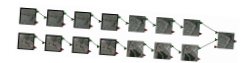


# ImageLinker Tutorial

A walk through tutorial with ImageLinker - an OSSIM application

## *Introduction*

### **ImageLinker Background**



ImageLinker is a GUI based application demonstrating the power of the OSSIM open source software library. It is one of many programs that have been built on top of the functionality in OSSIM. Users are encouraged to register online at <http://www.ossim.org> and join the collaborative community there. The site is the focal point for software development, user support, and related information.

ImageLinker is an application for viewing and processing remote sensing and Geographical Information System (GIS) data. Built on the underlying OSSIM library. Capabilities include advanced remote sensing, photogrammetry, and image processing. Underlying design goals and capabilities are covered in more detail in the Design Goals section of this document.

ImageLinker brings out many of the underlying functions through commands that are accessed through pull down menus and dialogs. ImageLinker also allows the user to construct and manipulate complex image flows through the Visual Chain Editor (VCE). The VCE allows the user to dynamically connect and re-order multiple “image chains” through the visual chain editor canvas.

Each function is represented by a thumbnail that reflects the state of the imagery at that point. Users can double click any function to access custom dialogs and parameters. Projects can be saved and retrieved at will and later used as processing templates for batch processing.

ImageLinker also supports a plugin architecture that allows new functions and processes to be loaded at runtime. The design of the plugins allows scientists and developers to quickly add new functionality without the need of learning the internals of the OSSIM software libraries.

In addition to viewing and manipulating image chains, ImageLinker can generate output products by passing the parameters to the igen command line tool (called through menu commands).

ImageLinker and OSSIM are open source software projects that are being widely deployed in various government and commercial organizations.

### Preparation and Setup

Refer to the OSSIM Installation document for detailed instructions on installing OSSIM and acquiring some sample data. This first tutorial uses data that can be found on <ftp.remotesensing.org>.

Login as anonymous leaving your email address as password.

Then cd incoming/ossim/sample\_data to find some tutorial data sets. From a terminal window you can typically perform the following commands:

```
ftp ftp.remotesensing.org
login: anonymous
Password: <youremail@yourcomputer.com>
cd ossim
cd sample_data
cd map_and_sanfran
ls
```

you should see:

```
-rw-r--r-- 1 ftpuser ftpusers 2790904 Jan 31 2003 map_and_sanfran.tar.gz
```

```
get map_and_sanfran.tar.gz
```

Wait for the download to complete then:

```
exit
```

to exit the ftp command

The file should download to your local disk. You might want to place it in a separate directory

```
mkdir testdata  
mv map_and_sanfran.tar.gz testdata  
cd testdata  
ls
```

unzip and untar the file

```
gunzip map_and_sanfran.tar.gz  
tar xvf map_and_sanfran.tar
```

perform an ls to see that the files are there

```
ls  
  
highres_utm_map.geom          sanfran.geom  
highres_utm_map.ovr          sanfran.ovr  
highres_utm_map.tif          sanfran.tif  
highres_utm_map_readme.txt    sanfran_readme.txt  
map_and_sanfran.tar
```

These files have been prepared as a test set for the ImageLinker program. ImageLinker will take advantage of auxiliary files if they are present. There are several OSSIM command utilities to create these files for data sets. Included in the sample data set is a raster map and a section of a satellite image over San Francisco. The initial files were sanfran.tif and highres\_utm\_map.tif - both geotiff files. GeoTiffs are tiffs that have geospatial tags embedded in the file.

The respective ovr files are overview files containing reduced resolutions sets. These files can be generated with the img2rr (image to reduced resolution) command line utility. The geom files contain geometry information and were created with the create\_geom command.

Histogram files can be created with **create\_histo**.

The readme.txt files are human readable files about the data sets.

These two files will be used to demonstrate some of the basics of ImageLinker.

## *A Walkthrough Tutorial*

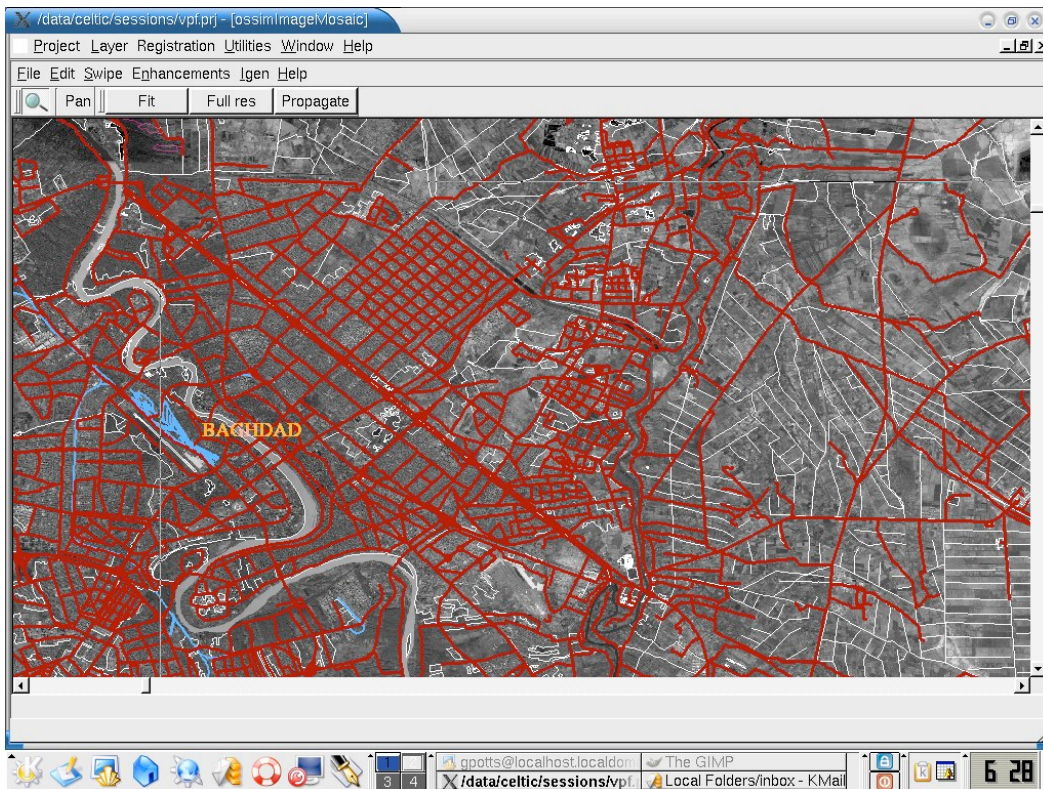
### **Starting the Program**

Double clicking the application will bring up an empty project window. ImageLinker can support multiple projects, each one will invoke a master project window. Images, image chains, and visual chain editors for each project will be contained within the project window. The main project window can be resized by the user, minimized and maximized.



