fwg_parker_3D USER MANUAL

fwg_parker_3D: A MATLAB based 3D gravity forward modelling tool by Parker-Oldenburg Algorithm

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CONTENTS

1-HOW TO RUN

- Required Software: Matlab 2019a or above or Matlab Runtime 2019a.
- There are 3 ways to run the program:

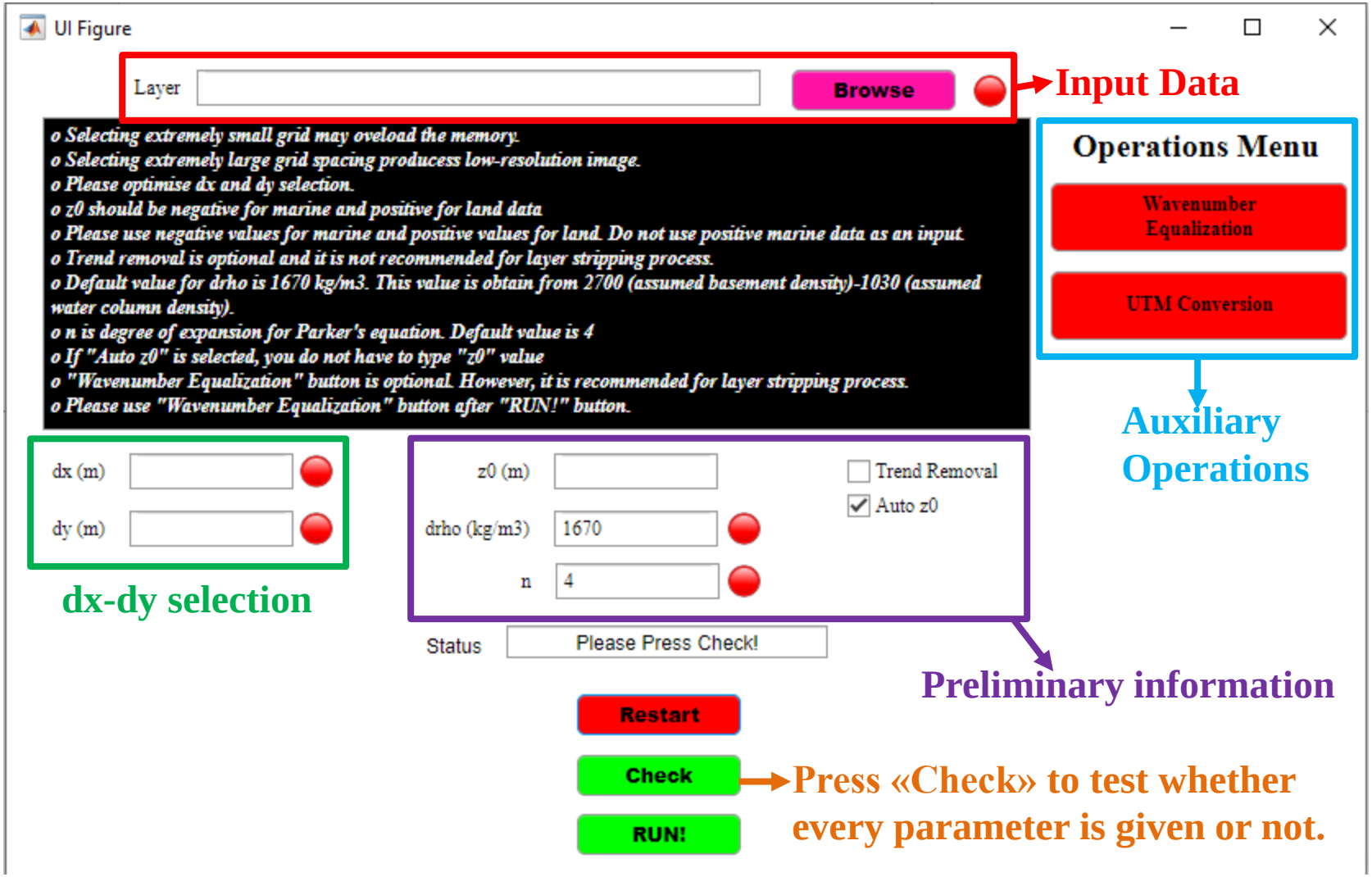
1-Double click on ‘fwg_parker3D_v5mlapp.mlapp.’

