

Octave no es un GIS y sin embargo mapea

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FOSS4G + SOTM

23-28 de octubre 2017, Argentina

Conferencia de Geomática Libre

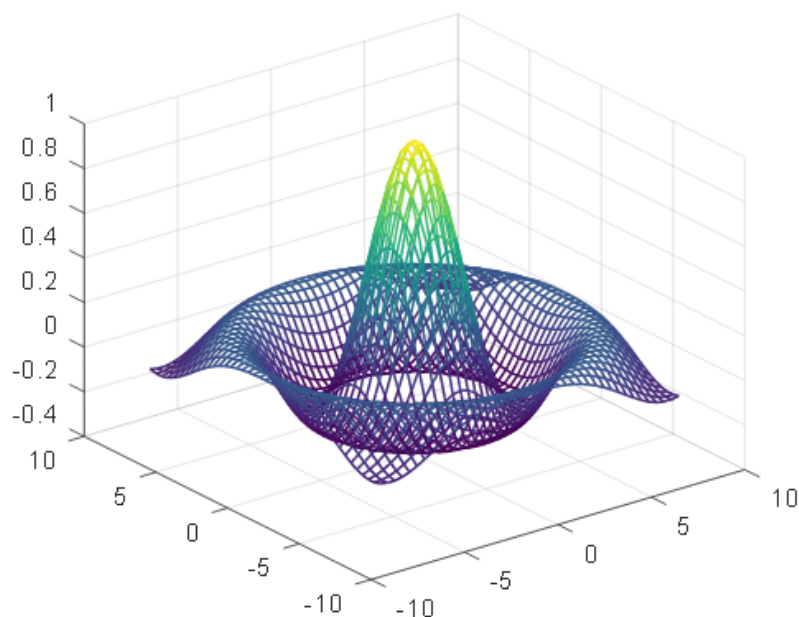
Instituto Geográfico Nacional



¿Qué es Octave?

- ♦ *Un potente lenguaje de programación científica de libre distribución orientado al cálculo numérico.*
- ♦ *Su capacidad para elaborar mapas es bastante desconocida e inexplorada, y requiere conocimientos básicos de programación, ya que los mapas no se logran de manera tan intuitiva como en un SIG.*
- ♦ *La ventaja de generar mapas en Octave consiste en mantener la continuidad entre la etapa de análisis de datos y su correspondiente mapeo.*
- ♦ *Y recordar: Octave no es un SIG!*





Scientific Programming Language

- Powerful mathematics-oriented syntax with built-in plotting and visualization tools
- Free software, runs on GNU/Linux, macOS, BSD, and Windows
- Drop-in compatible with many Matlab scripts

[Download](#)

[Docs](#)

Syntax Examples

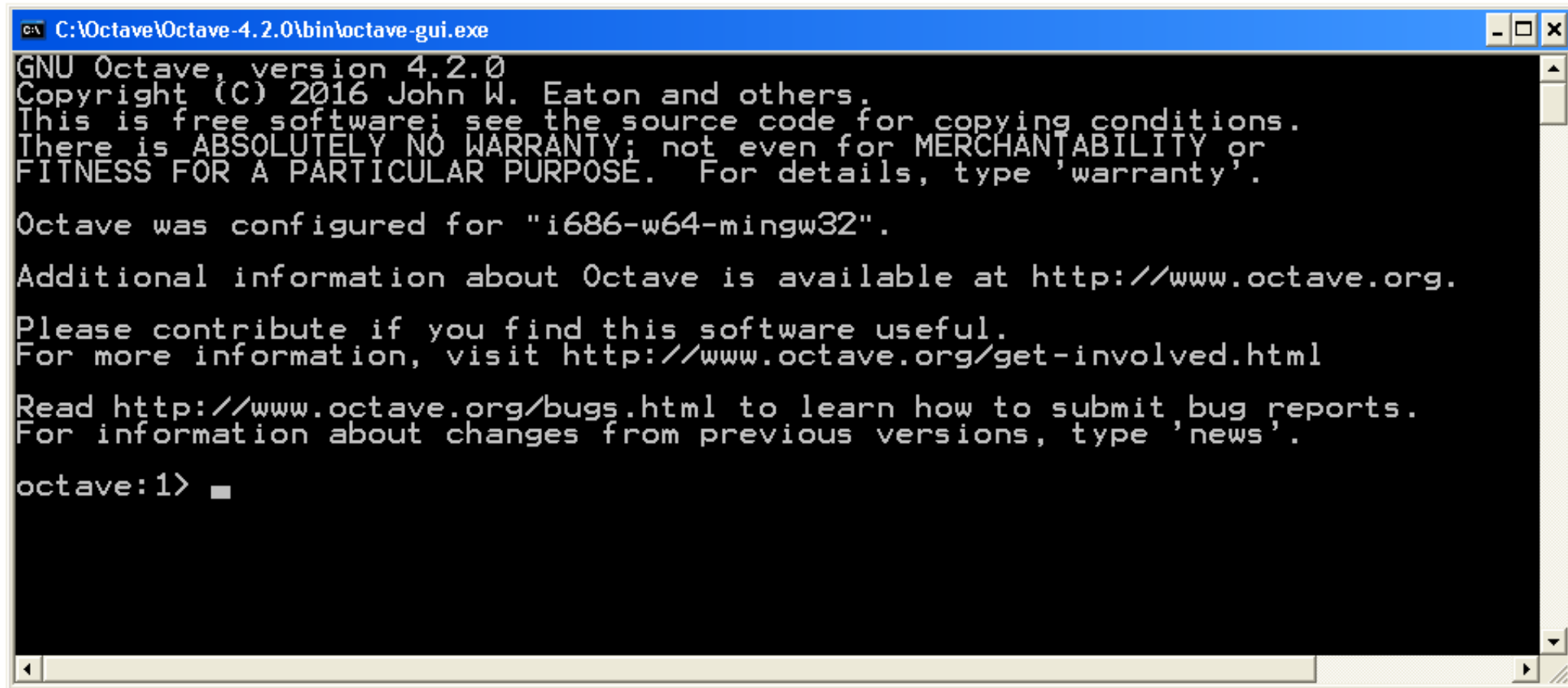
The Octave syntax is largely compatible with Matlab. The Octave interpreter can be run in GUI mode, as a console, or invoked as part of a shell script. More Octave examples can be found in [the wiki](#).

