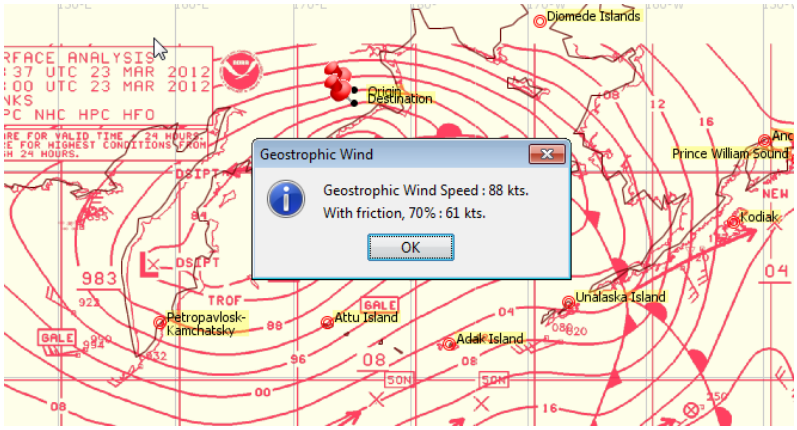
Some faxes come with a Geostrophic Scale.

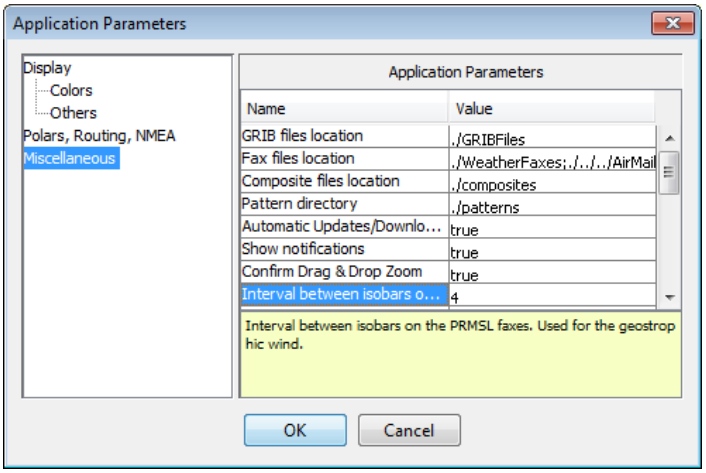


It is here to estimate – at a given latitude – the wind speed, based on the distance between 2 given isobars.

This feature is available in the Weather Wizard, for the Mercator projections. To use it, display a surface fax, and drop pushpins (just click on the chart) on two isobars of the fax.

Then use the menu **Tools > Geostrophic Wind**.