### **File Opening**

For operating systems that support drag and drop, files that OSSIM understands can be dragged from the desktop to the project window and an associated image chain and display will be automatically opened up. Multiple files can also be selected and dragged as a group.

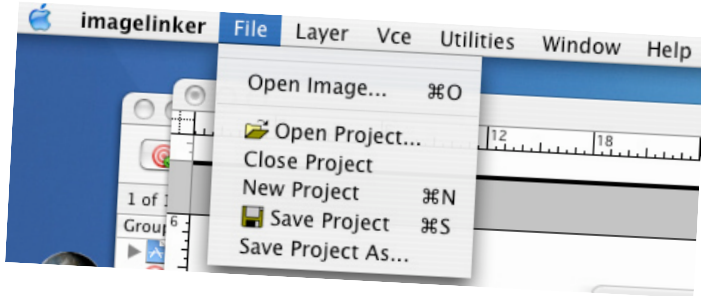




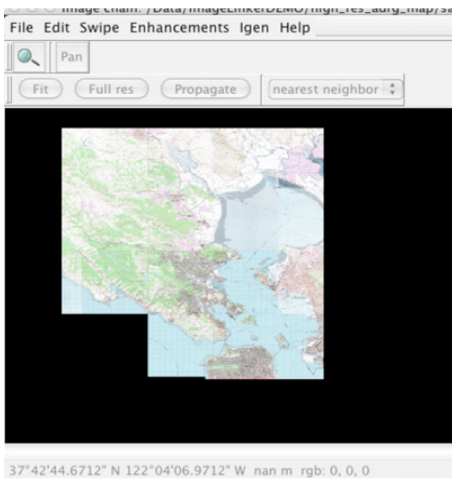
### Menus

The application will display a menu bar with the main menu categories as shown above. Each of the menus will be covered in more detail:

### File Menu



The project menu contains all of the commands related to manipulating projects. Project files can be thought of as sessions. Multiple images can be loaded and filters and parameters can be applied to their respective image chains. All of these settings including window positions and user settings are captured and saved at will when the user saves a project. A project typically has a .prj extension.

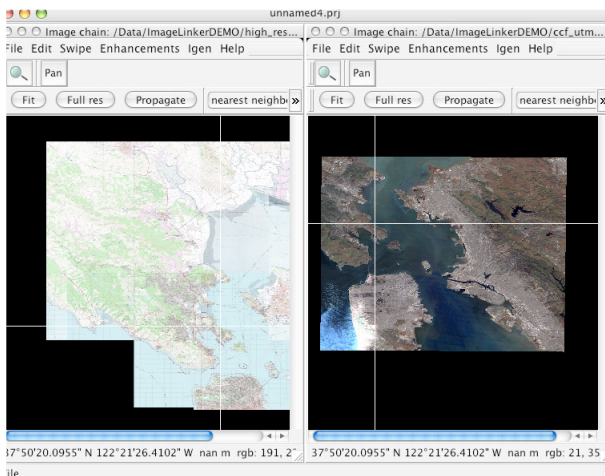


### Open Image...

The Open Image menu item invokes a file dialog box that allows the user to navigate the file system and open an image for ingest and display in the project. When the image is loaded an image chain is created and can be seen in the Manager dialog.

A display is also created in the project window. The display windows have a number of capabilities and menus that can manipulate the underlying image chain for the display.

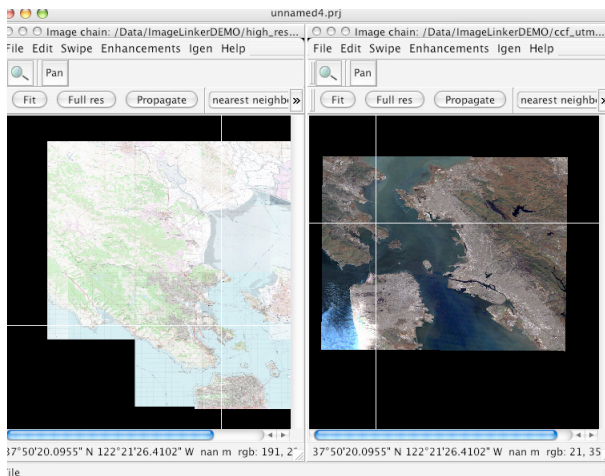
Each display window contains a title bar that denotes the source. Display menus and menu items operate on the underlying image chain for the window. The window also has a number of modes for panning and zooming. When a display is initially created it determines if there is an underlying geographic context associated with the imagery. If none is available through associated metadata or internal geo-specific tags, a dialog is presented to the user asking if a default geographic projection should be assigned to the image.





## Zoom and Pan Modes

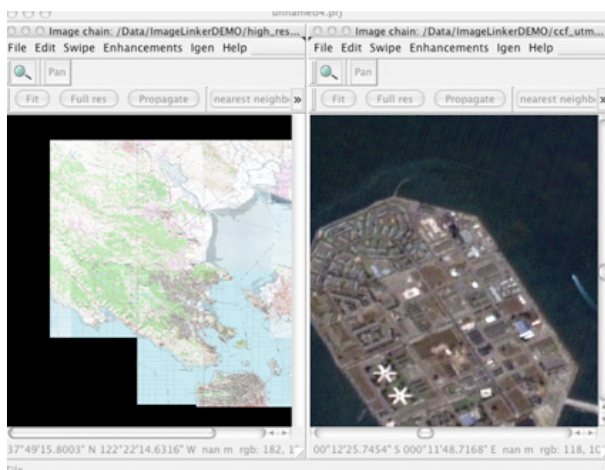
The window palette contains two icons for selecting zooming and panning modes for the display. Select the mode then control by clicking in the content of a display. Shift click will cause the zoom mode to zoom out. Dragging a rectangular area will zoom the display to that area of interest.



### Fit

The Fit button calculates and scales the image so that the entire coverage is visible in the display window as shown on the left.