Solve systems of equations with linear algebra operations on **vectors** and **matrices**.

```
b = [4; 9; 2] # Column vector
A = [ 3 4 5;
      1 3 1;
      3 5 9 ]
x = A \ b      # Solve the system Ax = b
```



Interfaz de línea de comando *command-line interface (CLI)*

A screenshot of a Windows command prompt window titled "C:\Octave\Octave-4.2.0\bin\octave-gui.exe". The window has a blue title bar and standard Windows window controls (minimize, maximize, close) in the top right corner. The main area is black with white text. The text displays the GNU Octave version 4.2.0 startup message, including copyright information for John W. Eaton and others, a disclaimer about warranty, and configuration details for "i686-w64-mingw32". It also provides links to the Octave website for more information, bug reports, and news. The prompt "octave:1>" is visible at the bottom left, followed by a small white cursor block.

```
C:\Octave\Octave-4.2.0\bin\octave-gui.exe
GNU Octave, version 4.2.0
Copyright (C) 2016 John W. Eaton and others.
This is free software; see the source code for copying conditions.
There is ABSOLUTELY NO WARRANTY; not even for MERCHANTABILITY or
FITNESS FOR A PARTICULAR PURPOSE.  For details, type 'warranty'.

Octave was configured for "i686-w64-mingw32".

Additional information about Octave is available at http://www.octave.org.

Please contribute if you find this software useful.
For more information, visit http://www.octave.org/get-involved.html

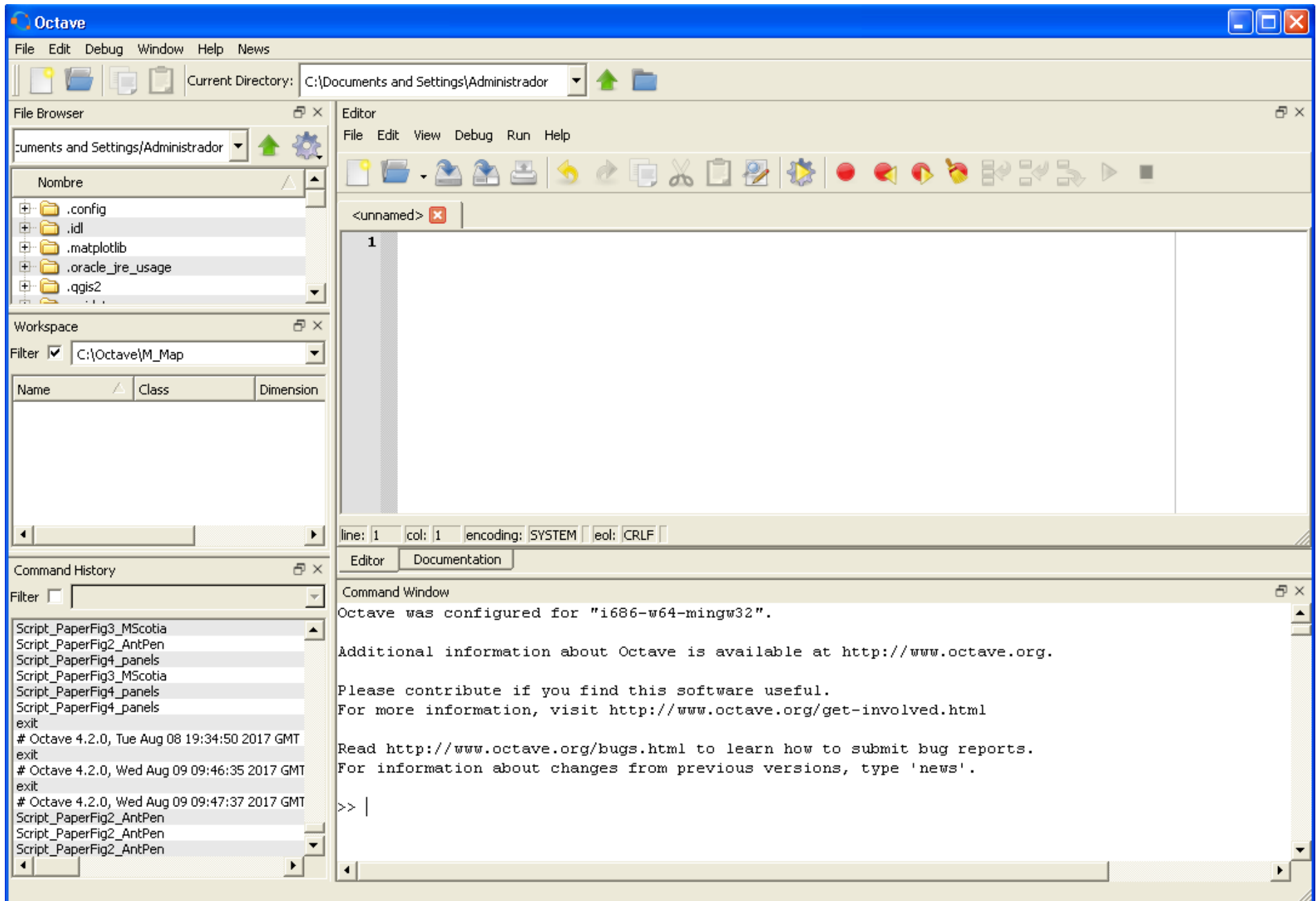
Read http://www.octave.org/bugs.html to learn how to submit bug reports.
For information about changes from previous versions, type 'news'.

octave:1> █
```



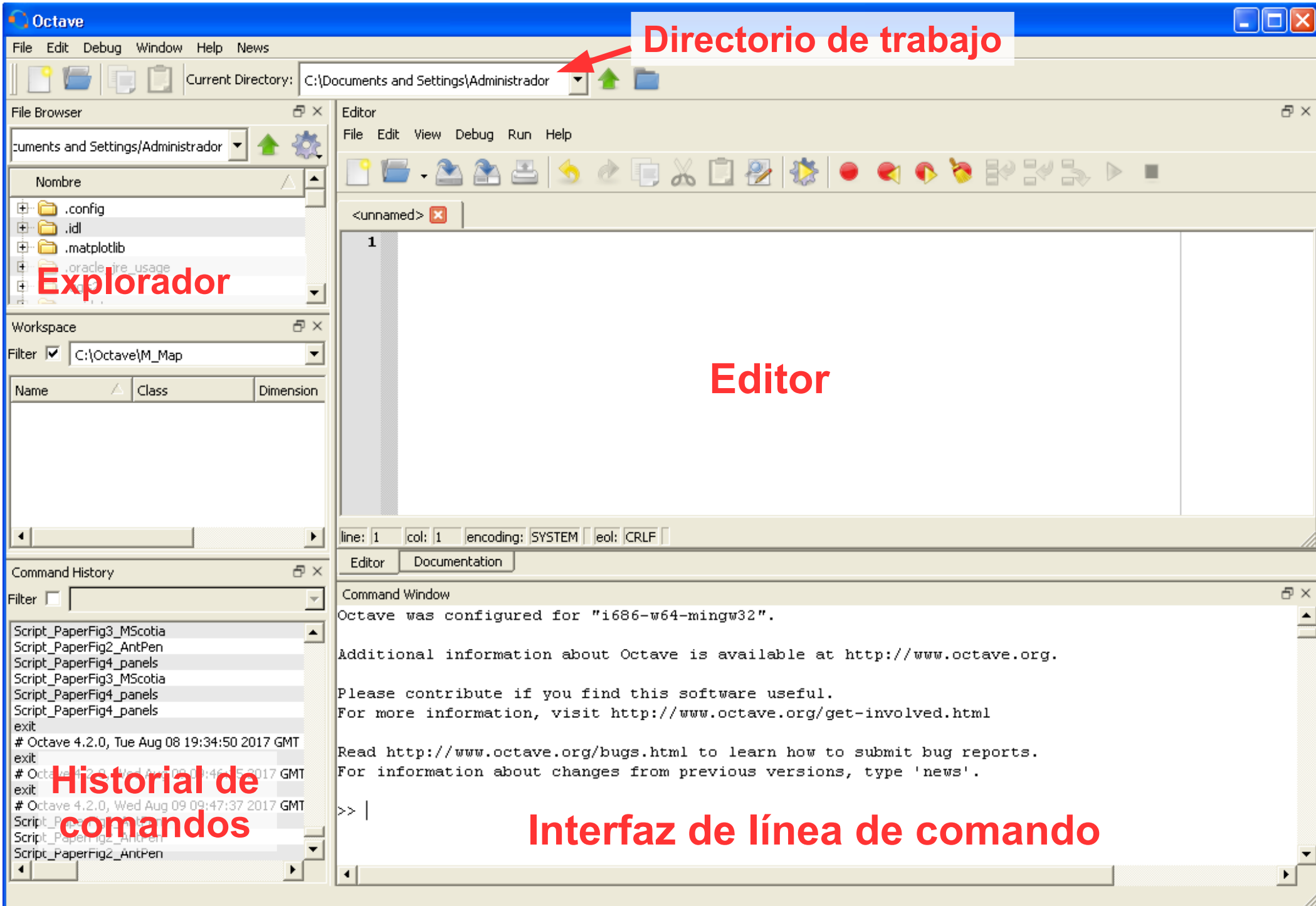
Interfaz gráfica de usuario

graphical user interface (GUI)



Octave no es un GIS y sin embargo mapea. H. Sala, IAA-DNA. FOSS4G+SOTM, 23-28 Octubre 2017, IGN.