2-Open Matlab and drag the ‘fwg_parker3D_v5mlapp.mlapp.’

3-Open Matlab. Type ‘fwg_parker3D_v5mlapp.mlapp to the command window.

All files must be in the same file directory.

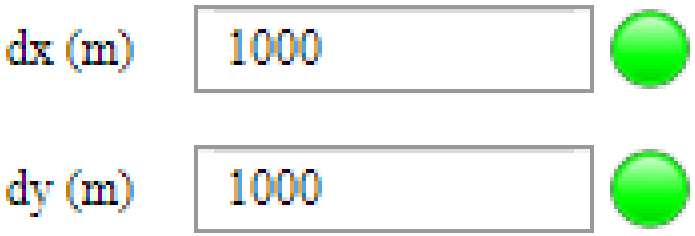
2-GUI INTERFACE



2.1. Input Data

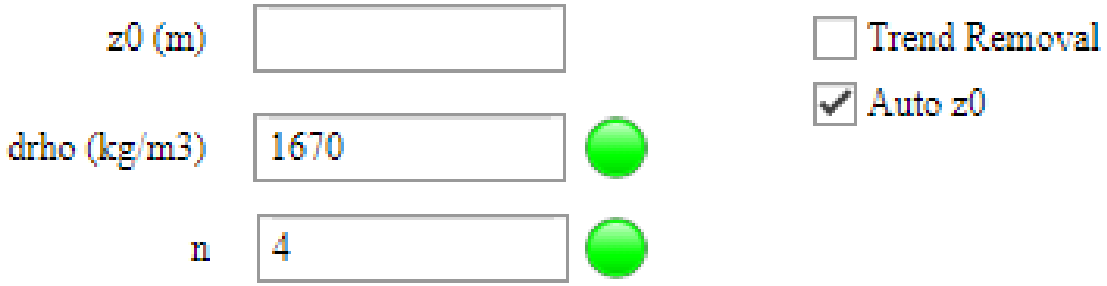
- Input data must have a ‘.dat’ extension.
- Data must be in xyz column format where x – Longitude or UTM Easting, y – Latitude or UTM Northing and z – Topography/Bathymetry or undulating layer (m)
- The file path of the data does not have to be the same as the file path of the program.

2.2. dx and dy Selection



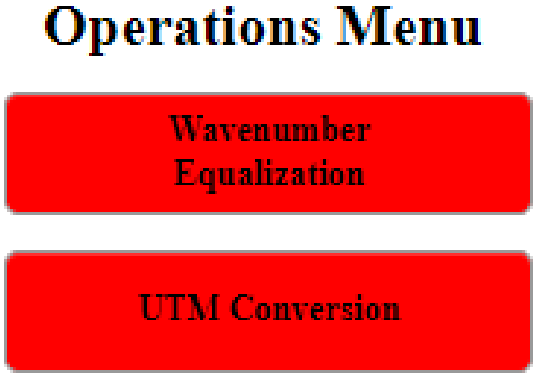
- dx and dy are spacing along x and y directions.
- Spacing is directly controls resolution of data . Hence do not use too sparse spacing value.
- The best selection is ½ spacing of the input data. For example; input data have 1km or 0.01° spacing you can choose 0.5 km or 0.005° in the program.

