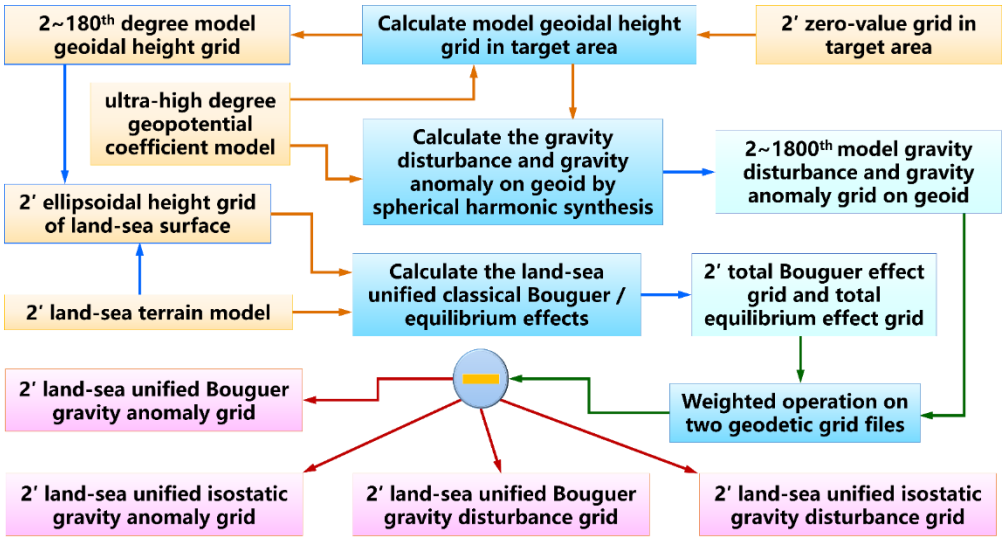
Computation process demo of land-sea Bouguer / equilibrium anomaly from geopotential model

From the Earth geopotential coefficient model and land-sea topographic relief model, the classical Bouguer gravity anomaly (disturbance) and isostatic gravity anomaly (disturbance) are calculated synchronously in four steps in any region of the world to demonstrate the fast and convenient computation process of the land-sea unified classical Bouguer / isostatic anomaly.



Computation process demo of land-sea Bouguer/equilibrium anomaly from geopotential model

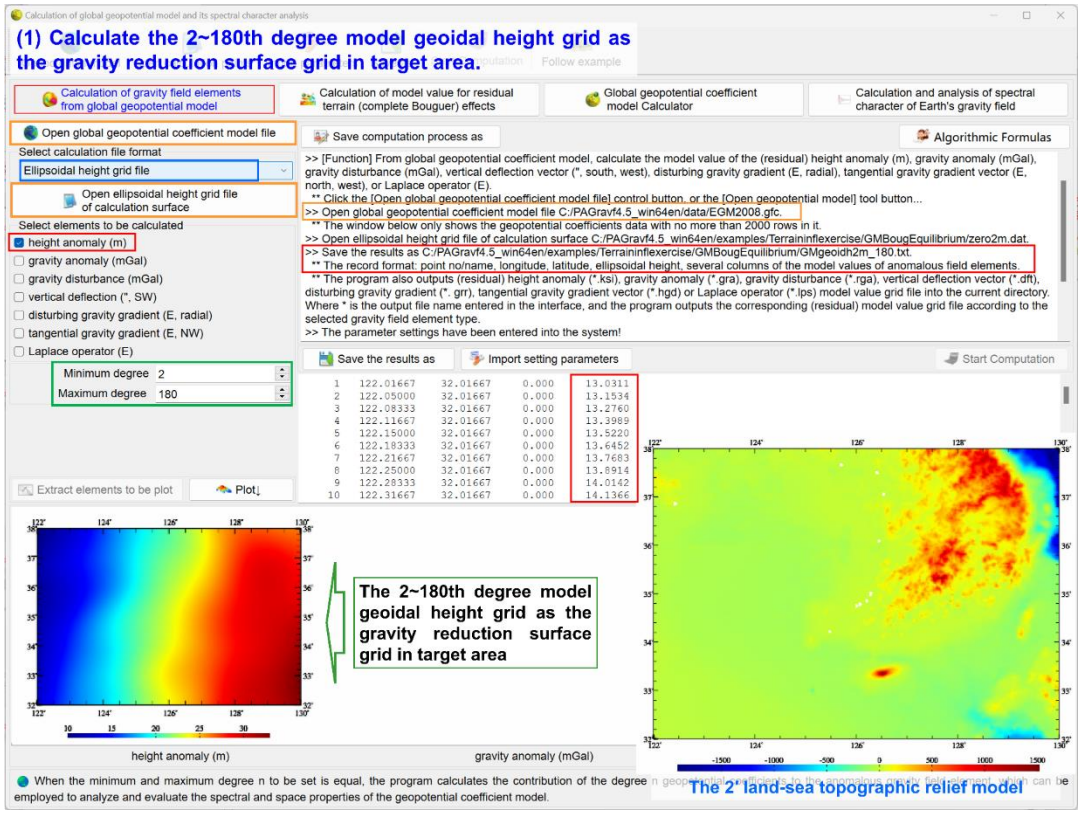
(1) Calculate the 2~180th degree model geoidal height grid as the gravity reduction surface grid in target area.