Command Window

```
>>
>> 2+3
ans = 5
>> A=3^2+3*(2+1)
A = 18
>> A=3^2+3*(2+1);
>> M= [1, 2; 3, 4] %Genera una matriz de 2x2
M =

     1     2
     3     4

>> C= [4; 9; 2] % Genera un vector columna
C =

     4
     9
     2

>> F= 0:9 % Genera un vector fila
F =

     0     1     2     3     4     5     6     7     8     9

>> F= 0:0.5:2 % Genera un vector fila con intervalos de 0.5
F =

    0.00000    0.50000    1.00000    1.50000    2.00000
```



Octave

File Edit Debug Window Help News

Current Directory: C:\Octave\M_Map

File Browser

C:\Octave\M_Map

Nombre

- private
- 800x800.png
- Contents.m
- DeAngelis_2014_GlacierInventorySPI.zip
- DeAngelis_glacier-inventory-SPI.dbf
- DeAngelis_glacier-inventory-SPI.prj
- DeAngelis_glacier-inventory-SPI.shp
- DeAngelis_glacier-inventory-SPI.shx
- DeAngelis_glacier-inventory-SPI.txt
- etopo1_ice_g_i2.bin
- etopo1_ice_g_i2.hdr
- etopo1_ice_g_i2.zip
- ETOPO2v2g_i2_M5B.bin

Workspace

Filter ☒ C:\Octave\M_Map

Name	Class	Dimension
------	-------	-----------

Command History

Filter ☐

```

10-5+2*4
a=(1:2)
a=(1:2) % Es un vector fila
a=(0:9) % Es un vector fila
a=([0:9]) % Es un vector columna
a=[0:9] % Es un vector columna
a=[1,2;3,4]
Figura1a
3^2
2+3
A=3^2+3*(2+1)
A=3^2+3*(2+1);
M=[1, 2; 3, 4] %Genera una matriz de 2x2
C=[4; 9; 2] % Genera un vector columna
F=0:9 % Genera un vector fila
F=0:0.5:2 % Genera un vector fila con intervalos de 0.5
exit
# Octave 4.2.0, Thu Oct 26 11:54:10 2017 GMT, Zulu

```

Editor

File Edit View Debug Run Help

Figura1a.m

```

1 % Script para figura 1a del poster, FOSS4G-AR 2017
2
3 clf % Clear figure
4 clear
5
6 x= 0:1:700; % Definio el intervalo en x.
7
8 y1= sind (x); % Sind compute the sine for each element of x in degrees.
9 y2= sind (10*x);
10 y3= y1+y2;
11 % y4= y1.*y2; Da un lindo grafico!!
12
13 subplot (3,1,1)
14 plot (x, "color", "red", y1, "linewidth", 1)
15 set(gca,'xticklabel',{[]}) % Remove xaxis labels
16 h = legend ("sin (x)"); % Estas 3 lineas permiten editar fontsize de la leyenda
17 legend (h, "location", "northeast");
18 set (h, "fontsize", 12);
19 %legend ("sin (x)"); % Agrega leyenda
20
21 subplot (3,1,2)
22 plot (x, "color", "blue", y2, "linewidth", 1.2)
23 set(gca,'xticklabel',{[]}) % Remove xaxis labels
24 h = legend ("sin (10x)"); % Estas 3 lineas permiten editar fontsize de la leyenda
25 legend (h, "location", "northeast");
26 set (h, "fontsize", 12);
27 % legend ("sin (10x)"); % Agrega leyenda
28
29 subplot (3,1,3)
30 plot (x, "color", "black", y3, "linewidth", 1.2)
31 h = legend ("sin(x) + sin(10x)"); % Estas 3 lineas permiten editar fontsize de la leyenda
32 legend (h, "location", "northeast");
33 set (h, "fontsize", 12);
34
35 % legend ("sin (x) + sin (10x)"); % Agrega leyenda
36
37

```

line: 1 col: 1 encoding: SYSTEM eol: CRLF

Editor Documentation

Command Window

```

>> Figura1a
>> |

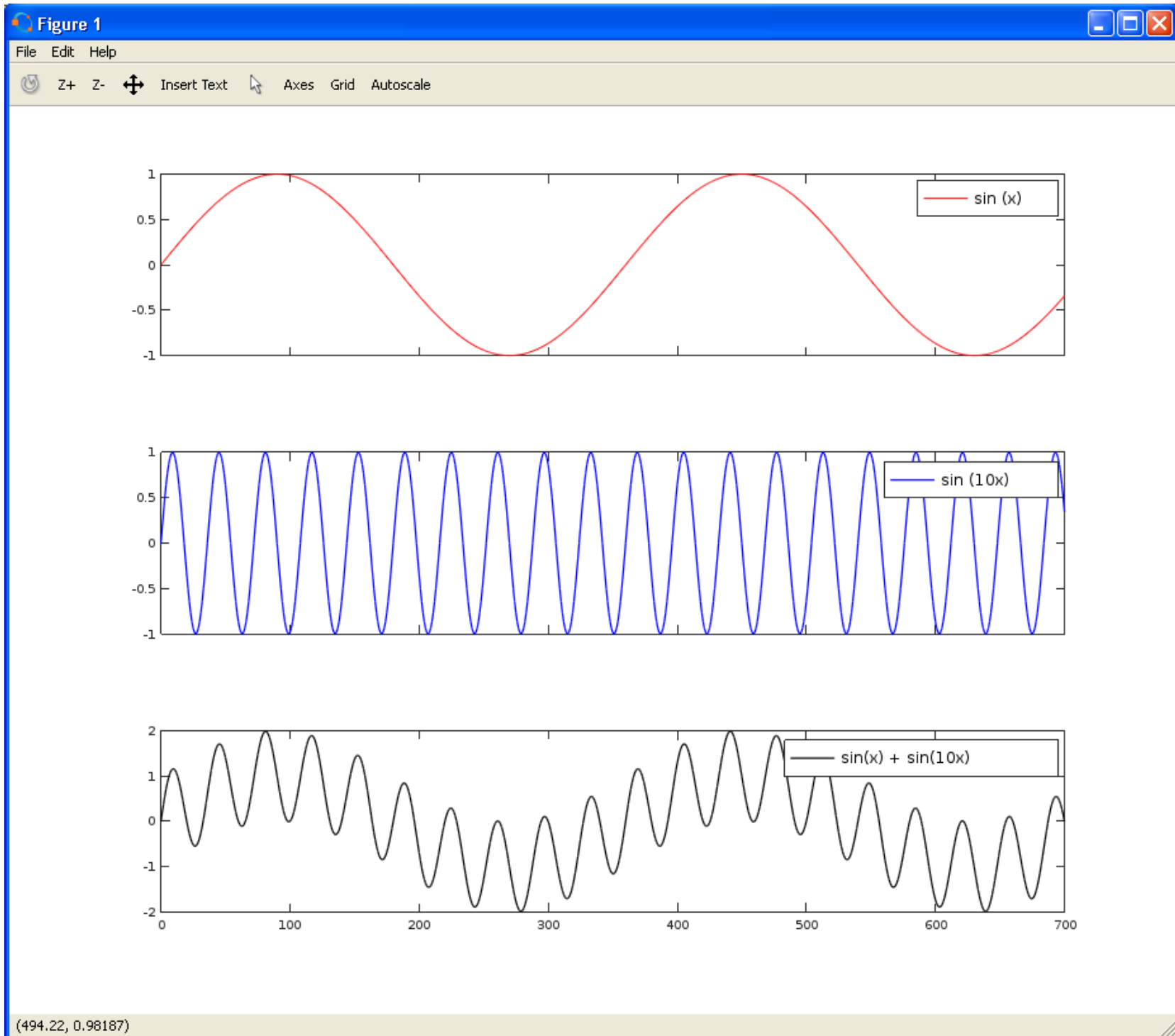
```