2.3. Preliminary Information



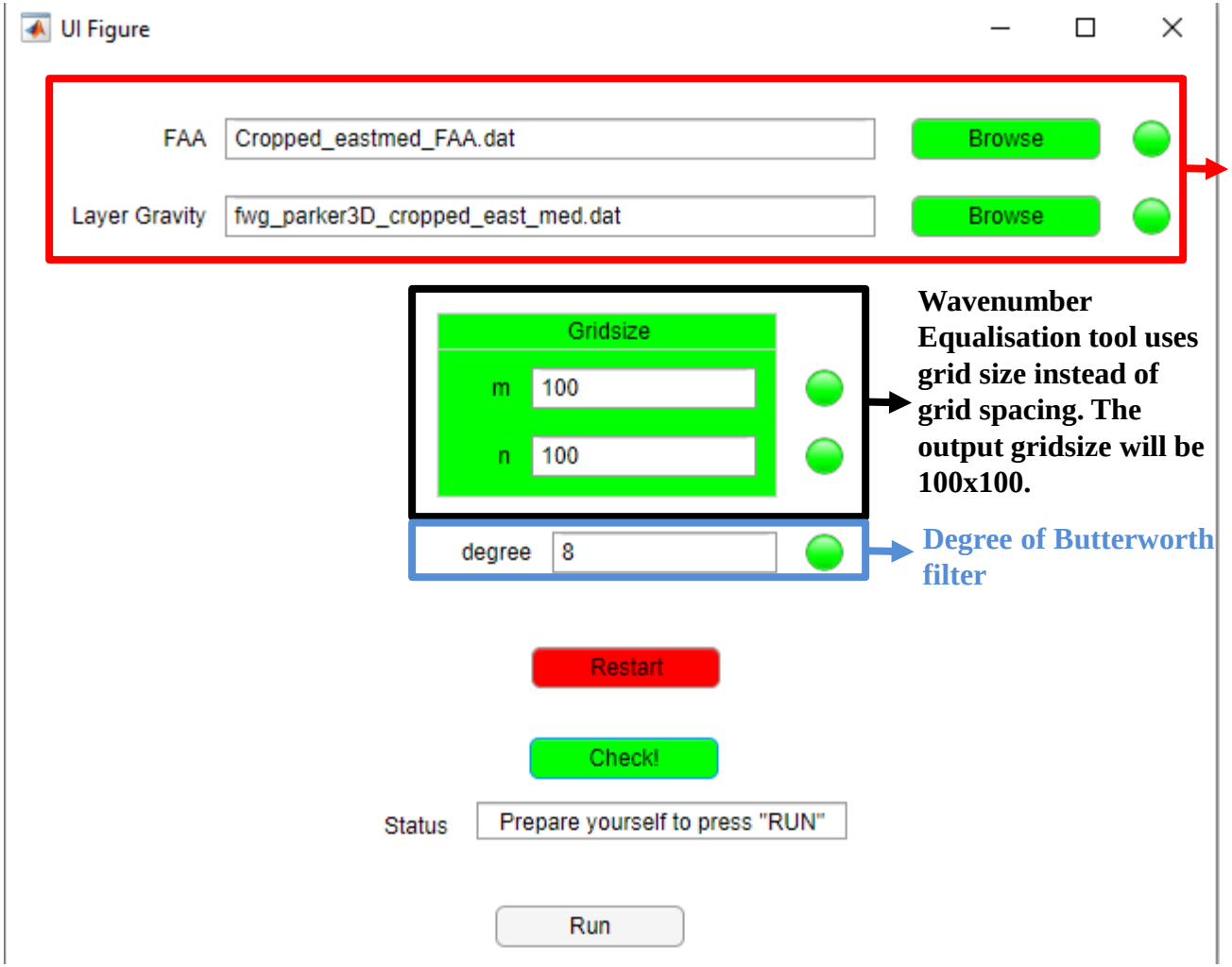
- z0 indicates computation datum. The undulations below and above this datum are taken into account during the calculation. Instead of determining specific z0 value, mean depth can be used. However, user should diligently select appropriate z0 in land-marine transition zones.
- Trend removal is optional procedure to better interpretation of modelled data. However, it alters amplitude information. Hence, it is not suitable for layer stripping process.
- Parker-Oldenburg Expansion degree is shown by «n» value. Default is 4.
- Density contrast between basement and current layer is given as 1670 kg/m3. However, this value is obtained from subtracting assumed water column density (1030 kg/m3) from assumed basement density (2700 kg/m3). Therefore, this value cannot be considered as a default value for all studies.

2.4. Auxiliary Operations



- Wavenumber Equalization: This tool facilitates layer stripping process. It equalizes wavenumber component of the modelled layer and FAA using RAPS and Butterworth Filter.
- UTM Conversion: Coordinates of the input data should be given in «m». The best option is providing input data in projected coordinate system.