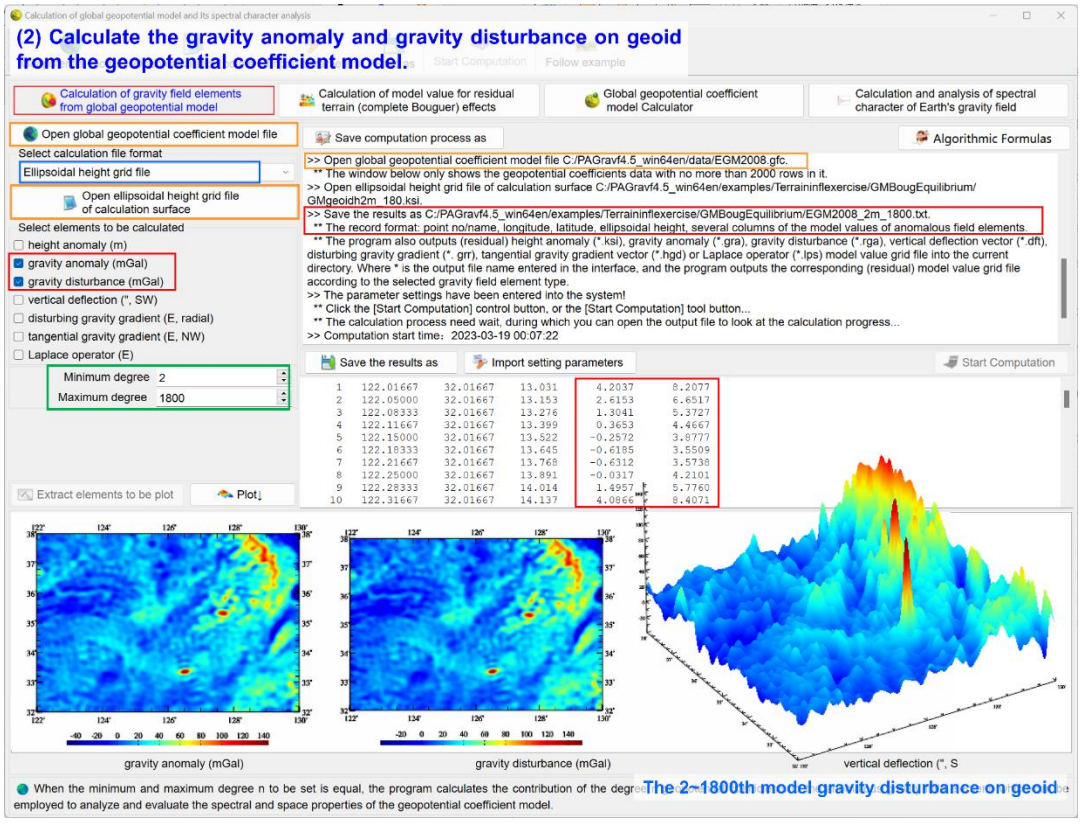
Call the function [Calculation of gravity field elements from global geopotential model] with the minimum degree 2 and the maximum degree 180, input the file EGM2008.gfc and the zero-value grid file zero2m.dat of the target area, and select the calculation type 'height anomaly', to generate 2′×2′ model geoidal height grid file GMgeoidh2m_180.ksi.