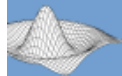
Script Figura1a


```

1  % Script para figura 1a del poster, FOSS4G-AR 2017
2
3  clf % Clear figure
4  clear
5
6  x= 0:1:700; % Definio el intervalo en x.
7
8  y1= sind (x); % Sind compute the sine for each element of x in degrees.
9  y2= sind (10*x);
10 y3= y1+y2;
11 % y4= y1.*y2; Da un lindo grafico!!
12
13 subplot (3,1,1)
14 plot (x, "color", "red", y1, "linewidth", 1)
15 set(gca,'xticklabel',{}) % Remove xaxis labels
16 h = legend ("sin (x)"); % Estas 3 lineas permiten editar fontsize de la leyenda
17 legend (h, "location", "northeast");
18 set (h, "fontsize", 12);
19 %legend ("sin (x)"); % Agrega leyenda
20
21 subplot (3,1,2)
22 plot (x, "color", "blue", y2, "linewidth", 1.2)
23 set(gca,'xticklabel',{}) % Remove xaxis labels
24 h = legend ("sin (10x)"); % Estas 3 lineas permiten editar fontsize de la leyenda
25 legend (h, "location", "northeast");
26 set (h, "fontsize", 12);
27 % legend ("sin (10x)"); % Agrega leyenda
28
29 subplot (3,1,3)
30 plot (x, "color", "black", y3, "linewidth", 1.2)
31 h = legend ("sin(x) + sin(10x)"); % Estas 3 lineas permiten editar fontsize de la leyenda
32 legend (h, "location", "northeast");
33 set (h, "fontsize", 12);
34
35 % legend ("sin (x) + sin (10x)"); % Agrega leyenda
36

```





Octave-Forge - Extra packages for GNU Octave

Home · Packages · Developers · Documentation · FAQ · Bugs · Mailing Lists · Links · Code



io

community

Input/Output in external formats

details download repository

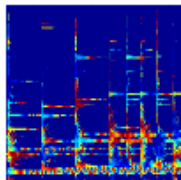


linear-algebra

community

Additional linear algebra code, including general SVD and matrix functions

details download repository



lftfat

external

The Large Time/Frequency Analysis Toolbox (LTFAT) is a Matlab/Octave toolbox for working with time-frequency analysis, wavelets and signal processing

details download repository

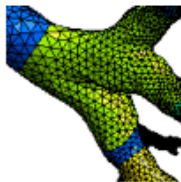


miscellaneous

community

Miscellaneous tools that don't fit somewhere else

details download repository

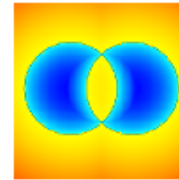


msh

external

Create and manage triangular and tetrahedral meshes for Finite Element or Finite Volume PDE solvers

details download repository

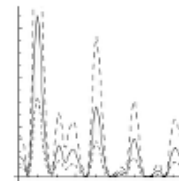


level-set

community

Routines for calculating the time-evolution of the level-set equation and extracting geometric information from the level-set function

details download repository

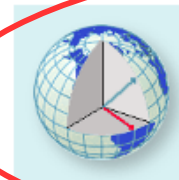


lssa

community

A package implementing tools to compute spectral decompositions of irregularly-spaced time series

details download repository



mapping

community

Simple mapping and GIS .shp and raster file functions

details download repository

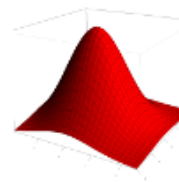


mpi

community

Octave bindings for basic Message Passing Interface (MPI) functions for parallel computing

details download repository



mvn

community

Multivariate normal distribution clustering and utility functions

details download repository

M_Map: A mapping package for Matlab

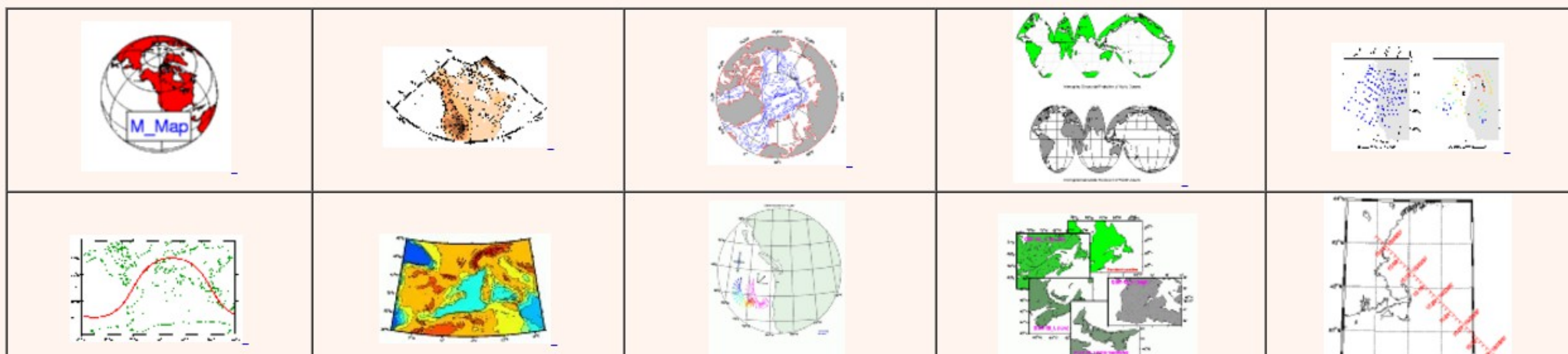


You have collected your data, loaded it into Matlab, analyzed everything to death, and now you want to make a simple map showing how it relates to the world.

But you can't.

Instead you have to figure out how to save all your data, and then read it into another program (like, for example GMT), and then spend all that extra time figuring out why it doesn't give you what you expected it would...or you can invest in Matlab's own mapping toolbox (with a similarly steep learning curve)... or not!