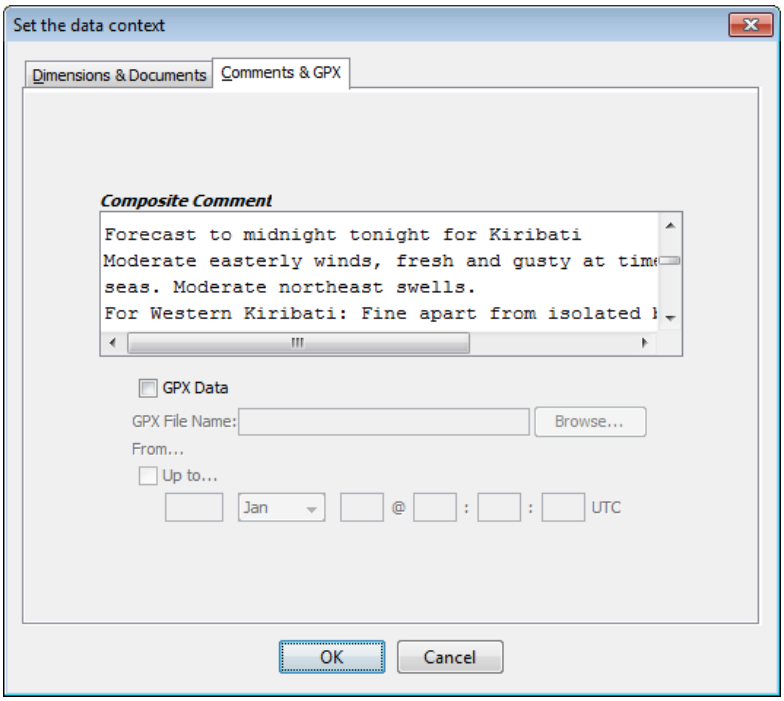
Position Acquisition

The position of the boat can be plotted on a Composite. It can be done manually, or automatically, from GPS data. The port to read to get the GPS (NMEA) data is to be set at the preferences level, **Tools > Preferences > Polars, Routing, NMEA > NMEA Serial Port**.

Use the comments in a Composite

There is the possibility to store some text with a Composite. The amount of text is not limited, it could be useful to store data like the text bulletins received at the same time as the documents part of the Composite.

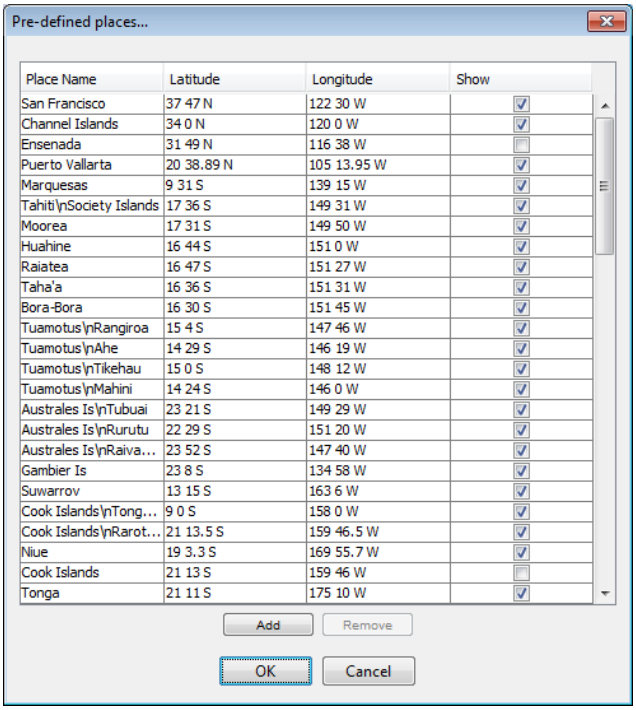
The comment text can be accessed through the Composite Editor dialog, tab "**Comments & GPX**".



Customize the pre-defined places

The places displayed on the chart are stored into a file named `places.xml`, located in the "`all-scripts`" directory.

It can be edited with any editor, and it can be modified from the software, **Tools > Administration Tools > Pre-defined places...**



Pre-defined places user interface

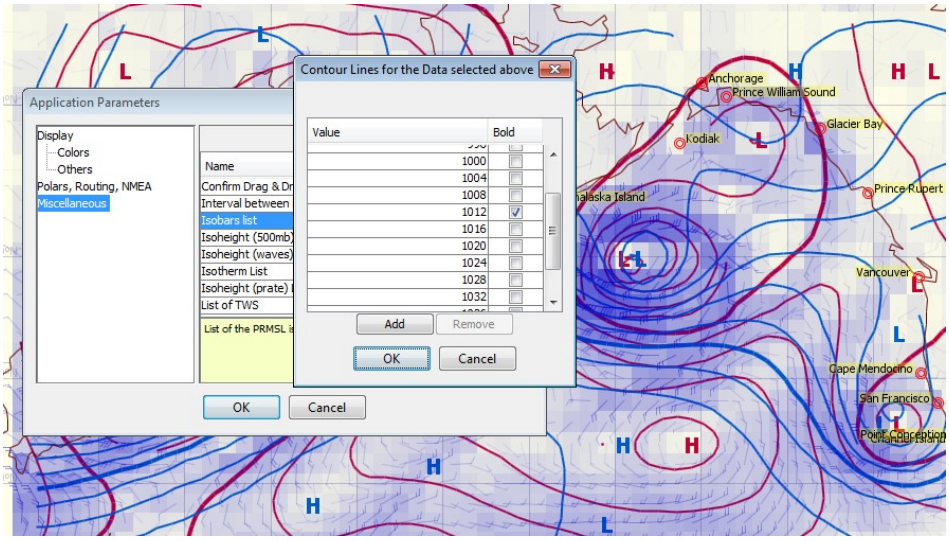
You can add lines, remove lines, etc. You also have the possibility to show or hide a given place.

