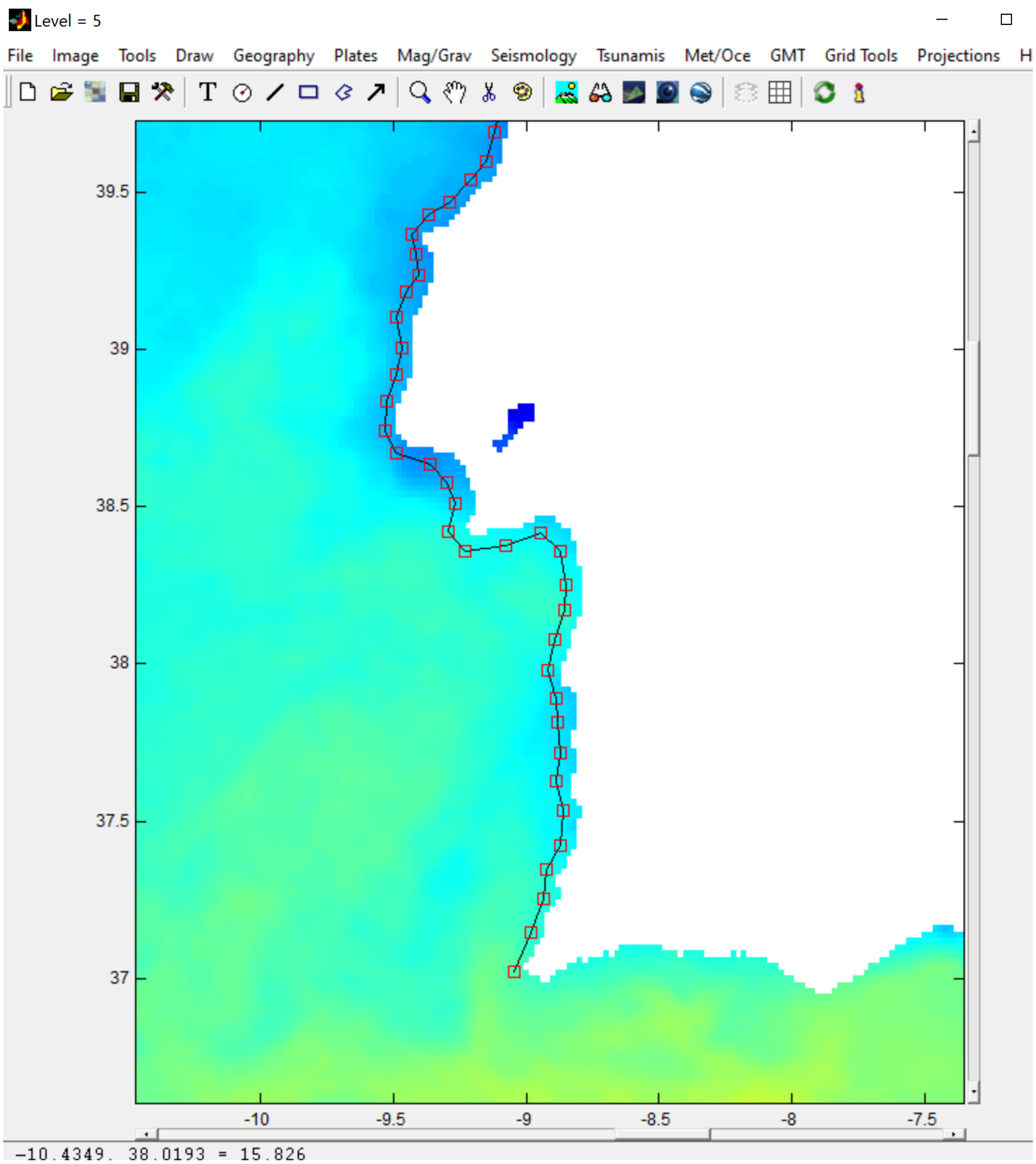
Detecting upwelling events I

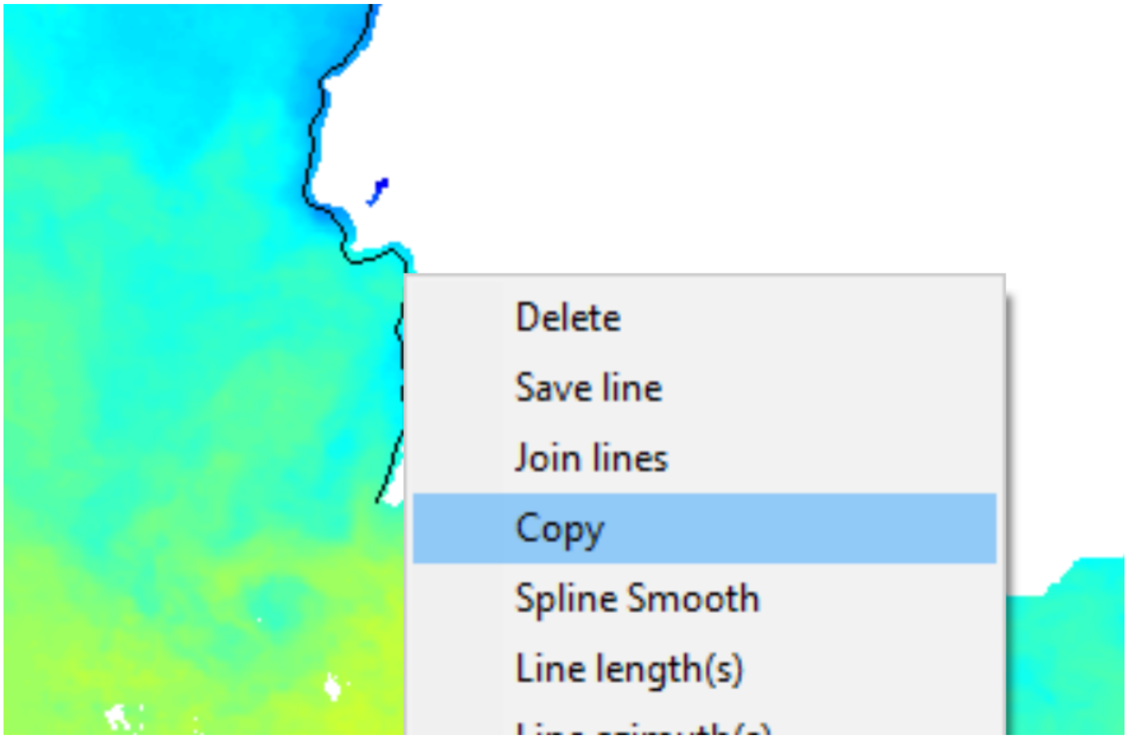
In this lesson we are going to see how to detect upwelling evens based on the difference in temperature between coastal zones and offshore. The basic idea is detect where those differences are lager than a certain threshold value.