2.4.1. Wavenumber Equalization



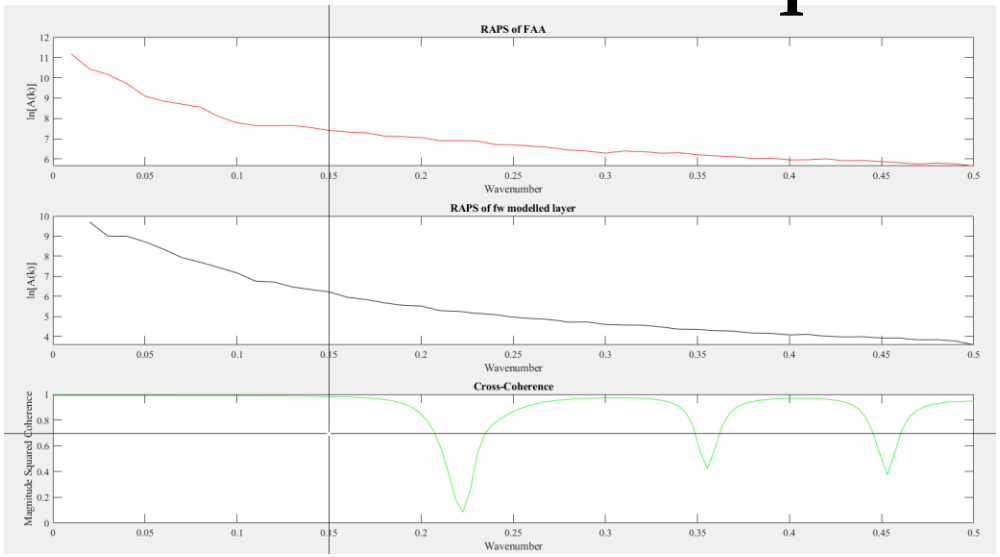
The first input data should be FAA and the second one is modelled gravity data (output of fwg_parker3D).

Wavenumber Equalisation tool uses grid size instead of grid spacing. The output gridsize will be 100x100.