Announcing M_Map v1.4h! (updated Sep/2014)



Octave no es un GIS y sin embargo mapea. H. Sala, IAA-DNA. FOSS4G+SOTM, 23-28 Octubre 2017, IGN.



M_Map: A mapping package for Matlab !

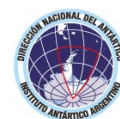
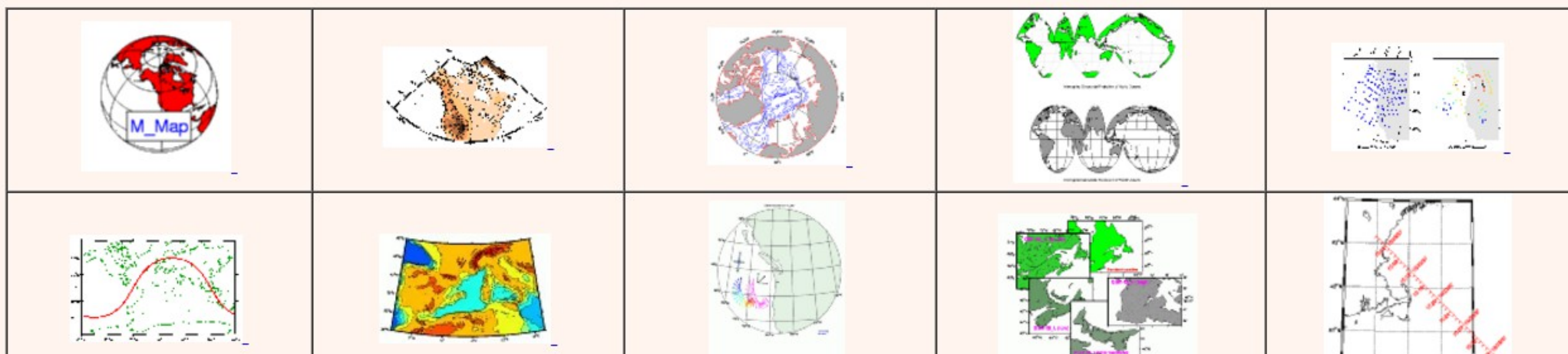


You have collected your data, loaded it into [Matlab](#), analyzed everything to death, and now you want to make a simple map showing how it relates to the world.

But you can't.

Instead you have to figure out how to save all your data, and then read it into another program (like, for example [GMT](#)), and then spend all that extra time figuring out why it doesn't give you what you expected it would...or you can invest in Matlab's own mapping toolbox (with a similarly steep learning curve)... or not!

Announcing M_Map v1.4h! (updated Sep/2014)



Para hacer los mapas que se muestran a continuación fue necesario:

- 1) Bajar M_Map a un directorio en donde Octave pueda reconocerlo.
- 2) Bajar una serie de DEMs con distinta fecha y resolución espacial, todos ellos de acceso libre.
- 3) Editar algunas funciones (o scripts) de M_Map para:

Adecuar el path en donde buscar los archivos de datos (DEMs) utilizados.

Evitar la aparición de “warnings” al ser usadas en Octave.

En la documentación de M_Map, Rich Pawlowicz, aclara dónde y cómo hacerlo.

- 4) Elaborar scripts propios que llamen a las funciones de M_Map.
- 5) El resto es ensayo y error... *mucho error!*



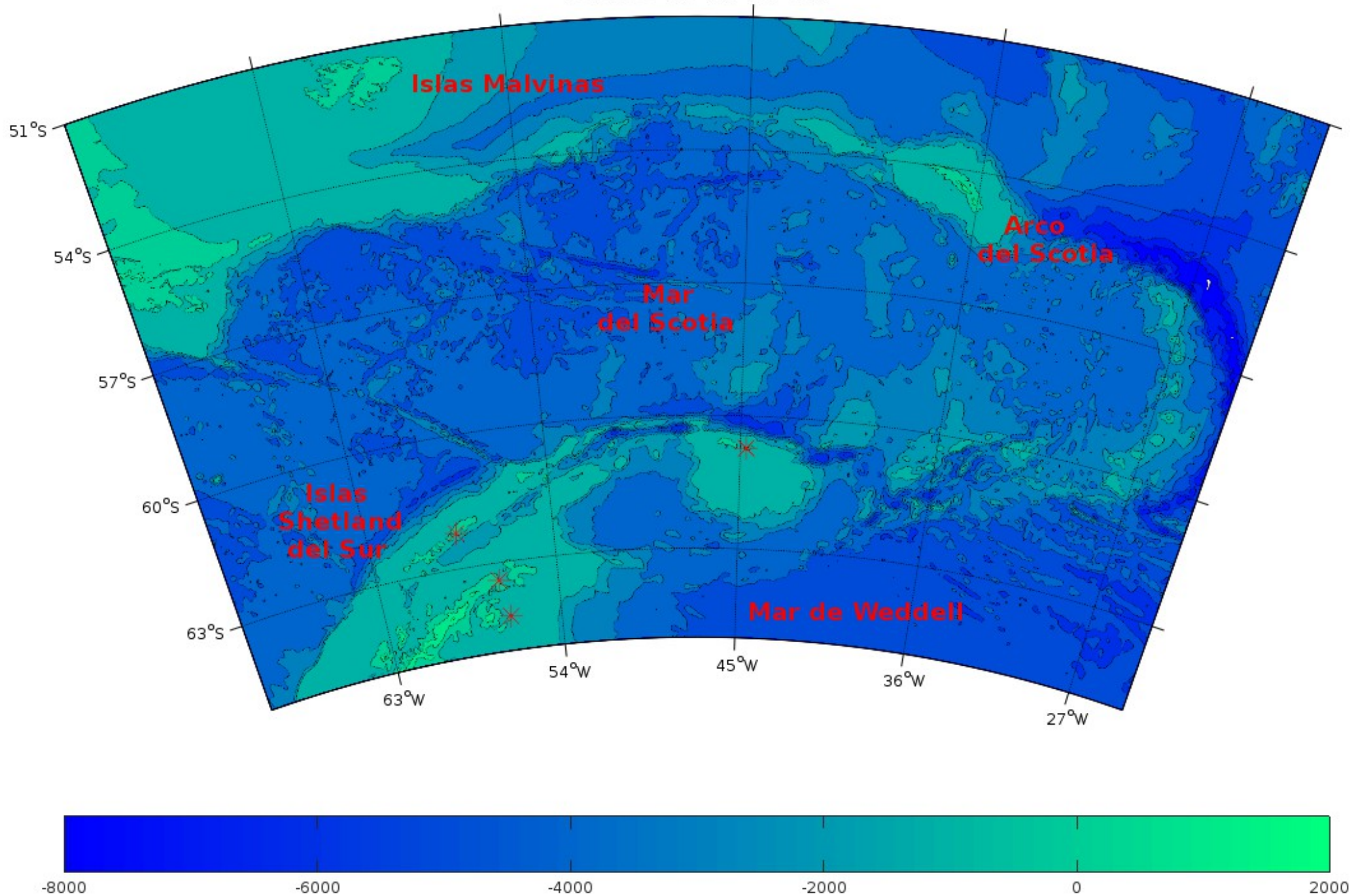
```

1 % Script para crear mapas utilizando MDE ETOP01 en Octave con M_Map.
2 clear % If clear is called without any arguments, all user-defined variables (local and global).
3 figure() % Abre una nueva ventana grafica
4 axis ('off') % Grafica o no ejes (on/off).
5
6 %%% cmap = summer (64); % Crea paleta de colores de 64 elementos que se usa en los 2 paneles
7
8 m_proj ('lambert', 'lon', [-70 -24], 'lat', [-65 -51]); % Define la proyeccion y el area a mapear
9 mo_etopol_a ('contourf', [-8000:1000:2000], 'linestyle', ':', 'linewidth', 0.4);
10 % Modifique ligeramente esta función de M_map (Rich Pawlowicz),
11 % por eso el nombre comienza con "mo_" en lugar de "m_".
12 % La resolución altimétrica se define así: [cota min, intervalo, cota max]