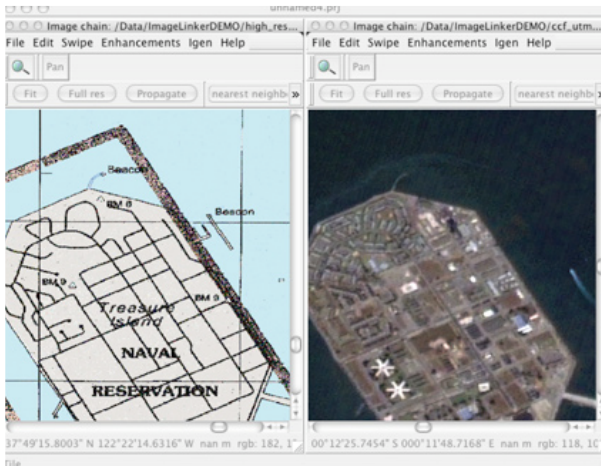
In this example a map and a Landsat image have been scaled to fit in the display windows.



### Full Res

The full res button scales the image to full resolution centered about the last cursor click in the window. Each geographic image has a full resolution parameter which defines the native resolution mode of the data set.

In this example the Landsat image on the left was zoomed to full resolution.



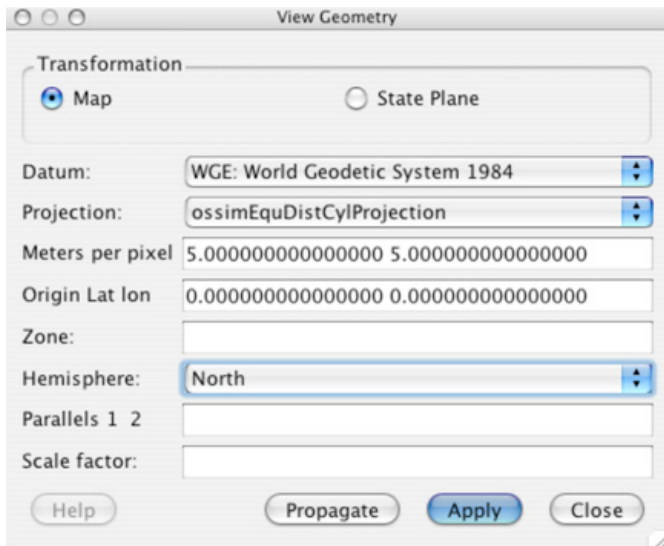
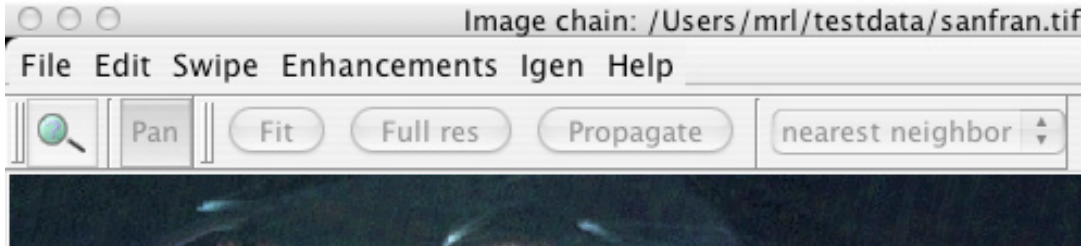
## Propagate

The propagate mode syncs the views of coincident geographic data sets to the same scale and resolution as the selected window. It transmits a command to the other windows to present themselves in the same view as the window where the button was pressed.

In this example the full resolution view of the Landsat image on the right was propagated to the map on the left. Both images are presented in the same scale and area of coverage.

## Resamplers

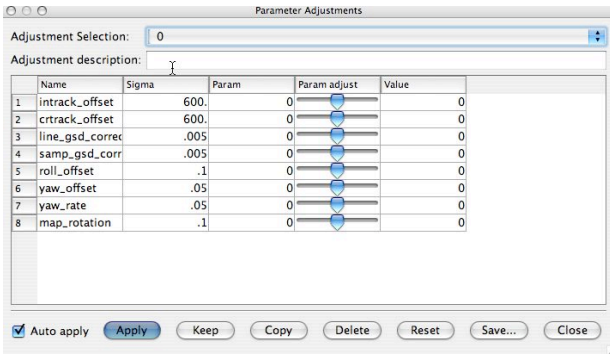
## Display Menus



Several menus are available on the display window. Each will be covered in more detail below:

## View

This dialog displays and modifies the projection and image of the displayed image. Transforming to another projection / datum is as simple as selecting the desired output from the pull down menus. Parameters for resolution, origin, etc are also available from this dialog. OSSIM application are projection and resolution independent. All transformations and resamplings are performed automatically to meet the needs of any display.

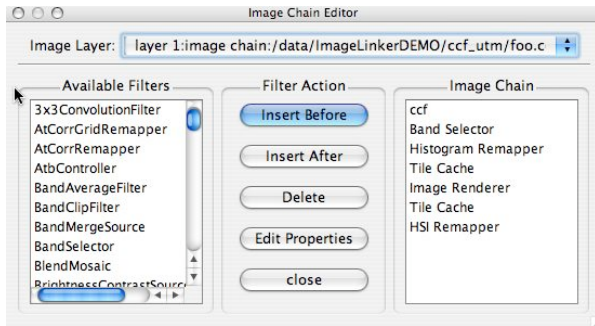


## Geometry Adjustment

This dialog is available for sources that are derived with sensor models. OSSIM has support for rigorous sensor models and adjustable parameters. For this particular example both inputs are map projected products. The dialog shown reflects the adjustable parameter dialog for a Landsat 7 model.

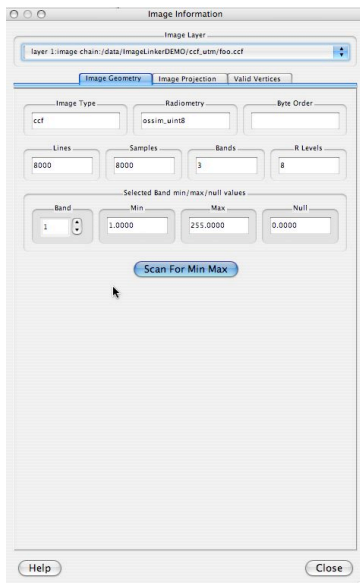
## Image Chain

OSSIM support dynamic image chains. This will become more apparent later in the demonstration with the visual chain editor. An image chain typically begins with a geo-spatial file on disk and is connected through a series of band selectors, caches, filters, and resamplers. This dialog shows the current image chain (right side) associated with the particular display. The left hand list contains a list of all of the registered image objects.