A label can be displayed on several lines. To insert a line break, just add "\n" in the label. Like in "Cook Islands\nRarotonga".

Contour Detection

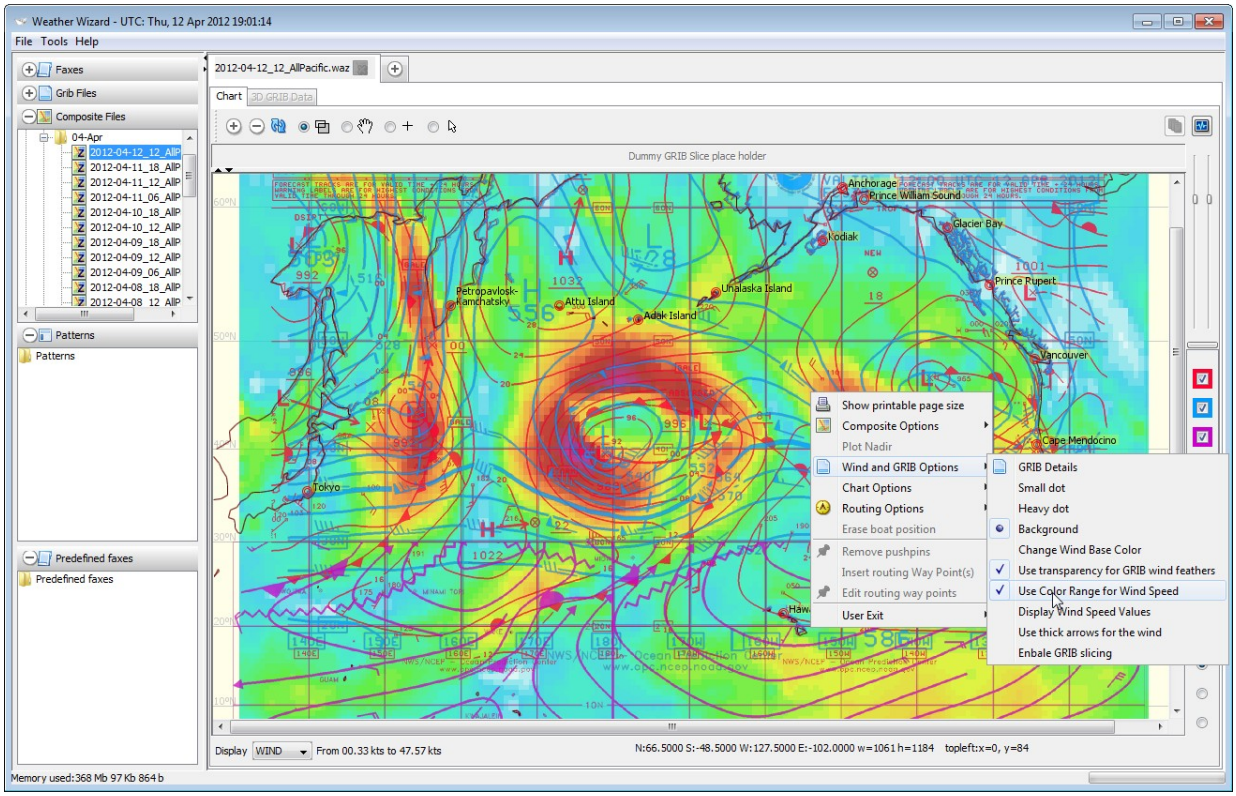
In a GRIB, you have the possibility to detect the contours; this will be specially useful for PRMSL and HGT500. All the data in the GRIB can have their contours detected, but this would not be as interesting as those two.