13 % M_ETOP02 contours elevations at 1000m intervals for the map.
14 % M_ETOP02(OPTN, LEVELS, ARCS, ...) lets you change various options.
15 % if OPTN='contour', contour lines are drawn. for OPTN='contourf',
16 % filled contours are drawn. LEVELS are the levels used, and ARCS
17 % are optional patch arguments of line types, colors, etc.
18 %
19 mo_grid_a ('tickdir', 'out', 'linewidth', 1, 'fontsize', 12, 'linestyle', ':'); % Crea grilla sobre el mapa
20 colorbar ("SouthOutside", 'fontsize', 12) % Coloca una barra de escala con cierta tipografía
21 colormap ("winter") % Las opciones posibles son: viridis (default), jet, cubehelix, hsv, rainbow, etc.
22 title ("Datos de ETOP01", 'fontsize', 20, 'fontweight', 'bold');
23
24 %%% Referencias geográficas
25 [X1,Y1]=m_ll2xy(-44.4,-64.4); % Convierte lon/lat a coordenadas del mapa
26 text(X1,Y1,'Mar de Weddell', 'fontsize', 19, 'color', 'r', 'fontweight', 'bold'); % (Lon, lat)
27
28 [X2,Y2]=m_ll2xy(-51.2,-57.5); % Convierte lon/lat a coordenadas del mapa
29 text(X2,Y2,"    Mar \ndel Scotia", 'fontsize', 19, 'color', 'r', 'fontweight', 'bold'); % (Lon, lat)
30
31 [X3,Y3]=m_ll2xy(-57.5,-52); % Convierte lon/lat a coordenadas del mapa
32 text(X3,Y3,"Islas Malvinas", 'fontsize', 19, 'color', 'r', 'fontweight', 'bold'); % (Lon, lat)
33
34 [X5,Y5]=m_ll2xy(-35.8,-55.5); % Convierte lon/lat a coordenadas del mapa
35 text(X5,Y5,"    Arco \ndel Scotia", 'fontsize', 19, 'color', 'r', 'fontweight', 'bold'); % (Lon, lat)
36
37 [X6,Y6]=m_ll2xy(-66.75,-61); % Convierte lon/lat a coordenadas del mapa
38 text(X6,Y6,"    Islas \nShetland \n del Sur", 'fontsize', 19, 'color', 'r', 'fontweight', 'bold'); % (Lon, lat)
39
40 %%% Bases argentinas permanentes en el area
41 [X10,Y10]=m_ll2xy(-58.7,-62.2); % Ubicación Base Carlini (lon, lat)
42 line(X10,Y10,'marker','*','markersize',18,'color','r');
43
44 [X11,Y11]= m_ll2xy(-56.98,-63.4); % Ubicación Base Espezanza (lon, lat)
45 line(X11,Y11,'marker','*','markersize',18,'color','r');
46
47 [X12,Y12]= m_ll2xy(-56.63,-64.23); % Ubicación Base Marambio (lon, lat)
48 line(X12,Y12,'marker','*','markersize',18,'color','r');
49
50 [X13,Y13]= m_ll2xy(-44.73,-60.73); % Ubicacion Base Orcadas (lon, lat)
51 line(X13,Y13,'marker','*','markersize',18,'color','r');
52