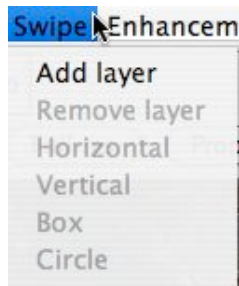
## Image Info

This dialog contains geometry, projection and vertex information on the displayed image. Each of these sections are available through the tabbed interfaces on the dialog. The geometry contains information the source file type, radiometry, pixel dimensions, and pixel values. The project tab provides information about the projection values of the source, and the vertices display the pixel values of the corners of the valid data within the image file.



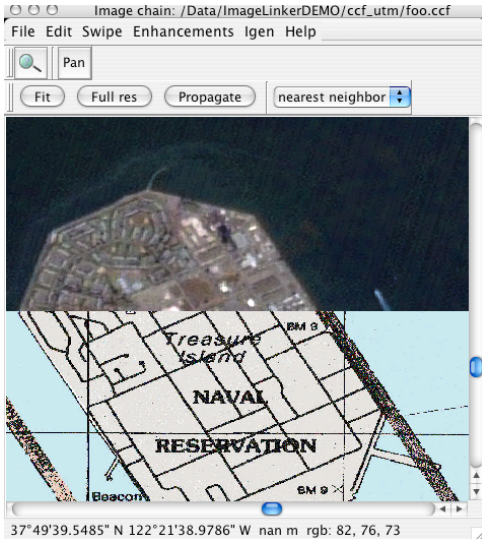
## Layers Vectors





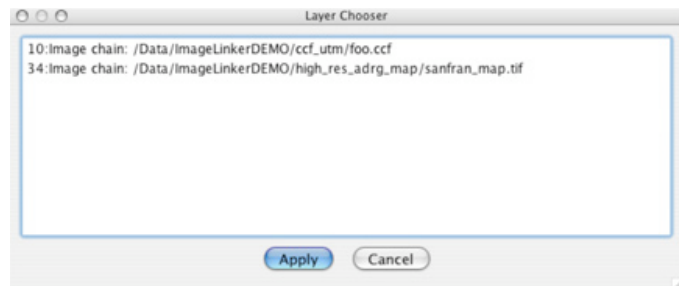
### Swipe Menu

The Swipe menu of the display window allows the user access to commands related to the swipe function. Two geographically coincident data sets can be stacked and rapidly compared by moving the cursor back and forth over the content region of the window. The top layer is covered and uncovered as the mouse is moved.



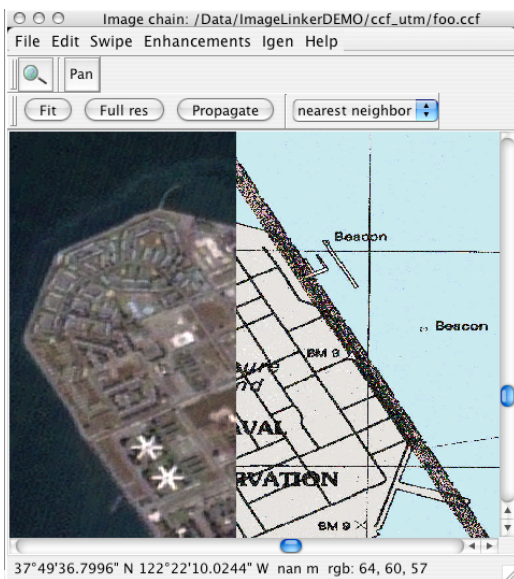
### Add Layer

The add layer menu item invokes a layer chooser dialog. Select the layer that you wish to place on top of the current display window and press the Apply button.



### Remove Layer

Once an additional layer has been added it can be removed using this command. Simply select the image chain to be removed and click the Apply button.



### Horizontal

Swipe modes are ideal for change detection or rapidly comparing two geographic coincident data sets. As the cursor is moved back and forth the top layer covers and uncovers the base layer.

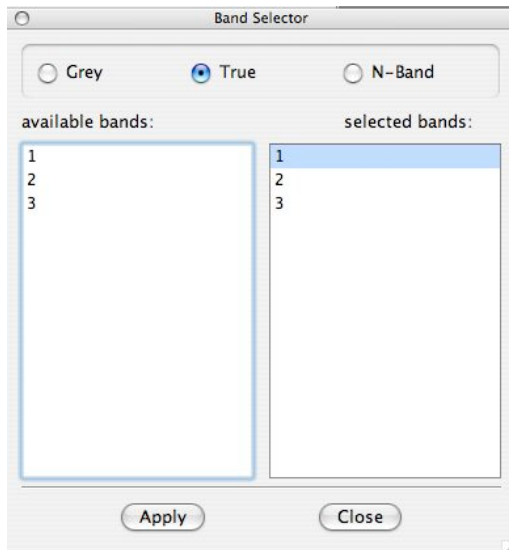
These are examples of swipes. As the cursor is moved, the top layer covers the base area following the cursor.

### Vertical

A vertical swipe mode can be entered by selecting the vertical swipe menu item.

### Box

Not currently implemented...



## Circle

Not currently implemented...

## Band Selection

The band selection dialog is used for selecting which source bands are to be mapped to designated output bands. Modes exist for grey scale (select one input band), True (select three bands for red, green, and blue channels), and N band (select and arbitrary number of bands). The bands can be reordered as well.

## Brightness Contrast

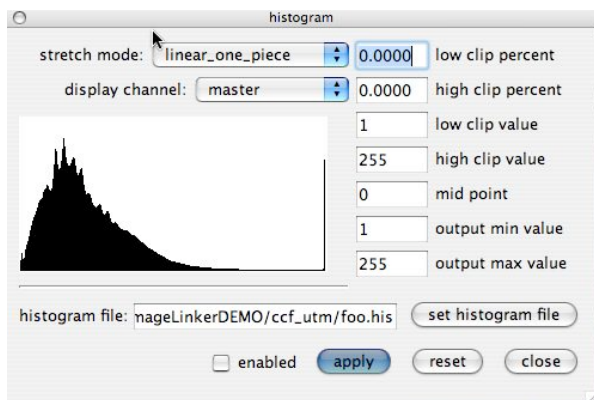
Not implemented

## Correction-->Topographic

Used for providing topographic illumination correction to imagery based on the normals generated from the underlying elevation surface. Used as an error removal process in preparation for material classification.