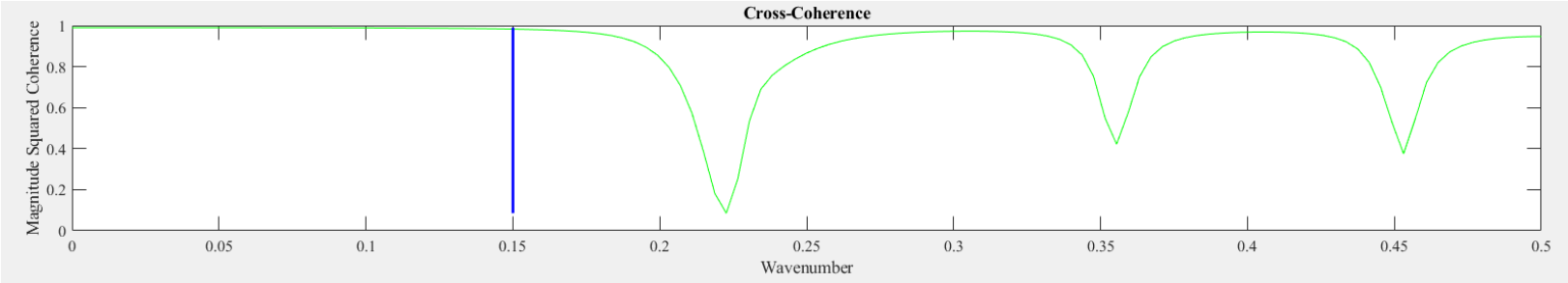
Degree of Butterworth filter

OUTPUT FILENAME:
Filtered_Layer_Gravity.dat

2.4.1. Wavenumber Equalization

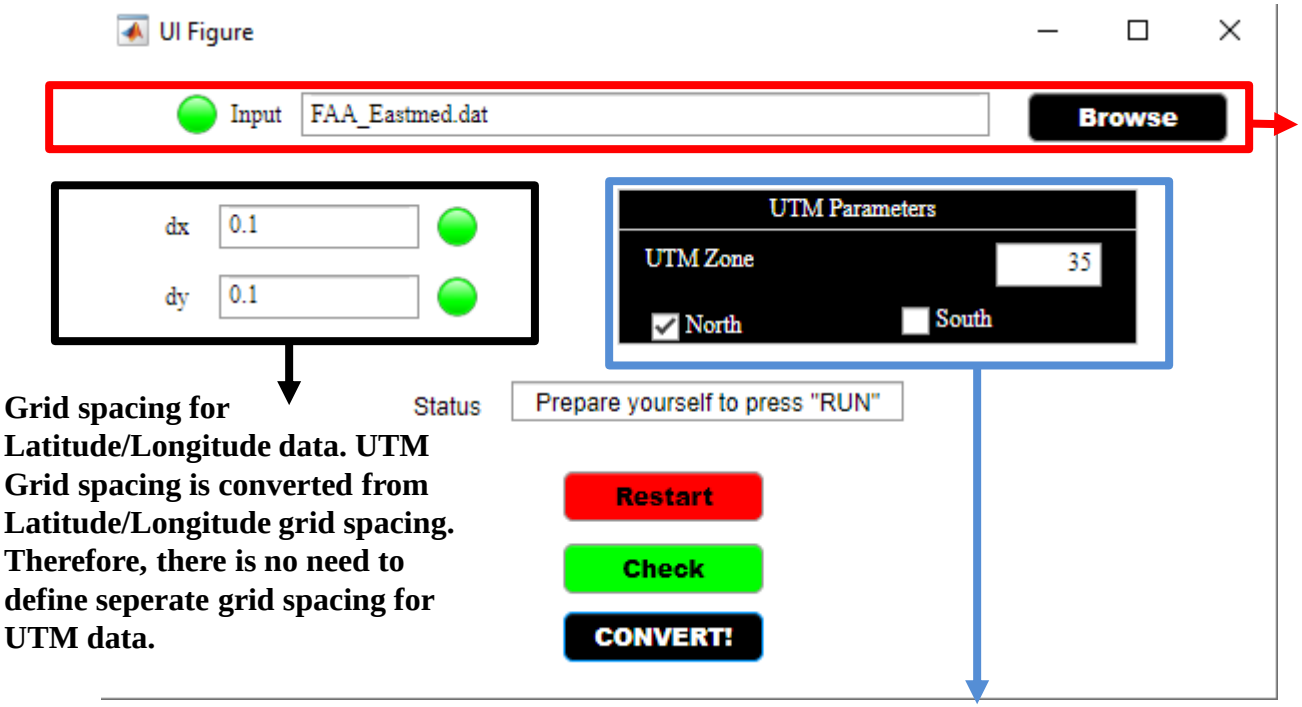


Spectral coherence method provides visual differences between RAPS of FAA and forward modelled layer.



Selected wavenumber value (blue line) is cut-off frequency for Butterworth filter.

2.4.2. UTM Conversion



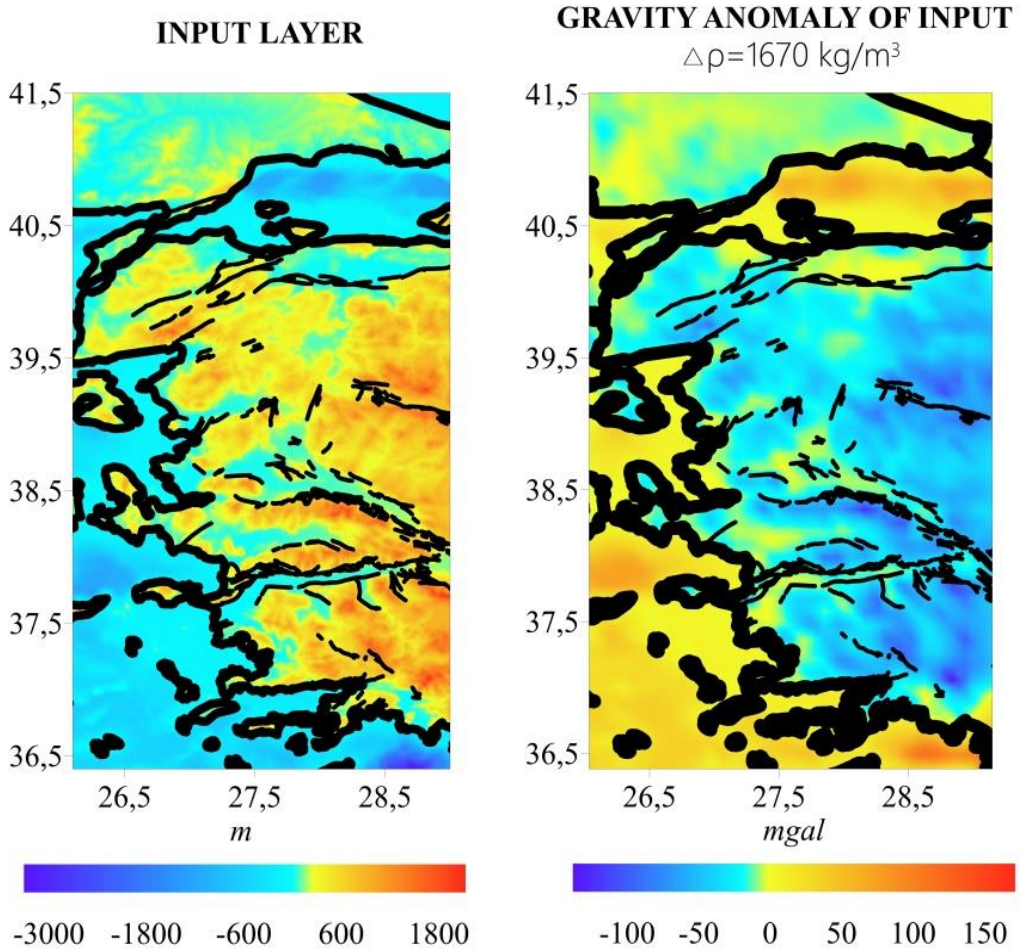
Input data should be given in WGS 84 Longitude/Latitude and xyz column format.