```

Script de la figura del Mar del Scotia

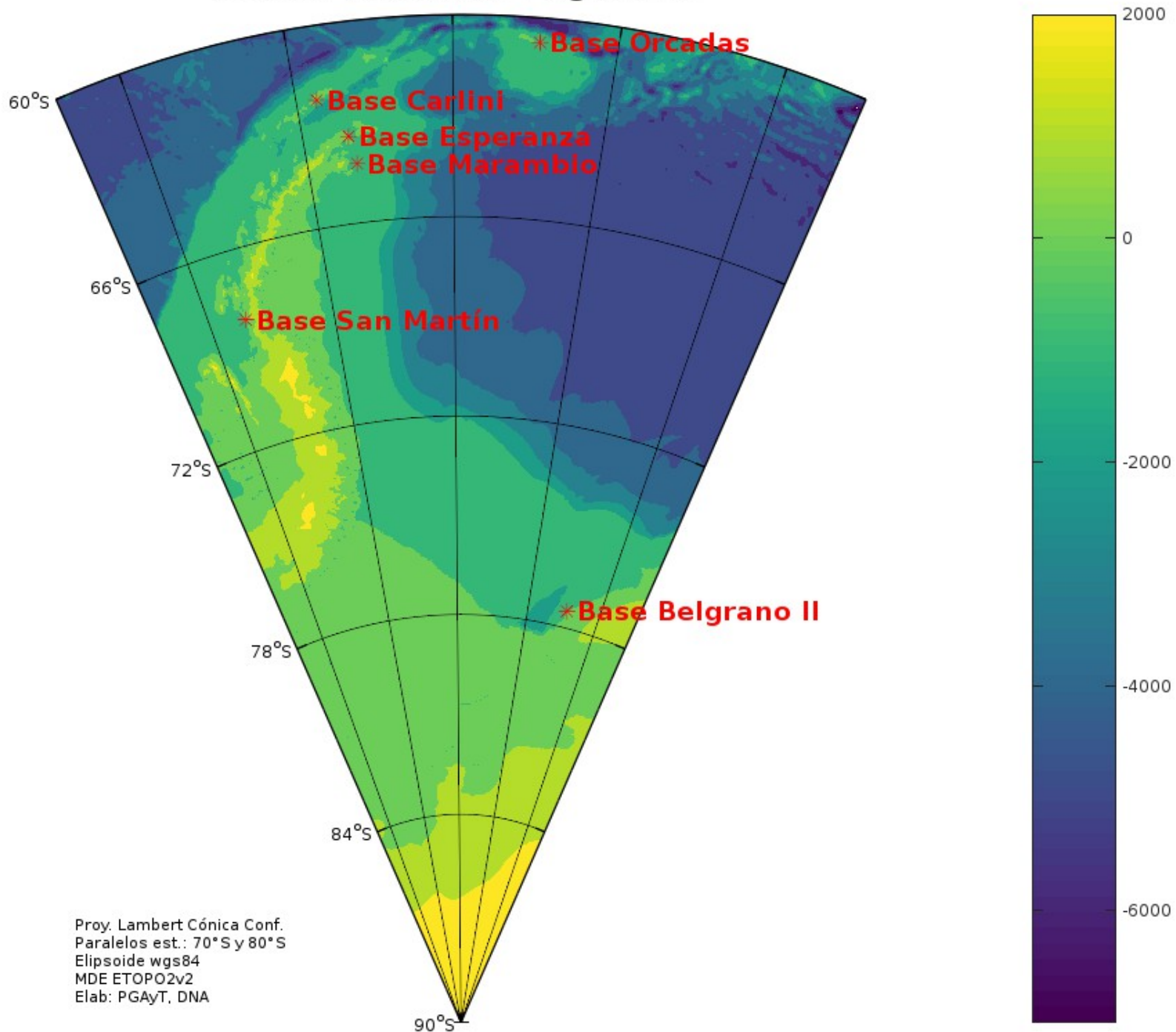
Datos de ETOP01



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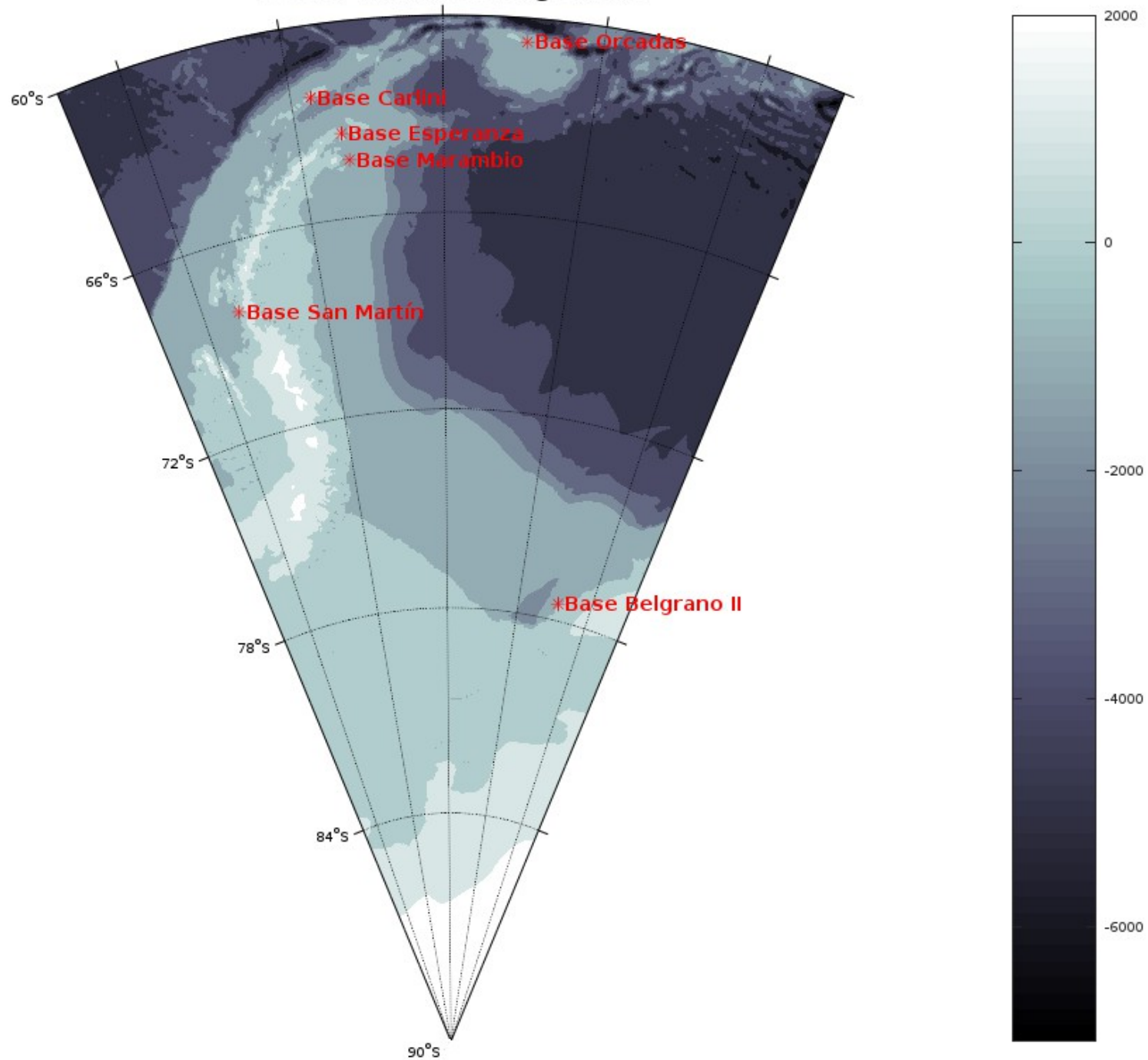
Sector Antártico Argentino



Octave no es un GIS y sin embargo mapea. H. Sala, IAA-DNA. FOSS4G+SOTM, 23-28 Octubre 2017, IGN.



