

## HOWTO g05: Plotting in GrafLab and the output variable

You will learn how to plot the results of the synthesis with GrafLab and about the GrafLab output variable.

Only synthesis at a grid can be plotted with GrafLab.

All the GrafLab input parameters are explained in [../docs/graflab.md](https://github.com/graflab/graflab/blob/master/docs/graflab.md).

```
clear; clc; init_checker();
```

### Plotting with "Mapping Toolbox"

Define the GrafLab input parameters.

```
GM          = 3986004.415E+8;
R           = 6378136.3;
nmin        = 0;
nmax        = 360;
ellipsoid   = 1;
GGM_path    = '../data/input/EGM96.mat';
crd         = 0;
point_type  = 0;
lat_grd_min = -90.0;
lat_grd_step = 1.0;
lat_grd_max = 90.0;
lon_grd_min = 0.0;
lon_grd_step = lat_grd_step;
lon_grd_max = 360.0;
h_grd       = 0.0;
out_path     = '../data/output/howto-g05-mapping-toolbox';
quantity_or_error = 0;
quantity     = 5;
fnALFs      = 1;
export_data_txt = 1;
export_report = 1;
export_data_mat = 1;
display_data = 1; % Use Mapping Toolbox to plot the synthesis
graphic_format = 6;
colormap     = 1;
number_of_colors = 60;
dpi          = 300;
status_bar   = 1;
```

Do the synthesis

```
tic
out_mt = GrafLab('OK', ...
    GM, ...
    R, ...
    nmin, ...
    nmax, ...
    ellipsoid, ...
    GGM_path, ...
```

```

    crd, ...
    point_type, ...
    lat_grd_min, ...
    lat_grd_step, ...
    lat_grd_max, ...
    lon_grd_min, ...
    lon_grd_step, ...
    lon_grd_max, ...
    h_grd, ...
    [], ...
    [], ...
    [], ...
    [], ...
    out_path, ...
    quantity_or_error, ...
    quantity, ...
    fnALFs, ...
    [], ...
    export_data_txt, ...
    export_report, ...
    export_data_mat, ...
    display_data, ...
    graphic_format, ...
    colormap, ...
    number_of_colors, ...
    dpi, ...
    status_bar);
time_mt = toc;

```

You may now open the following files to see the maps:

```
fprintf("%s*.png".\n", out_path);
```

The time needed to perform the synthesis and plot the results is:

```
fprintf("%0.1f sec.\n", time_mt);
```

Conclusion: the plots are nice, but the plotting may be very slow for large grids.

## Plotting with the "imagesc" function

Update some of the GrafLab input parameters.

```

display_data = 2; % Use the "imagesc" function to plot the synthesis
out_path      = '../data/output/howto-g05-imagesc';

```

Do the synthesis

```

tic;
out_imgsc = GrafLab('OK', ...
    GM, ...

```

```

R, ...
nmin, ...
nmax, ...
ellipsoid, ...
GGM_path, ...
crd, ...
point_type, ...
lat_grd_min, ...
lat_grd_step, ...
lat_grd_max, ...
lon_grd_min, ...
lon_grd_step, ...
lon_grd_max, ...
h_grd, ...
[], ...
[], ...
[], ...
[], ...
out_path, ...
quantity_or_error, ...
quantity, ...
fnALFs, ...
[], ...
export_data_txt, ...
export_report, ...
export_data_mat, ...
display_data, ...
graphic_format, ...
colormap, ...
number_of_colors, ...
dpi, ...
status_bar);
time_imgsc = toc;

```

You may now open the following files to see the maps:

```
fprintf("%s*.png".\n", out_path);
```

The time needed to perform the synthesis and plot the results is (compare the time with the Mapping Toolbox):

```
fprintf("%0.1f sec.\n", time_imgsc);
```

Conclusion: very simple plots, but also very fast plotting, even with large grids.

## Output variable from GrafLab

You may redirect the numerical outputs from GrafLab to a MATLAB variable. The output variable stores the numerical data used by GrafLab to prepare the "txt" and/or "mat" file(s). Note that the "out\_path" must be specified, even if you do not export any data or plot.

Now, you may want to explore the GrafLab numerical outputs stored in the "out\_mt" and "out\_imgsc" variables.