Grid spacing for Latitude/Longitude data. UTM Grid spacing is converted from Latitude/Longitude grid spacing. Therefore, there is no need to define seperate grid spacing for UTM data.

OUTPUT FILENAME: UTM.dat

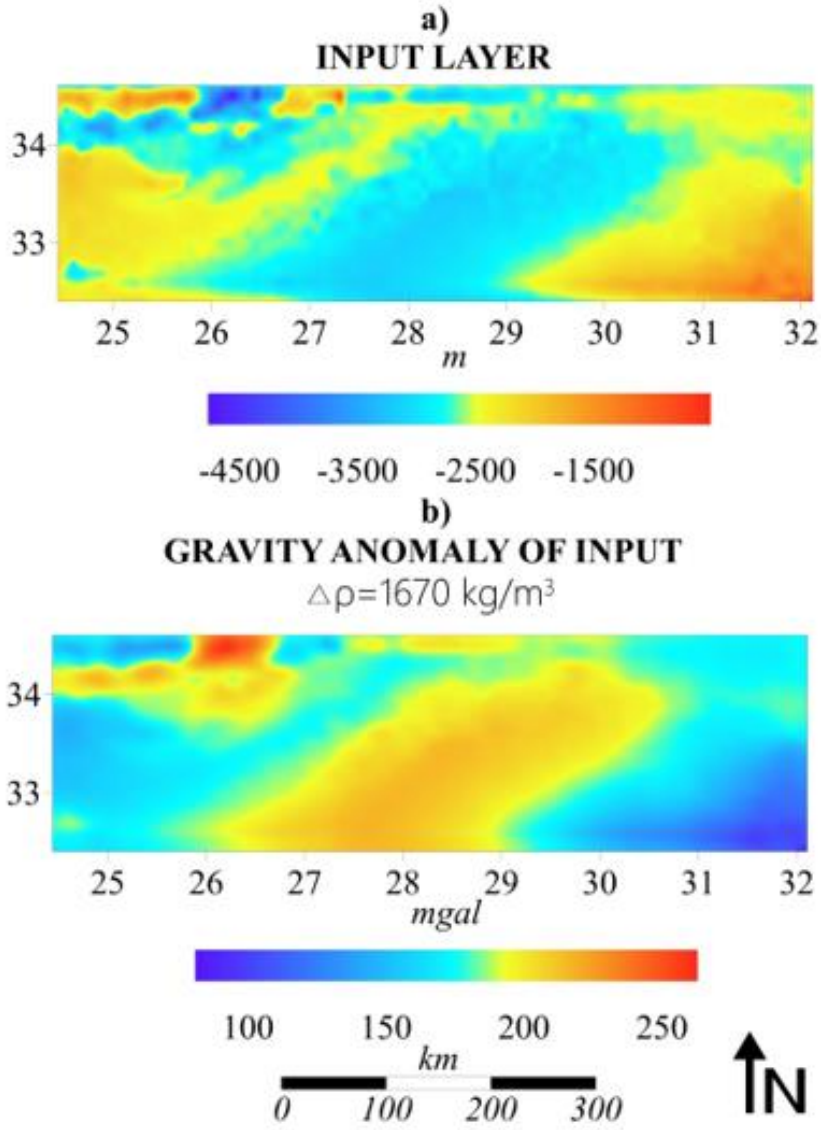
User should provide UTM Zone and Hemisphere. Northern hemisphere is default. Please do not forget to choose the appropriate hemisphere for your data.