Digitize a line approximately at 10 km interval along the coast



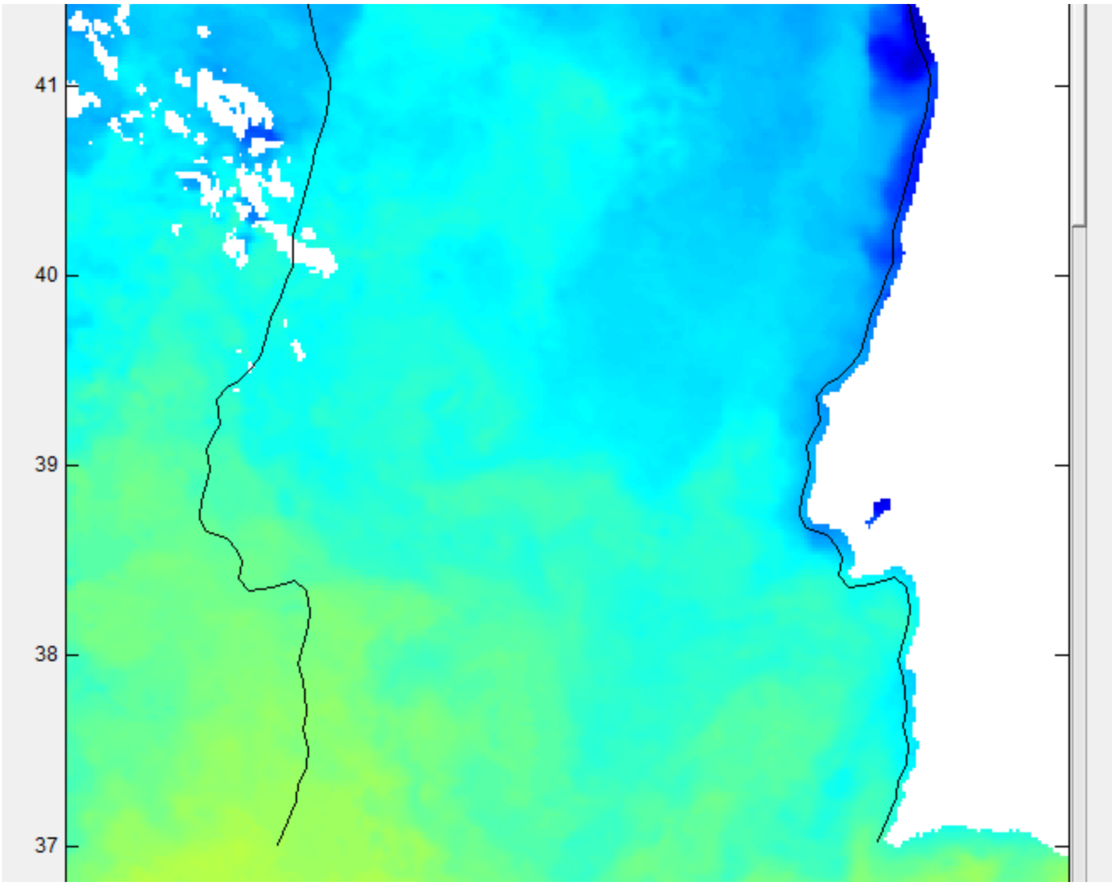
Load the SST stack containing the the WEEKLY SST averages. In this example we will be using the **A2019_SST_WEEK_noite_filt_2k.nc** file. Digitize a line along the cost like one shown in fig above.

Copy the digitized line



Right-click on the line and select "copy"