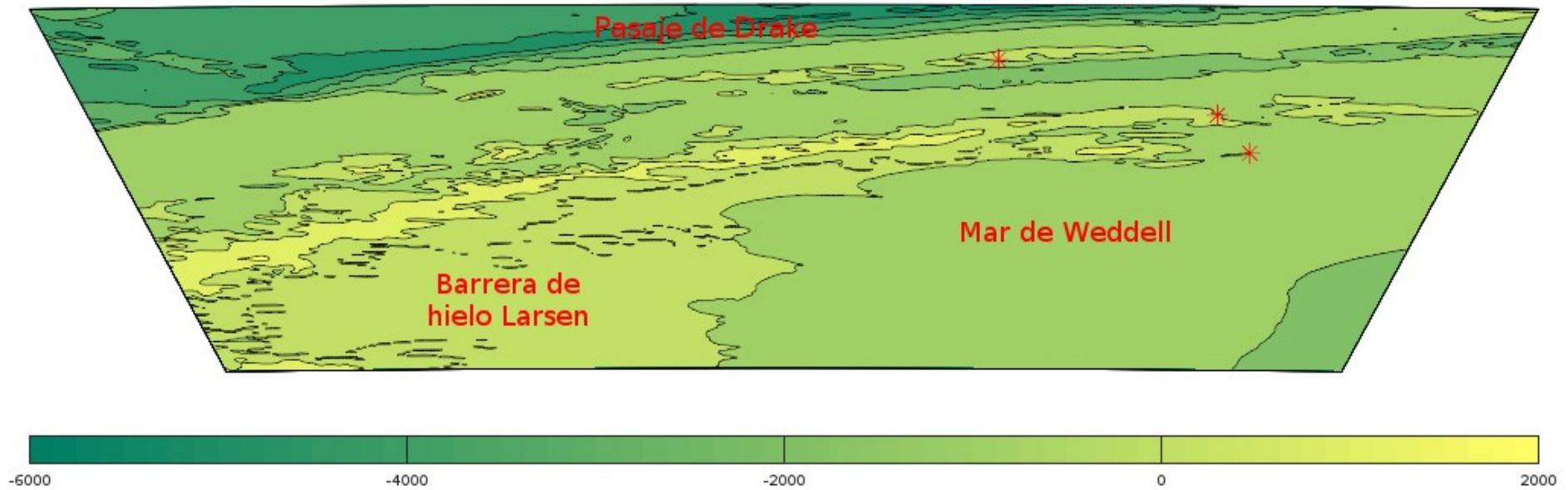
Sector Antártico Argentino



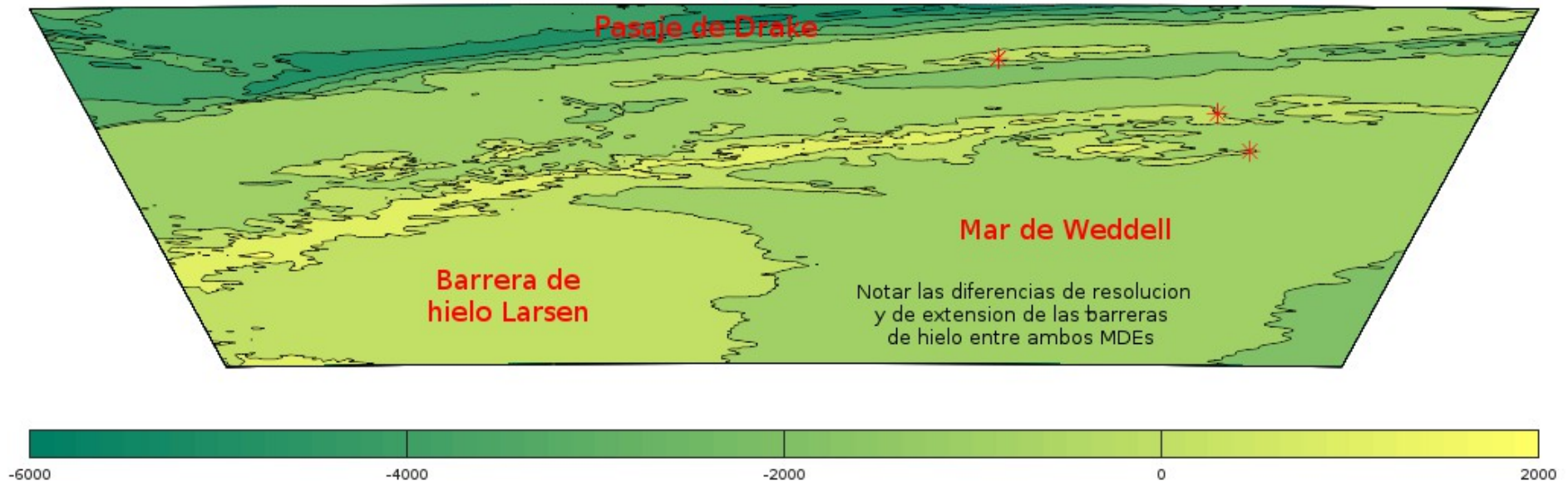
Octave no es un GIS y sin embargo mapea. H. Sala, IAA-DNA. FOSS4G+SOTM, 23-28 Octubre 2017, IGN.



Datos de ETOPO2v2, NCEI-NOAA (2006)



Datos de ETOPO1, NOAA-CIRES (2009)



En síntesis

Octave es un FOSS que posee una enorme potencialidad para elaborar mapas, de allí que sea necesario complementar y optimizar los paquetes y funciones ya existentes, y desarrollar otras nuevas.

Sería de gran valor que M_Map pasase a integrar el repositorio “oficial” de paquetes de Octave.

Si bien es necesario adaptar algunas funciones, hacer mapas en Octave no exige conocimientos avanzados de programación ya que puede hacerse de forma relativamente sencilla.

Agradecimientos

Al Programa de Gestión Ambiental y Turismo de la DNA y al IAA.
A Juan Pablo Carbajal, Paula Casela y Hernán De Ángelis.



Referencias

ETOPO1. Amante C. and Eakins B. (2009). ETOPO1 1 Arc-Minute Global Relief Model: Procedures, Data Sources and Analysis. NOAA Technical Memorandum NESDIS NGDC-24. NGDC, NOAA. doi:10.7289/V5C8276M. Disponible en: <https://www.ngdc.noaa.gov/mgg/global/seltopo.html>.

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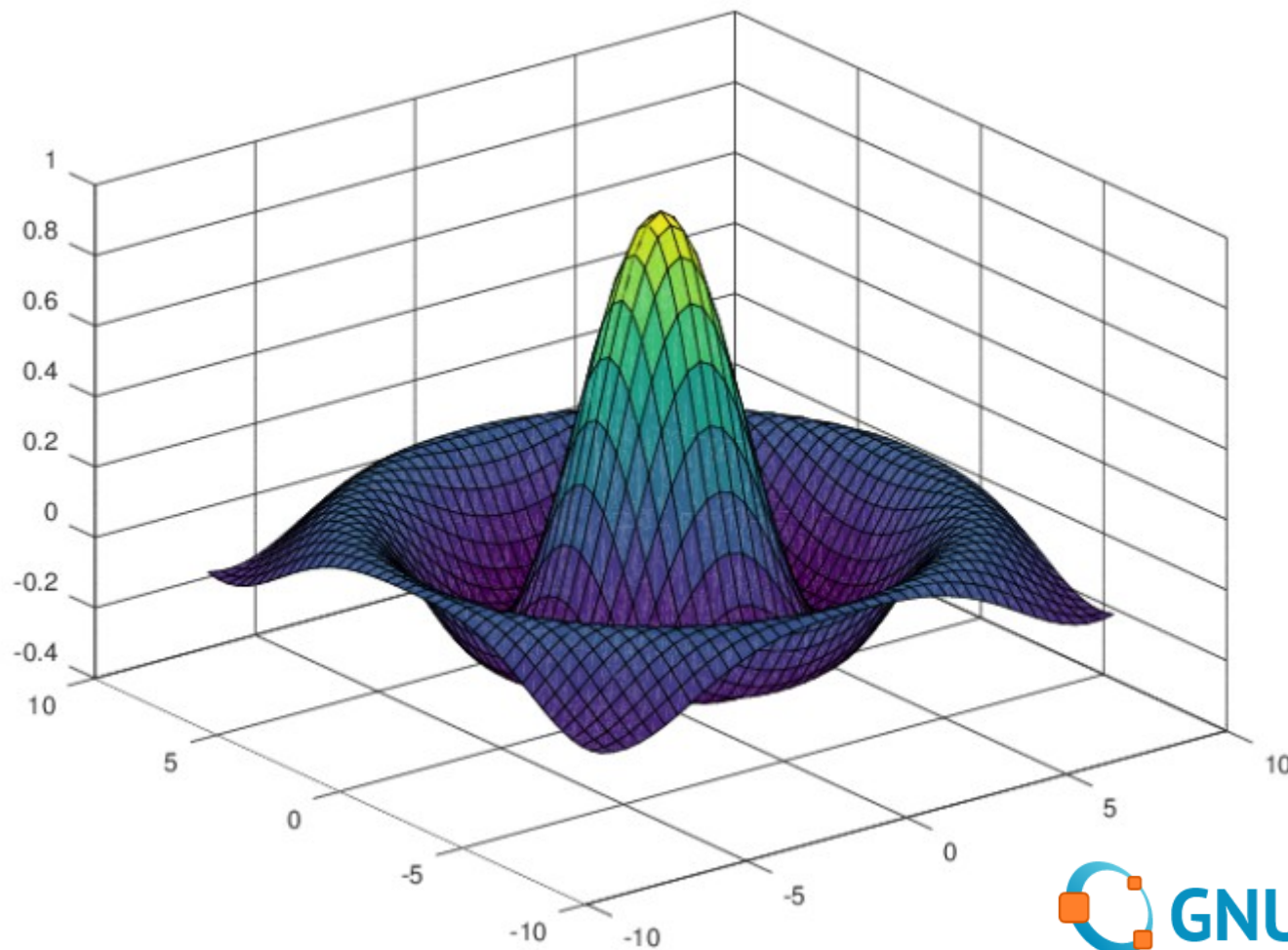
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Octave. Disponible en: <https://www.gnu.org/software/octave/>





Muchas gracias por su atención!