2.5. SYNTHETIC DATA



- Synthetic data are provided with «fwg_parker3D» code.
- Synthetic data of the Western Anatolia region is given as «*western_anatolia_topo.dat*».
- The data can be found in «Synthetic_Data» folder.

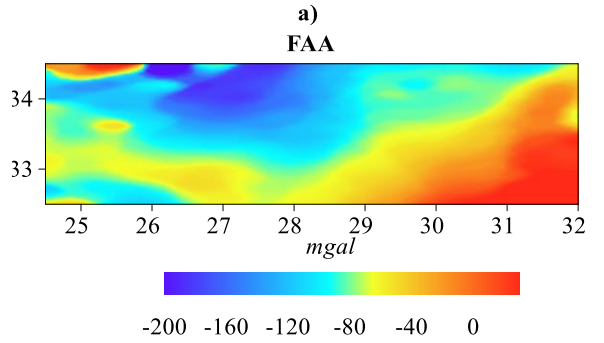
2.5. SYNTHETIC DATA



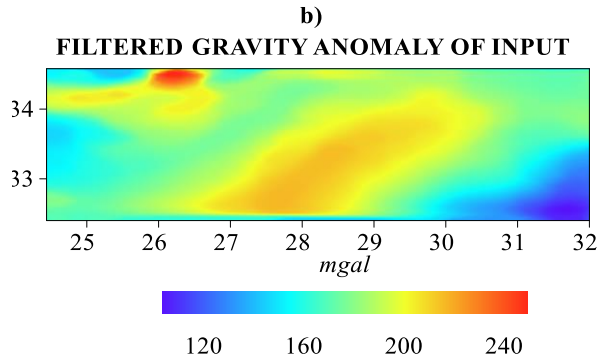
- Input Layer:
  cropped_east_med_Topo.dat