Copy



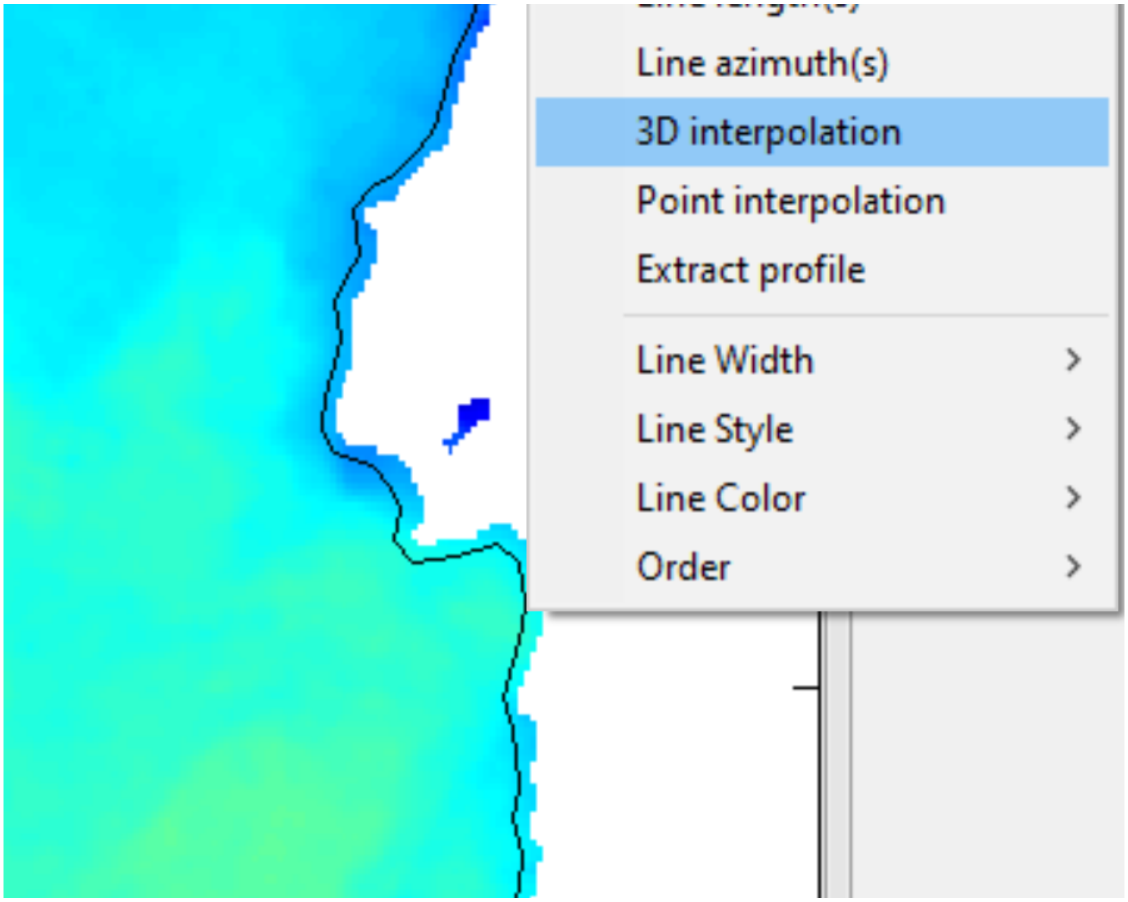
While in copy mode move the line to a position offshore of about 300 or more km. Right-click to finish copy. Save both lines, the coast and the offshore one

The interpolated result

```
# Interpolated file: C:\v\DRCS\A2019_SST_WEEK_noite_filt_2k.nc
#   -9.04469(X) -8.98135(X) -8.93639(X) -8.92319(X) -8.87036(X) -8.8597
#   37.0232(Y)  37.146(Y)   37.2527(Y)  37.3462(Y)  37.422(Y)   37.5356
>XY
5.00    16.365623   15.955924   NaN 15.776678   15.417747   15.372477
13.00   16.654665   15.787913   NaN 15.490751   15.296143   15.183819
21.00   15.627963   NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN 14.624166
29.00   14.824583   14.604536   NaN 14.652439   14.631835   14.572242
37.00   14.389883   14.226919   NaN 14.058444   14.036526   14.116480
45.00   14.898088   14.533028   14.369971   14.220523   14.117947   14.
53.00   14.774886   14.706353   NaN 14.623693   14.603351   14.294975
61.00   15.568880   15.307452   NaN 15.363241   15.071890   15.614549
69.00   15.522415   15.317634   NaN 15.438795   15.334380   15.326274
77.00   14.936990   14.756957   14.713644   14.807681   14.691196   14.
85.00   14.844799   14.805100   NaN 14.509077   14.401623   14.359993
93.00   15.721930   NaN NaN NaN 15.341775   15.474850   15.316276   15.
101.00  NaN NaN 15.018643   14.856486   14.952996   14.997311   15.0275
109.00  15.165148   15.069942   15.304114   15.196501   15.010159   14.
```

The interpolation result looks like this. The lines with # contain the coordinates of each vertex (points) and then we have as many columns as points in the line, plus de first column that holds the time in the form of day of the year.