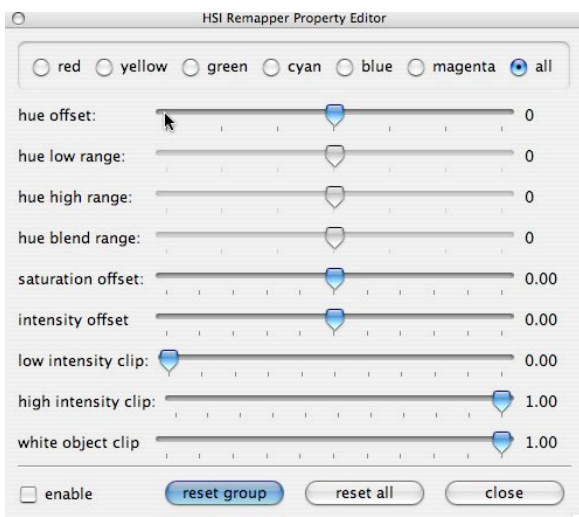
## Histogram Operations

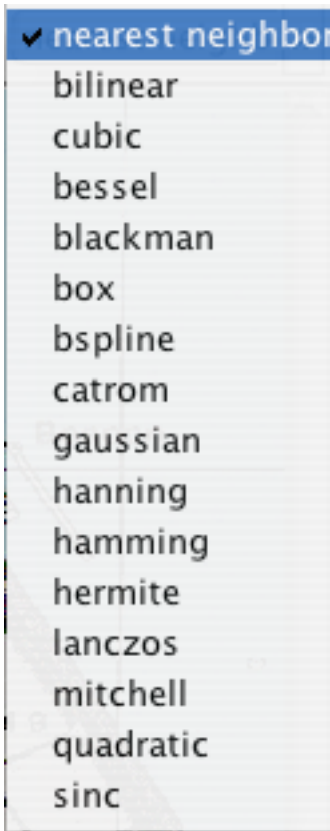
ImageLinker contains a dialog for viewing and manipulating image histograms. The current version of ImageLinks needs to attach to an external histogram file. That file can be created with the command line application **create\_histo**. The dialog allows the setting and application of clip points and input output curves.



## Hue Saturation Intensity Adjustments

This dialog provides color adjustments via hue, saturation and intensity sliders. The changes can be applied to individual or multiple channels by selecting the radio buttons on the top. Clip points and white object clip points can also be directly adjusted. The enable checkbox makes the changes active on the parent display.





### Resampling --> Propagate

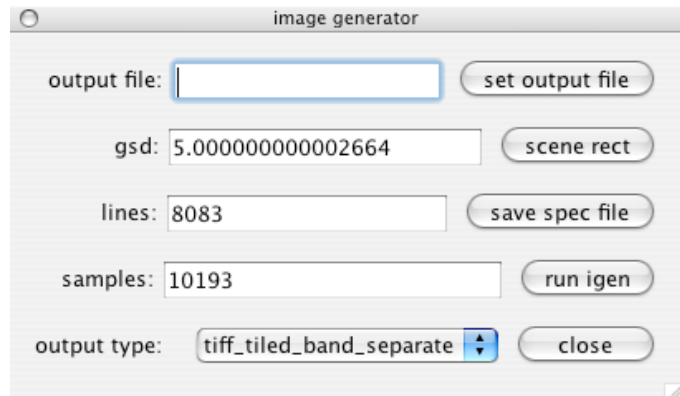
This command propagates the current window's resampler selection to other display windows in the project.

### Fusion

Currently Disabled

### Export --> Image Generator

Igen is the command for generating product output. The menu item allows the user to set parameters for product output, save those specifications to an external spec file and/or run the **igen** command line program to build the specified product. Products are actually generated by an OSSIM command line program called **igen**. This program is fired off in the background so the user can return to working with ImageLinker while the product is prepared.



### output file

The output file field allows the user to set the name of the output product file.

### Set output file

A button that applies the output file name

### gsd:

This allows the user to specify the output resolution of the product. This is known as gsd or ground separation distance. This value will cause the image chain to be resampled to the desired output resolution specified in meters.

scene rect

The output scene rectangle can be projected back on the image display given the current settings of the dialog. Alternatively the user can drag the cursor across the display and define a bounding rectangle and the values for line and sample will be updated in the dialog. Pressing the scene rect button projects the current dialog parameters back on the image display. All of this ultimately determines the extent and resolution of the output product that will be generated by **igen**.

### **Lines**

Defines the number of lines (rows) of pixels to be generated in the output product.

### **save spec file**

This button invokes a dialog for specifying and saving a spec file. A spec file contains the specifications required to build the current image chain and produce the specified product. The spec file can be manually fed to **igen** from the command line to build the product. A spec file is a text file that can be inspected and modified if desired. It is a list of keyword value pairs that specifies all of the source material, functions, and associated parameters for image generation.

### **Samples**

Specifies the number of pixel samples (columns) in the output product. Note that it is also possible to set the lines and samples in the dialog box by dragging the cursor in the display window and defining an output product rectangle.

### **run igen**

Pressing this button executes the current parameters in the display chain and the dialog box by feeding them to the igen command line product generator.

### **output type**

This pull down menu allows the user to select the desired output file format for the generated product. This list contains file formats that are supported by the OSSIM libraries.



### Close

This button closes the dialog box.

### Help

This concludes menus that are associated with the Display window. Now back to the main menu bar continuing on with the File Menu...

### Open Project

The Open command invokes a file navigation dialog allowing the user to navigate the file system and open a .prj project file. A project file saves the state of your session so that you can retrieve it later.

### Close

Closes the active project and asks if you would like to save the project file.

### New

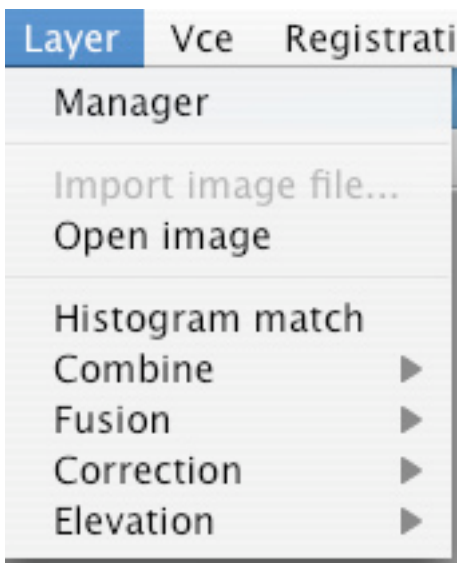
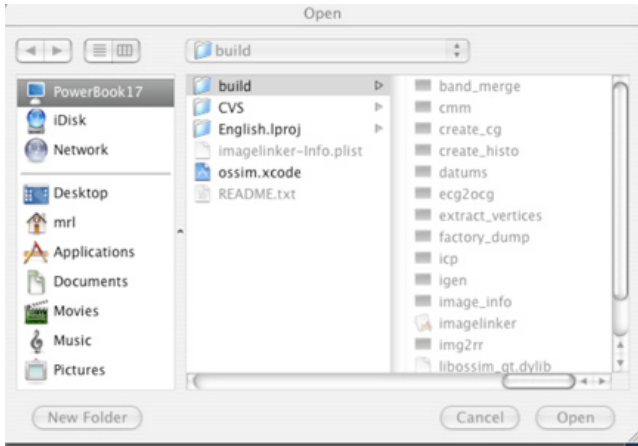
Creates a new project and associated project window.

