Making base maps for processing satellite data

Contents

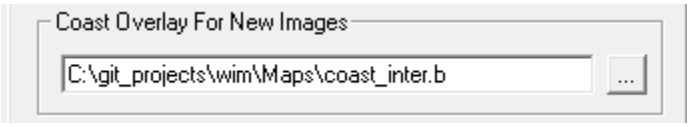
Making base maps for processing satellite data 1
1 Introduction 1
2 Creating base maps 1
2.1 Creating the "sea map" 2
2.3 Creating the SST map 6
2.4 Making other masks 7

1 Introduction

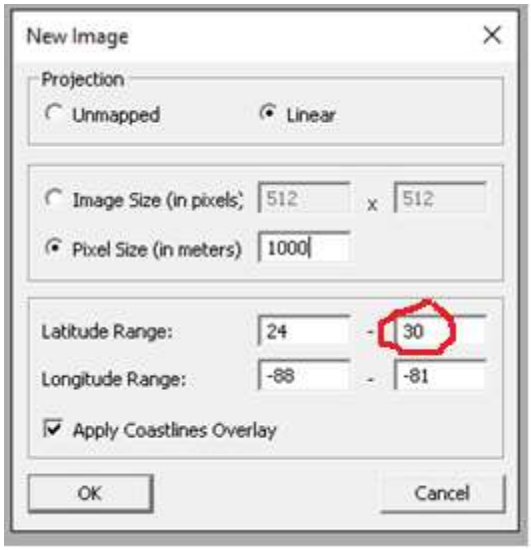
Almost all parts of satellite data processing in WIM/WAM include using various base maps. For example, in L2 processing base maps are used to remap the L2 swath data, to eliminate files with no valid data inside the area of interest, to overlay color bars, coastlines, etc. This manual is a summary how to create these maps for your area. Parts of this have been described in various other tutorials.

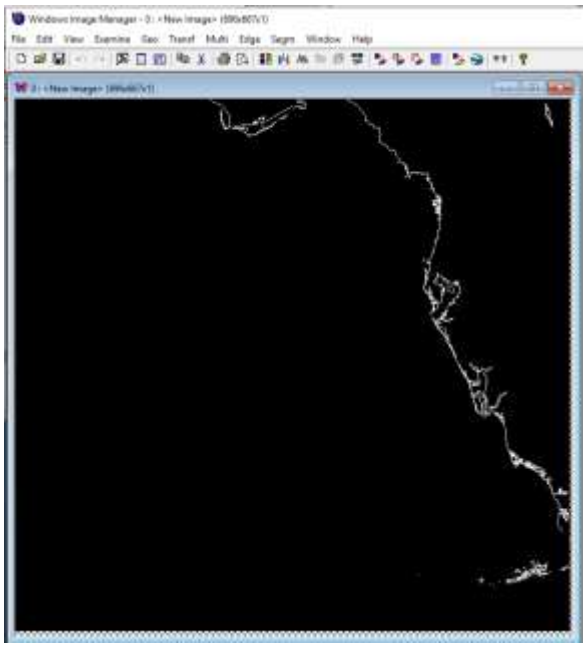
2 Creating base maps

Map should be in HDF4 format. Let's say that our area of interest is the west Florida shelf for latitude range 24-30 N and longitude range 81-88 W. The easiest way to make the maps is to use the *File-New* menu in WIM and create the map in Linear projection (see figure below, left). As the typical spatial resolution of ocean color sensors is 1 km, we use 1000 m as the pixel size. It may be better to use a smaller pixel size (e.g. 500 m or 250 m) even for 1 km data if our area is small. For low-resolution L3 data a largetr pixel size would be appropriate. Note that West longitudes are negative and we must use the longitude range from left to right, e.g. from -88 to -81 and not from -81 to -88. Similarly, in the Southern hemisphere we must use, for example, -60 to -35 and not -35 to -60. The coastline map (below right) is created with the coastlines from the default database which is declared in the Current Settings as "*Coast Overlay For New Images*":