- Gravity Anomaly of Input:
  fwg_parker3D_cropped_east_med.dat

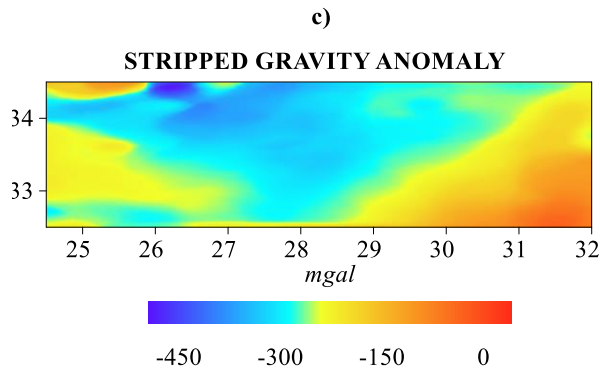
2.5. SYNTHETIC DATA



- FAA:
Cropped_eastmed_FAA.dat

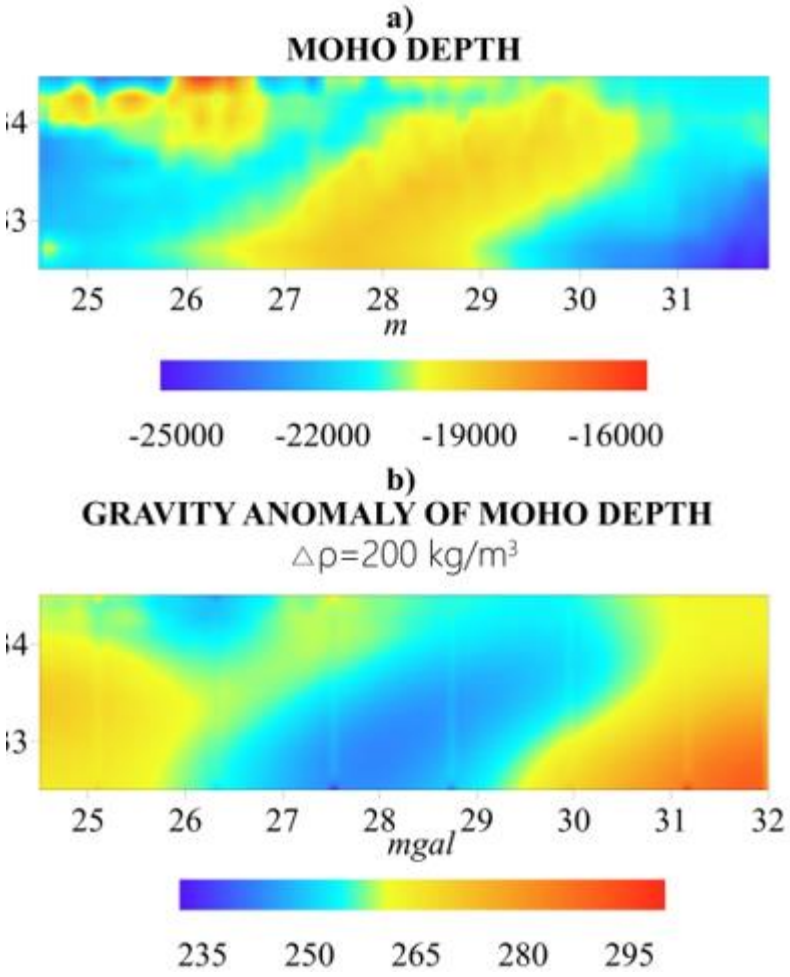


- Filtered Gravity Anomaly of Input:
cropped_eastmed_Filtered_Layer_Gravity.dat



- Stripped Gravity Anomaly:
mines_layerstrip_akdeniz.dat

2.5. SYNTHETIC DATA



- Moho Depth:

cropped_east_med_MohoAiry_m.dat

Flat Moho data is required computing isostatic correction. Flat Moho data are:

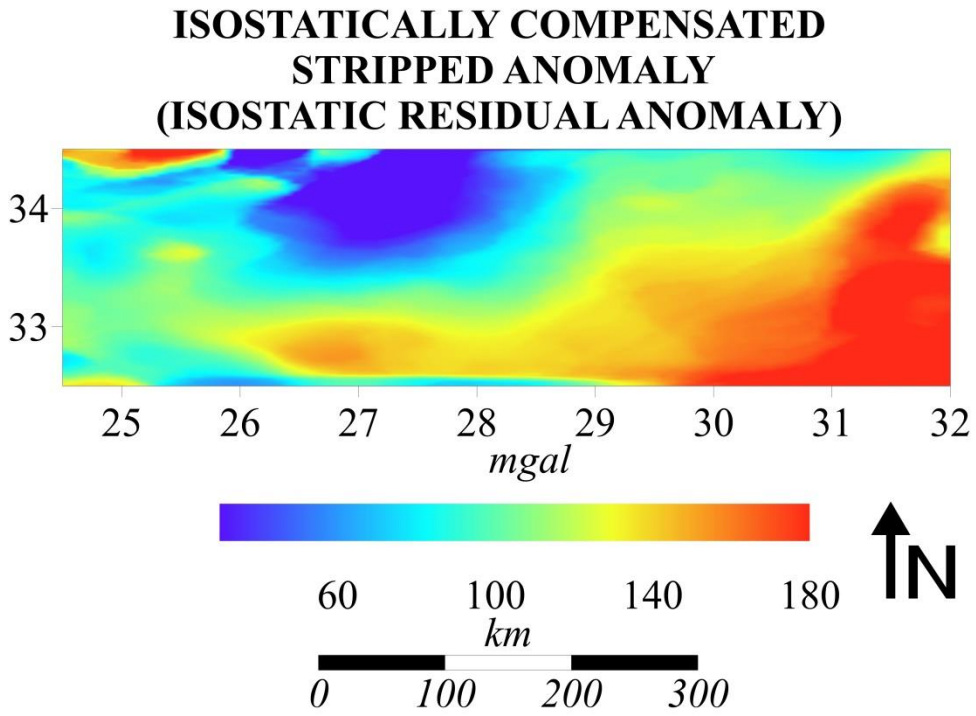
MohoAiry_m_FLAT_30000.dat for 30 km

MohoAiry_m_FLAT_25500.dat for 25 km

- Gravity Anomaly of Moho Depth:

fwg_parker3D_Moho_drho200.dat

2.5. SYNTHETIC DATA



- Isostatically Compensated Stripped Anomaly (Isostatic Residual Anomaly):

isostatic_res_mines_layerstrip_akdeniz.dat