### Save

Saves the current project and invokes a dialog box if the project hasn't been assigned a name.

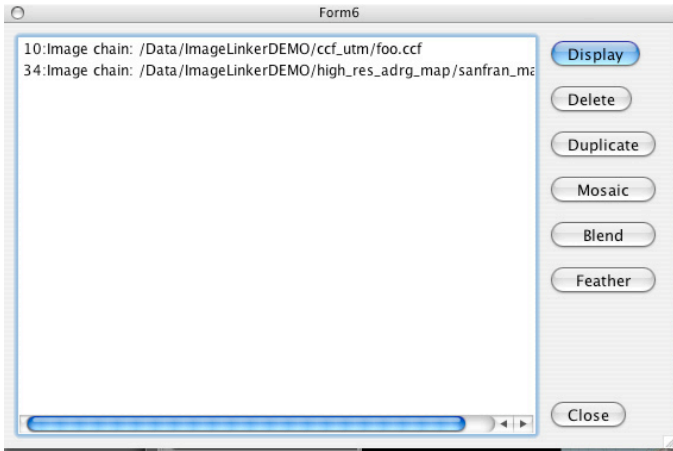
### Save As...

Invokes and Save dialog box and allows the user to assign a new name to the project.



### *Layer Menu*

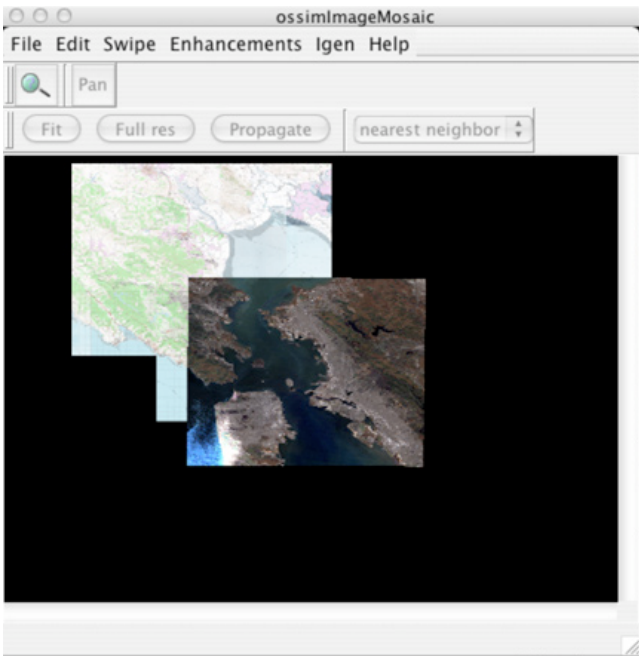
Images and image displays may have multiple layers. Opening an image establishes the initial base layer for a window. Other images, maps, and vectors can be overlaid or combined in various ways as additional layers. The Layer menu contains the commands that are related to layers.



## Manager

The Manager menu item invokes a Manager dialog that displays all existing image chains that are open within the current project. Image chains can be deleted, duplicated, mosaicked, blended and feathered within this dialog box.

It is also possible to drag and drop image chains from the manager into the Visual Chain Editor. Dragging and dropping from the manager to the VCE creates a copy of the image chain in the VCE.



## Display Button

The Display button brings the selected image chains display window to the front of the project window. Often when dealing with large numbers of images, it is easier to find a particular file in the manager display list and bring it to the front with this method.

## Delete Button

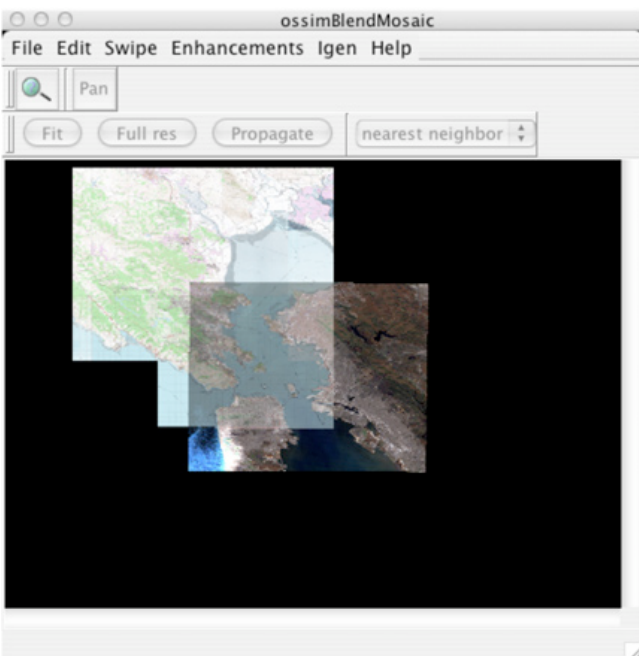
Deletes the selected image chains and their associated display windows.

## Duplicate Button

Makes a copy of the selected image chain.

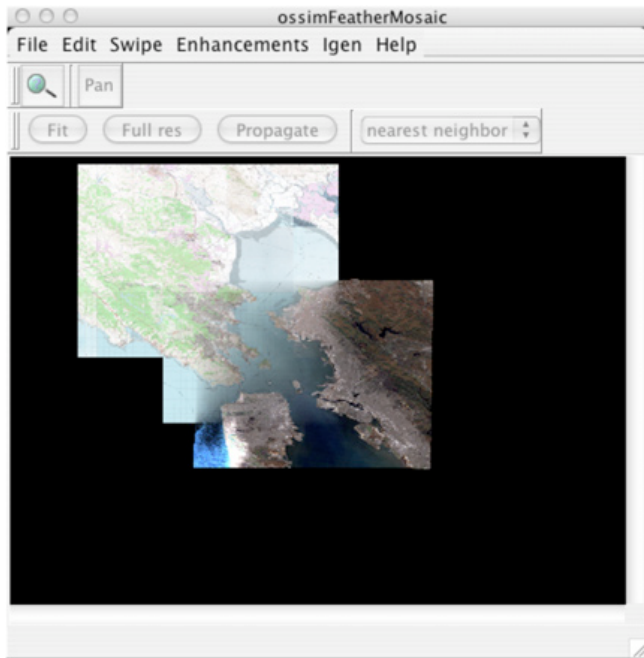
## Mosaic Button

Creates a mosaic in a new display window of the selected image chains. A new image chain will be created and added to the Manager window for the mosaic display.