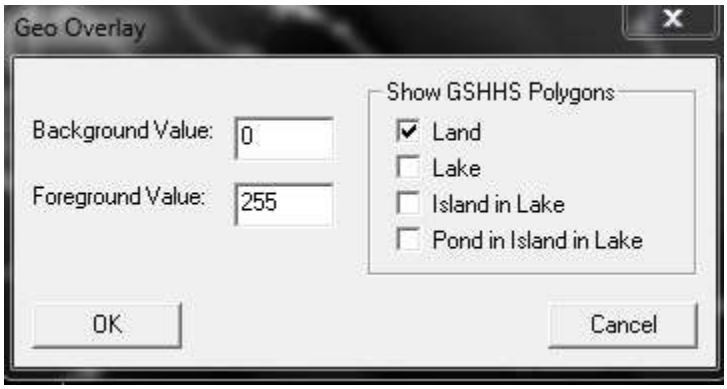


In my case it is the intermediate resolution database *coast_inter.b*. We want the coastline with **the highest resolution** and therefore I will specifically use ***coast_full.b*** when manually creating the coastlines.





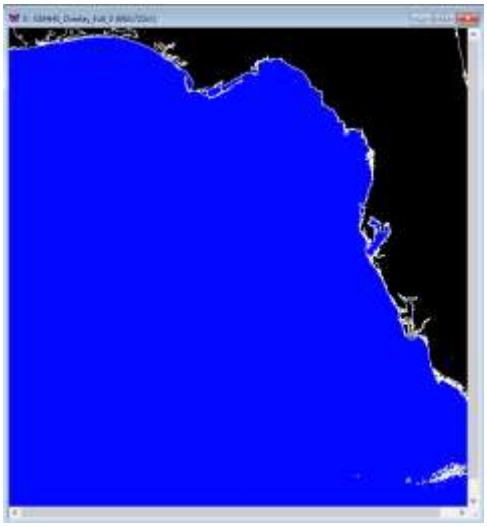
Note that the map in *File-New* was created with the default database that is in *Settings-Misc-Coasat Overlay For New Images*. It is better to create the coastlines at full resolution, therefore just to be sure, I create the same coastline map manually using the full-resolution coastlines with *Geo-Get Map Overlay - coast_full.b* with pixel value 255 as foreground:



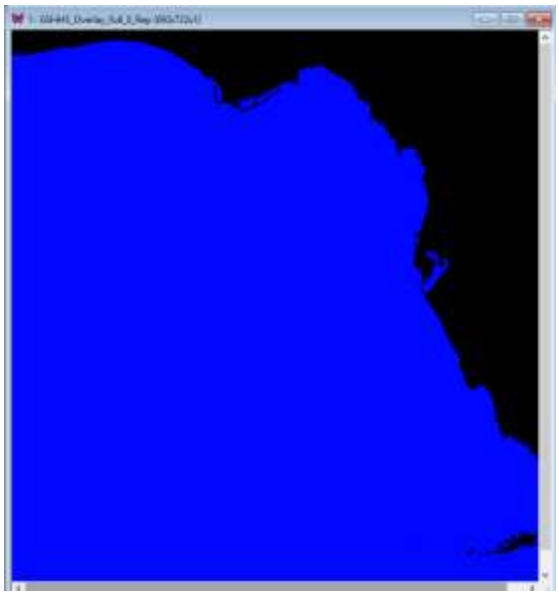
As you can see, the northern edge of our coastline crosses the top line of the image. We want to avoid that and therefore increase the latitude range from 24-30 N to 24-30.5 N. We will now save our coastlines map (in the HDF SDS format) as *WFlorida.hdf*. Please note that the size of our image is 692 x 772 pixels. It is better to have the width (here 692 pixels) as a multiple of 4. When saving bitmaps as PNG or JPG files with the width not a multiple of 4, there is often an ugly black vertical line along the right side of the image.

2.1 Creating the "sea map"

The "sea mask" specifies the area of interest with pixel value 1 and the area outside with pixel value 0. It is used to eliminate L2 files with no useful data within our area of interest. We now fill the area of interest ("sea area") with pixel value 1 with *Edit-Draw*, select the color fill. Notice that both Outline and Fill have both value 1.