You can set the interval and limits of the contours to detect, using **Tools > Preferences > Miscellaneous > Isobars list**.

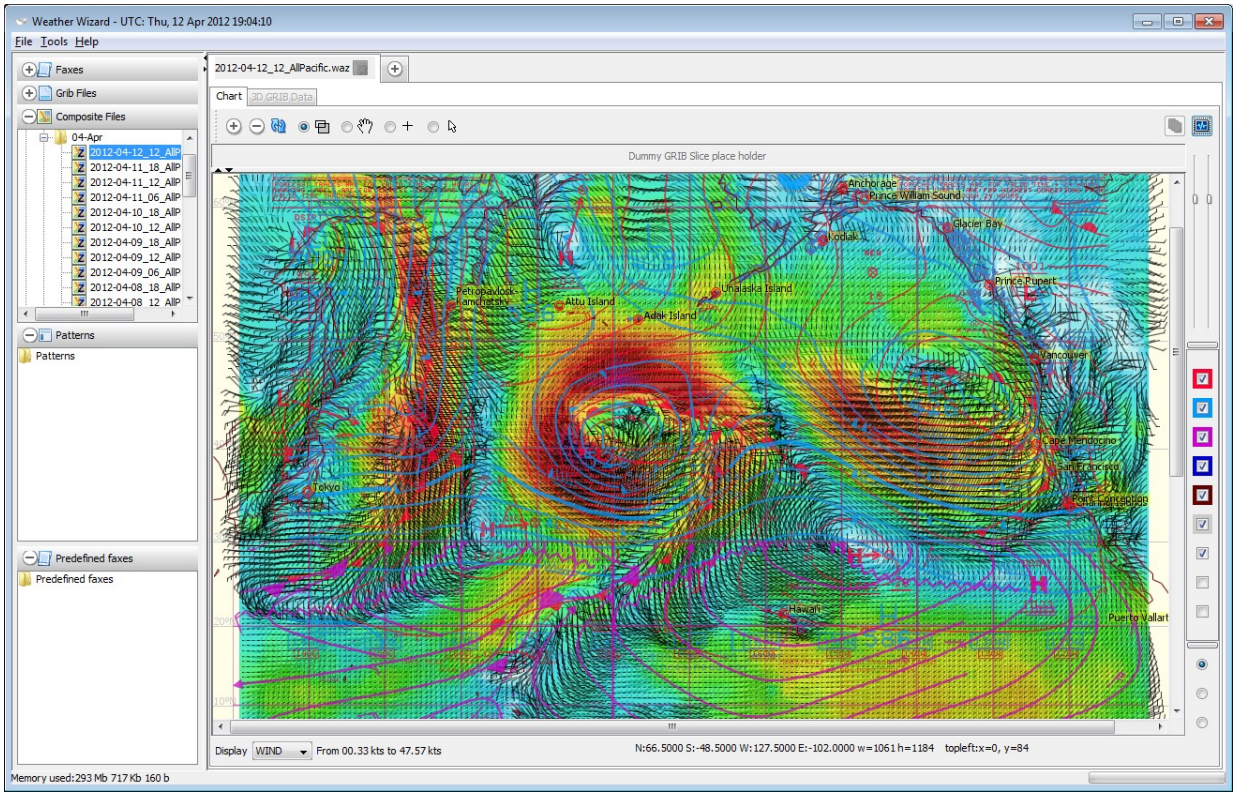


Use color range *and* wind direction for the GRIB wind

A right-click on the chart, and the menu "**Wind and GRIB Options > Use Color Range for Wind Speed**" will display another rendering of the GRIB wind.



If you want to add the wind direction to this rendition, you have to set the preference "**Display > Others > Display wind direction with color range wind speed**" to "**true**".



Report a bug, request an enhancement

In order to improve the software, use `http://code.google.com/p/weatherwizard/`, in the “Issues” section.