## Blend Button

Creates a blended mosaic in a new display window of the selected image chains. A new image chain will be created and added to the Manager window for the blended display. The resultant display mosaics the selected images averaging the pixel values where they overlap.



### Feather Button

Creates a feathered mosaic in a new display window of the selected image chains. A new image chain will be created and added to the Manager window for the feathered display. The resultant display mosaics the selected images transitioning the pixel values from one image to the other where they overlap.

### Histogram Match

Selecting this menu item brings up an image chain display list. Select the image chains to be mosaicked together and histogram matched. The Apply button will create a new image chain and open a display window that displays the histogram matched mosaic.

### Combine Sub-menu

The combine sub-menu holds menu items that invoke various image chain combiner methods.

### Mosaic

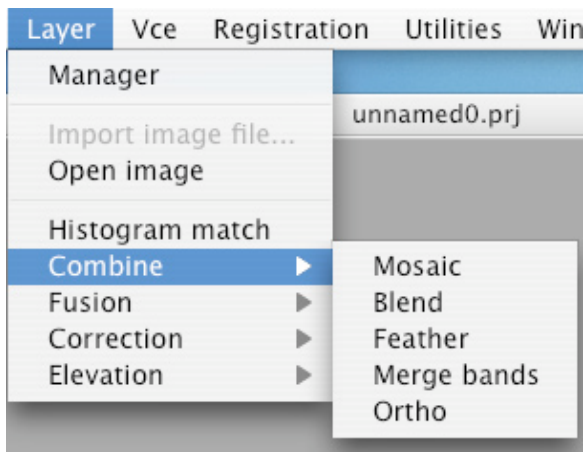
The mosaic combiner creates a new chain that creates an output mosaic fed by the selected input image chains. This combiner simply creates a list that provides A over B mosaicking. The images are stacked on top of each other first to last as they are selected. Image ordering can be changed from the mosaic display menus.

### Blend

The blend combiner creates a new chain that creates a blended output mosaic fed by the selected input image chains. This combiner averages the image chains where they overlap.

### Feather

The feather combiner creates a new image chain that creates a feathered mosaic. In the overlapping regions the imagery is transitioned gradually from A to B changing the relative contribution of the input imagery. Effectively creating a gradient from A to B in the overlap areas.

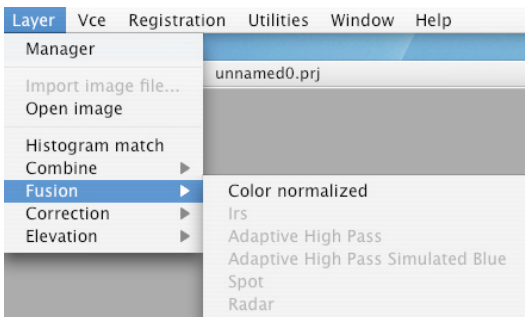


## Merge Bands

The merge combiner creates a new image chain that blends the individual input bands from the selected image chains together.

## Ortho

An ortho combiner is useful in mosaicking abutting tiles in image space before reprojecting the output mosaic. If all of the times are in the same scale and map projection they can be combined seamlessly in image space before map reprojections are made. Otherwise, gaps may occur due reprojection if the individual tiles are reprojected before being combined in an output mosaic. As with the other combiner methods, simply select the image chains to be combined to create the orthomosaic.



## Fusion Sub-menu

The Fusion sub-menu holds the image chain functions that provide various types of specialized image fusions. ImageLinker supports a dynamic plugin architecture. If these modules are available they will be loaded at runtime and their associated menu items will be enabled.

## Color Normalized

## IRS

## Adaptive High Pass

## Adaptive High Pass Simulated Blue

## Spot

## Radar

## Correction Sub-menu

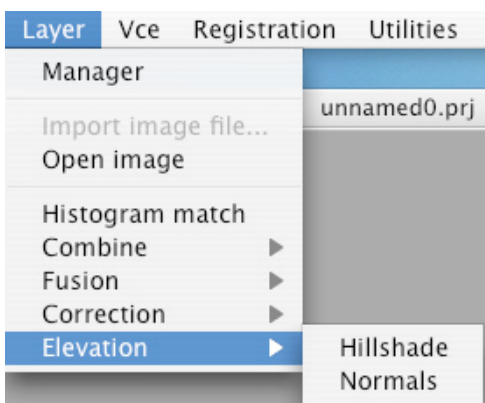
## Atmospheric

## Topographic

## Elevation Sub-menu

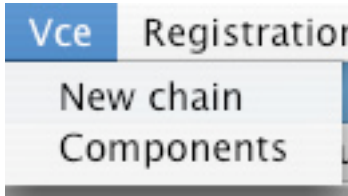
## Hillshade

## Normals



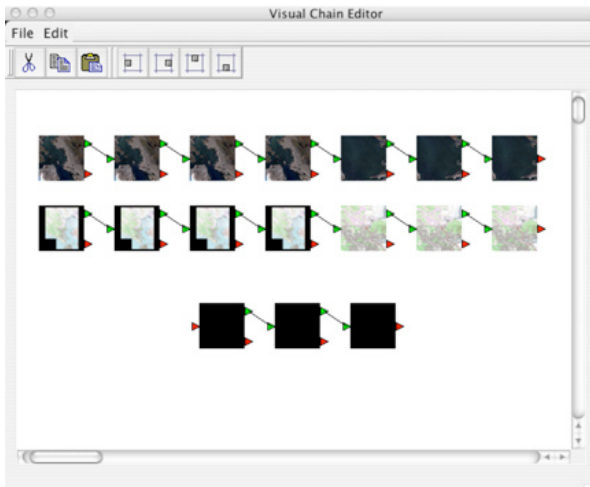


## Visual Chain Editor (VCE)



### New Chain

The visual chain editor canvas provides a visual interface to building and manipulating image chains. When selecting the New chain menu item a blank canvas dialog is invoked. Chains can be manually built from dragging individual components from the Components dialog and existing chains can be replicated in this environment from the Manager menu item. Simply select and drag existing image chains from the Manager dialog on to the VCE canvas.