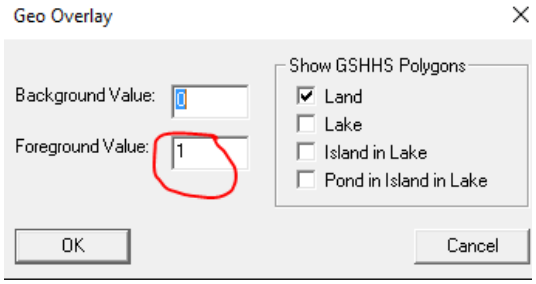
The sea area is now blue (filled with pixel value 1) and the coastline has pixel value 255. Note that there is a bit of the Atlantic Ocean (Florida's Eas coast) ocean in the top right corner unmarked but we don't want that marked as "sea area" as it is outside our area of interest. Also, there are some lagoons, lakes, etc that are not marked as sea. You may edit them manually. Note that quite often, when filling the "sea area" with pixel value 1, the color spills outside of the area and fills other areas (e.g. land). In that case we need to *Undo* the operation with the icon on the Toolbar, manually close the gaps in coastlines or between the coastline and the image edge using the Brush with pixel value 255 (see the right panel above) and repeat the filling operation until the color does not spill outside. Don't worry if the filling the gaps with pixel value 255 looks ugly as we will remove all values of 255 later. When we are satisfied with our sea mask, we eliminate all other pixel values other than 1 (and 0) by replacing al pixel values >1 with value 0. We do that with *Transf-Replace Values* and select pixel values from 2 to 255 to be replace with value 0. The output is an image like below:

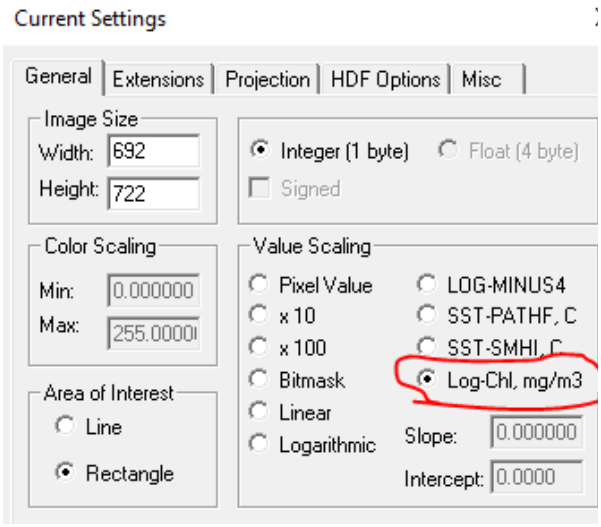


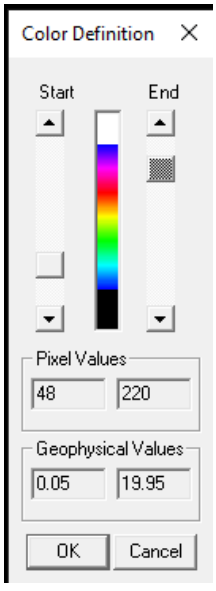
We can save the resulting image as *WFlorida_sea.hdf*.

2.2 Creating the chlorophyll map

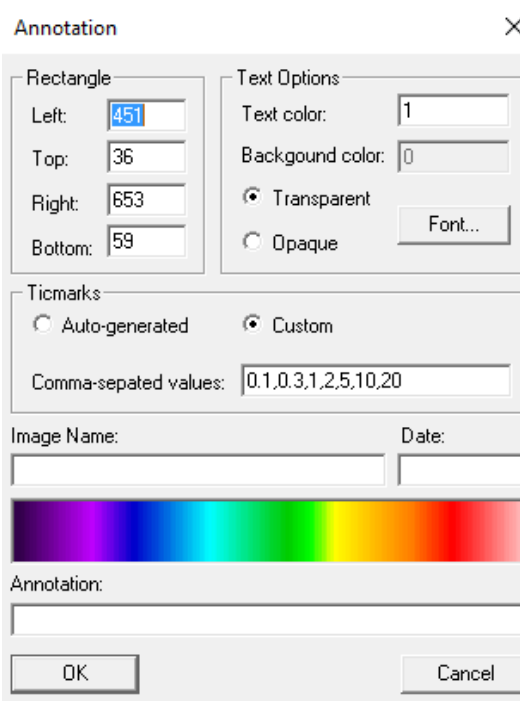
The chlorophyll map is just an overlay image that has the color bar and correct color stretch. We create it from our base mask (or sea mask) by creating a new coastlines map but this time with pixel value 1. We want land to be white (pixel value 255), the coastline to be black (pixel value 1) and ocean be transparent (pixel value 0). After we create the coastlines map (with pixel value 1) we fill land with pixel value 255 (see below). There are several disconnected pieces of land that we need to fill with white. After that we set the Value Scaling to *Log-Chl* in the *Current Settings* (the hammer icon on Toolbar).