Interpolate all layers along the line

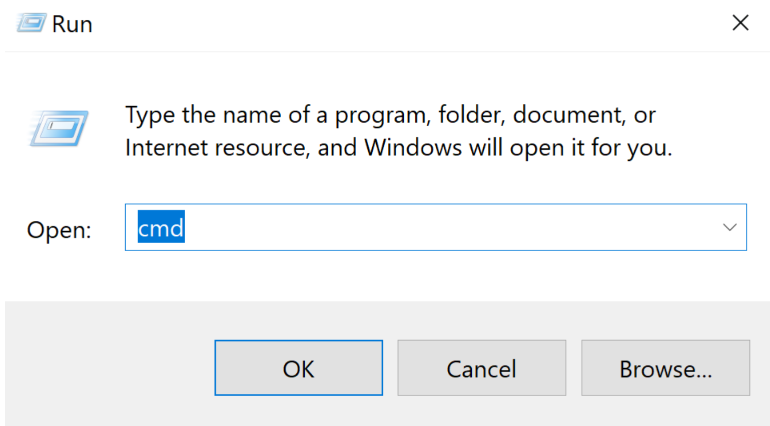


Next we will interpolate all the 46 layers (weeks) on the points (vertex) of these two lines. Do as in figure above and save the result. Name the file as *west_coast_interp.dat* and open it in a text editor to look at its contents.

As said above, do this interpolation for both of the shore and offshore lines.

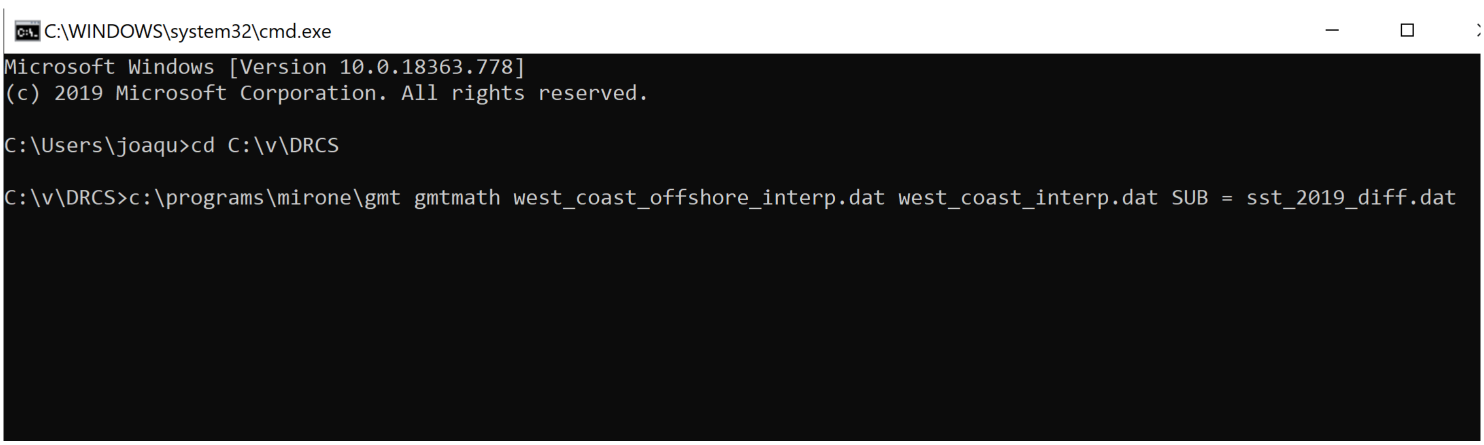
WARNING: DO NOT SAVE INTO FOLDERS THAT HAVE SPACES IN THE NAME

Open a command window



To open a command window, do for example, press both keyboard keys. The *Windows* and the R keys. Type cmd and *OK*

Subtract interpolated files



Change directory to where you have saved the lines and the interpolation result and run a command similar to the above. I am saying similar because your directory (folder) will not have the same name and the file names may be different. The point here is to understand that we are subtracting the SST from offshore from those at shore. When that difference, at each point, is larger than, say 2.5 degrees, we will consider it an indication that an upwelling event occurred. But to analyze the *diff_west_SST.dat* data we will need to apply some pre-processing steps because it only contains the SST differences but lost the coordinates information. We will address that in another lesson.