The screenshot shown at the left demonstrates the results of a Landsat image, map image, and mosaic image chain copied to the VCE canvas.

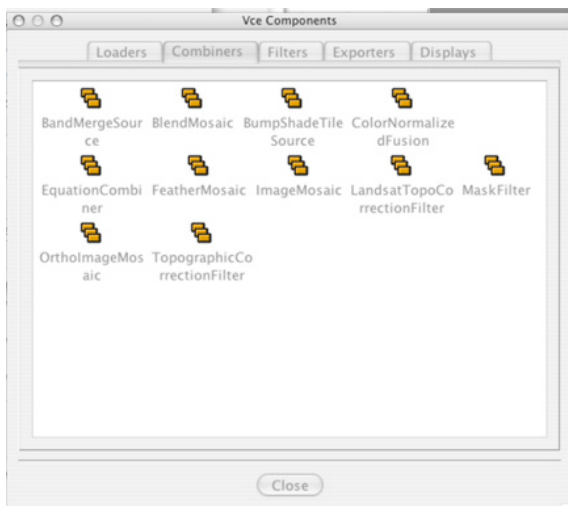
Each icon shows a miniature of that point in the image chain. Double clicking any object will bring up a Property editor for that function. Objects can be dynamically connected and disconnected through the Visual Chain Editor. Icons provide cut, duplicate and alignment functions for selected objects or connections. Groups can be selected and repositioned on the canvas.

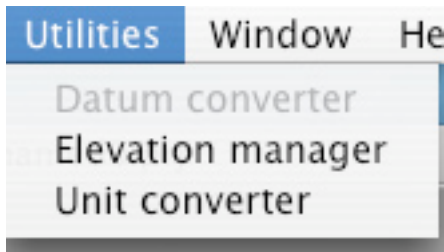
### Components

The Components menu item invokes a tabbed VCE Components dialog which holds individual components that can be dragged to the VCE canvas and connected.

The tabbed interface allows the user to select groups of components by overall function. Currently the components are grouped in the following categories:

- Loaders
- Combiners
- Filters
- Exporters
- Displays





## Utilities Menu

### Datum Converter

Not implemented...

### Elevation Manager

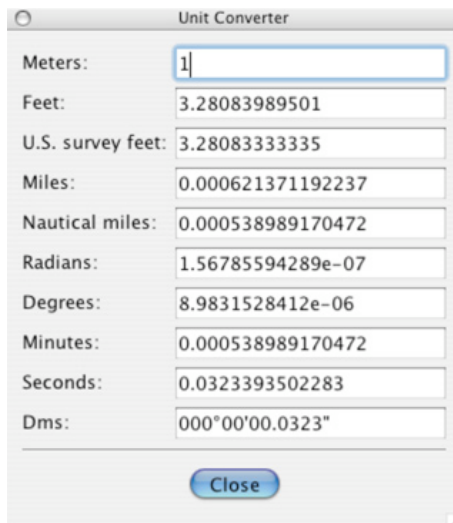
This menu item invokes an elevation manager dialog. Multiple trees of elevation data can be staged and prioritized with this interface. When using sensor models, elevation is automatically selected based on the definitions in this list and loaded on demand to provide coverage for the loaded imagery. Automatic precision terrain correction is performed as the imagery is projected through the sensor models and intersected with the elevation models.

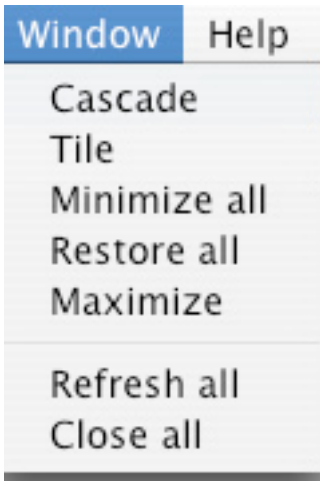


### Unit Converter

A Unit Converter dialog utility is provided to perform arbitrary unit conversions.

Simply select a field, enter a value and equivalent values will be calculated in the other fields.



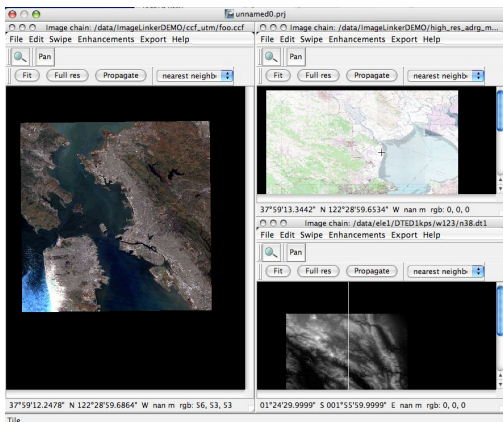
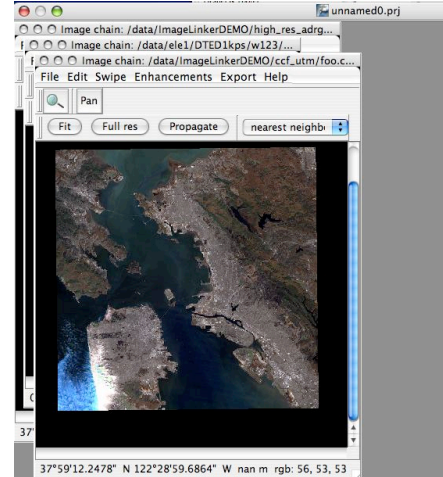


## Window Menu

This menu holds various commands for management of windows within the project canvas

### Cascade

Rearranges the windows so they cascade in the project canvas.

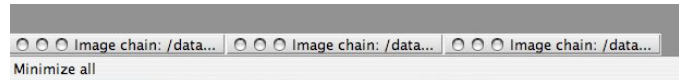


### Tile

Rearranges the windows to they are tiled within the project canvas.

### Minimize All

Minimizes all windows into buttons at the bottom of the canvas window.



### Restore All

### Maximize

### Refresh All

### Close All

## Help

### Next Steps

Additional tutorials are available in the OSSIM documentation section to guide you through specific projects. Please refer to [www.remotesensing.org](http://www.remotesensing.org) and [www.ossim.org](http://www.ossim.org) for the latest developments and support.