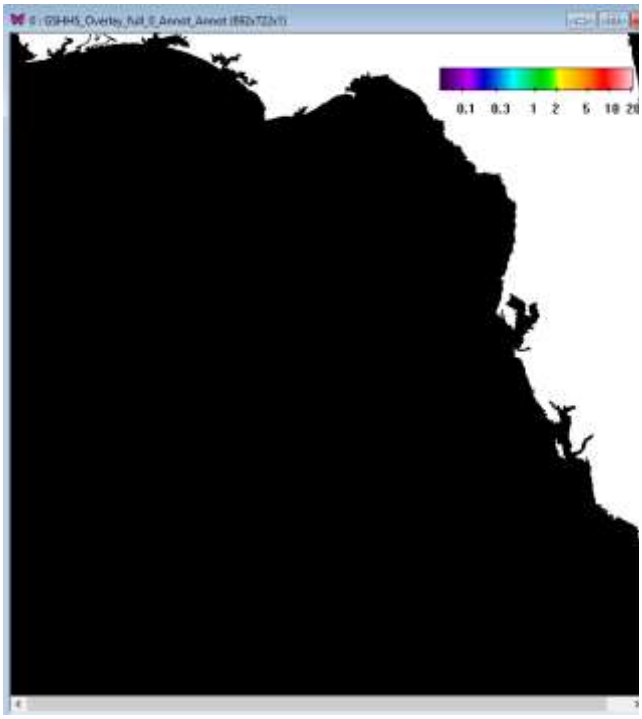






We now set the color range to pixel values 48 to 220 that corresponds to Chl range 0.05 to 20 mg m^{-3} (see above right). Notice that our area of interest ("sea" in sea mask) has pixel value 0 which will be transparent when we overlay this on top of actual Chla data. We now create the color bar for Chla. We select a rectangular area on land (white surface) where we want the color bar to be. In this case I select it to be in the upper right section of the image. I leave sufficient space on top of the color bar for the annotation (e.g. image date). You can select the tic-marks to be automatically generated first and later you can figure out what values you want to appear and fit to the space available. In this case I manually select values 0.1,0.3,1,2,5,10,20 (below left). The output is below right. As you can see, I have left space on top of the color bar for the annotation. You don't see the black coastline now but will see it after you overlay it on top of a Chla image.

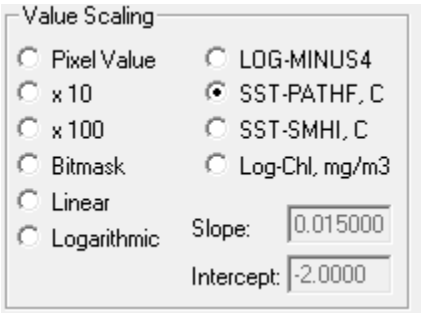


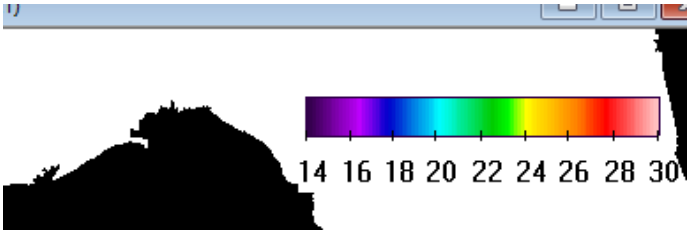


This will be our Chla map. We save this as *WFlorida_chl_48_220.hdf*. My tradition is to include "chl" and the pixel values of color stretch (48 and 220) in the file name.

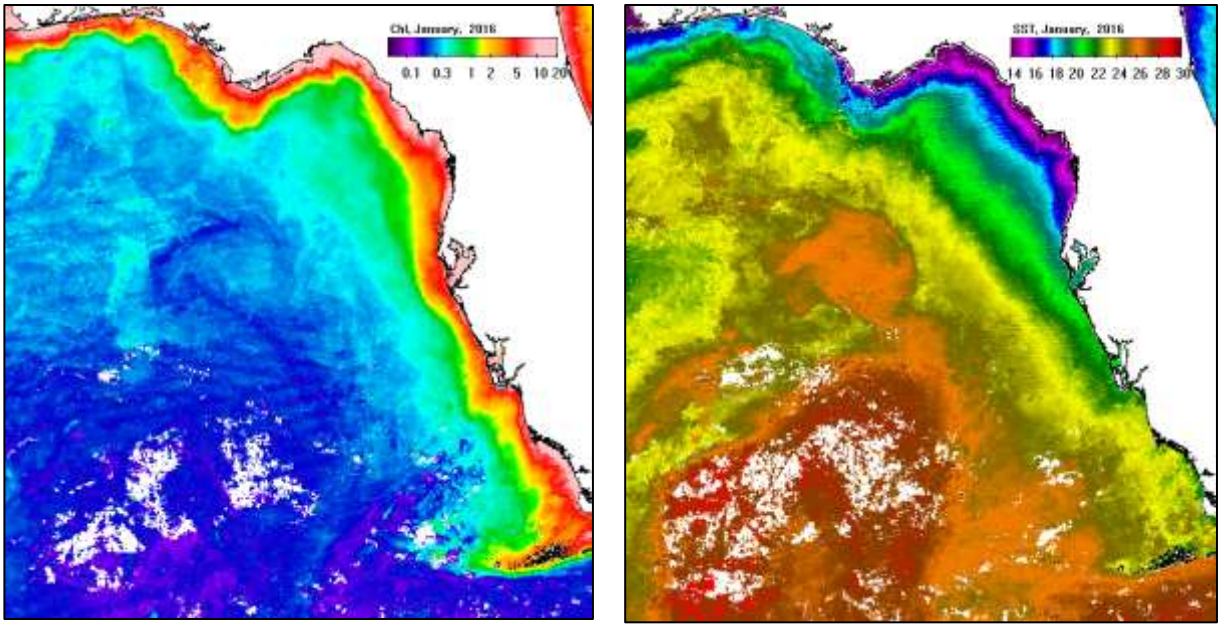
2.3 Creating the SST map

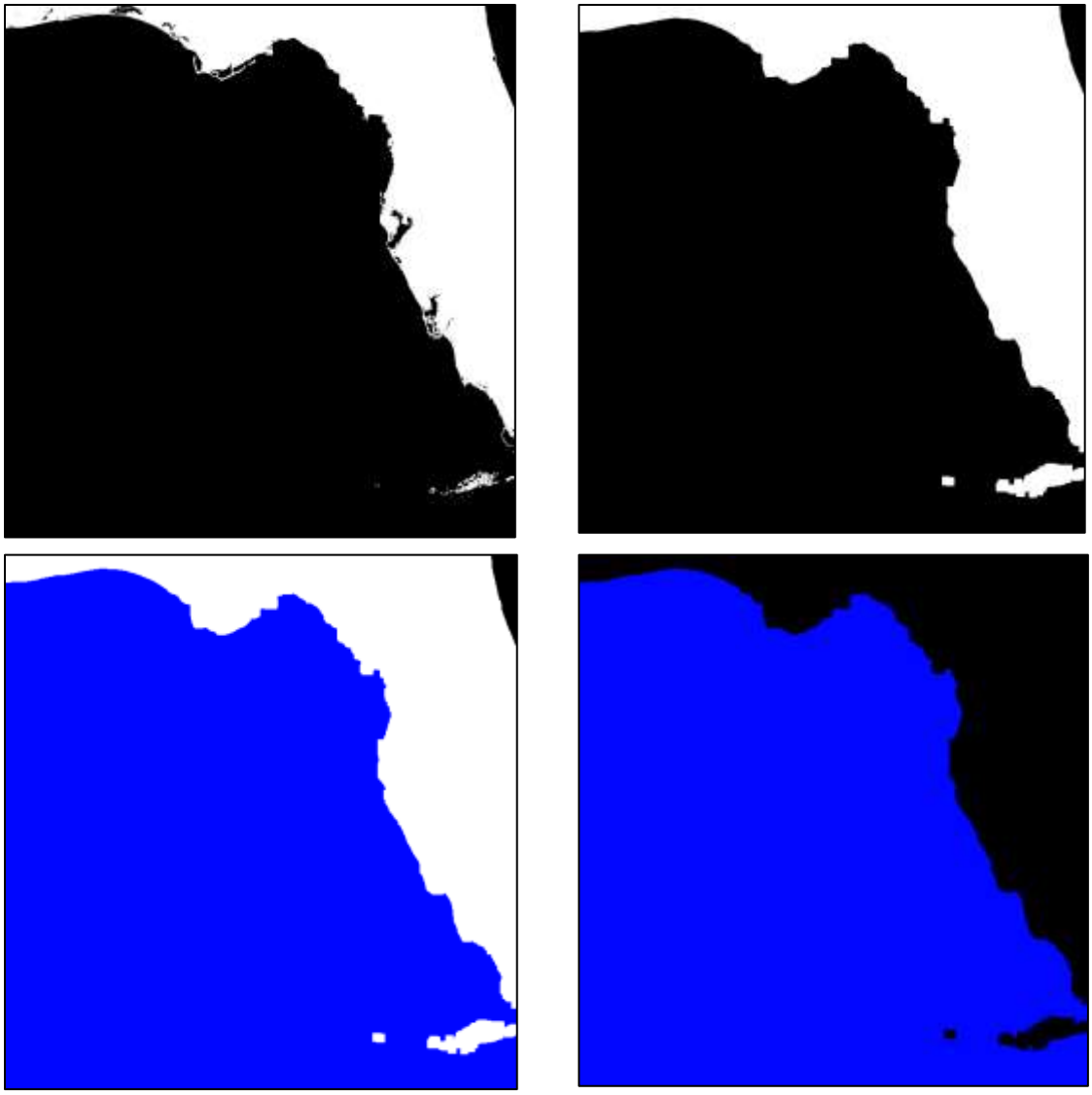
Creating the SST map will be similar to creating the Chl map. We delete the color bar created for Chla map, e.g. with a white rectangle in Edit toolbox but keep the location of the color bar. WIM remembers the location of the previous color bar and therefore, please DO NOT select the rectangular area for the SST color bar. By not selecting the rectangular area, WIM used the previously selected area. Select value scaling in the Settings as *SST-PathFinder in Celsius* (SST-PATHF, C). Then select the color stretch to the appropriate range of SST. This can be quite different from different regions of the ocean. In this case I select color range 114 to 220 in pixel values that correspond to SST of 14.1 to 30.0 C. I now use View-Annotate without selecting a rectangle for the color bar. I first select Auto-generated ticmarks to see how they look and later pick values 14,16,18,22,24,26,28,30 for my Custom ticmarks (below right).





I now pick the suitable location for annotations in L2 processing, i.e. the XPOS and YPOS values that represent the X and Y coordinates in the area on top and left of the color bar. In this case they are approximately 449 and 30. After L2 processing and using my newly generated sea mask, Chla map and SST map I get the following sample images (below). Here the Chla image is using palette *chl1_white_end.lut* and the SST image is using the *chl2_white_end.lutI*



2.4 Making other masks

Sometimes you want to crate various masks, i.e. maps with selected areas with certain pixel values. For example, you may want to have a sea mask that excludes the immediate coastal areas where various errors or great variability are expected. One way to do that is to create a land mask, dilate that and then use the remainder. We start by creating the coastlines with pixel value 255, background 0 and use the full resolution coastlines *coast_full.b*. We fill land with pixel value 255. We may have to separately do it for several parts of land. The land mask is the upper left image below. We now expand (dilate) land using Edge-Dilate and choose N=5 times to dilate (upper right image below). Now we fill the sea are of interest with pixel value 1 (lower left image below). Finally we use *Transf-Replace Values* to replace all values from 2 to 255 (i.e. the white land, PV=255) with 0. The resulting image (lower right below) has a sea mask but eliminates all coastal areas.