The 2~180th degree model geoidal height grid here is employed as the reduction surface and location for the classical Bouguer / equilibrium anomaly.

(2) Calculate the gravity anomaly and gravity disturbance on geoid from the geopotential coefficient model.

Call the function [Calculation of gravity field elements from global geopotential model] with the minimum degree 2 and the maximum degree 1800, input the file EGM2008.gfc and model geoidal height grid file GMgeoidh2m_180.ksi, and select the calculation type 'gravity anomaly' and 'gravity disturbance', to generate the 2′×2′ gravity anomaly grid file EGM2008_2m_1800.gra and gravity disturbance grid file EGM2008_2m_1800.rga in the target area.

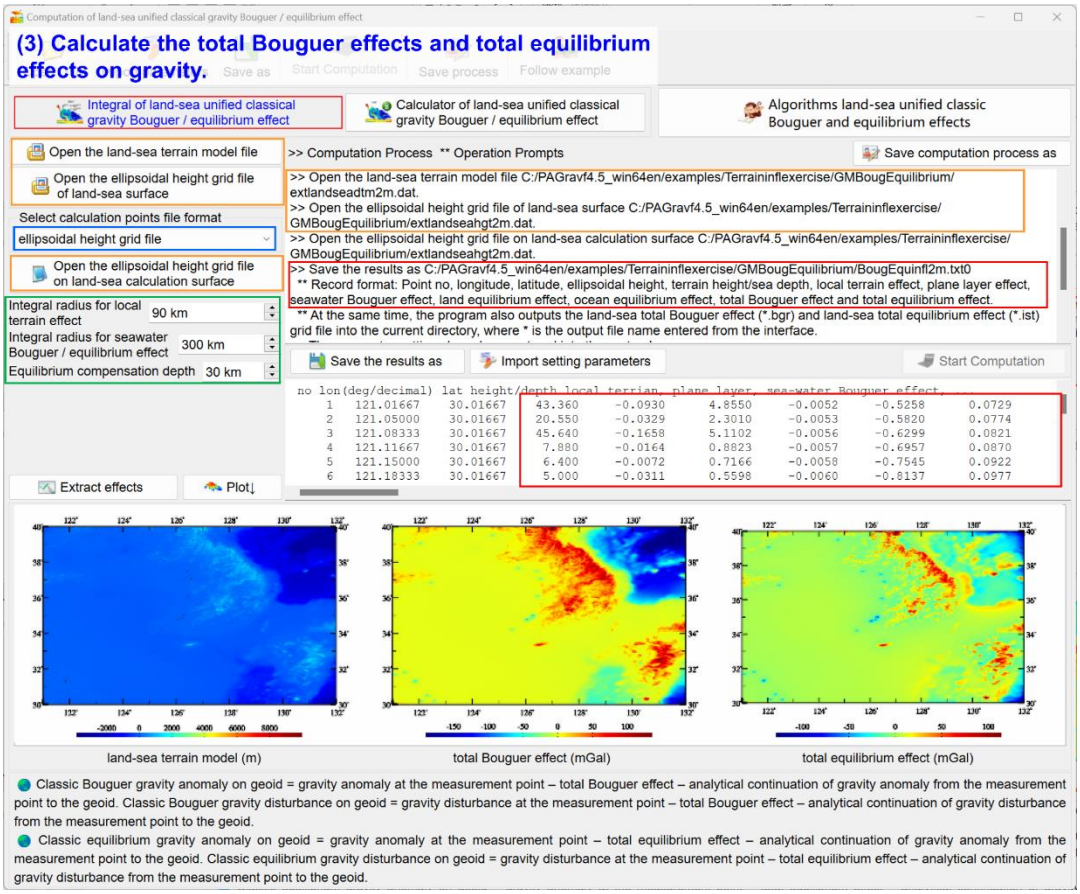

(1) Calculate the 2~180th degree model geoidal height grid as the gravity reduction surface grid in target area.
Calculation of gravity field elements from global geopotential model
Calculation of model value for residual terrain (complete Bouguer) effects
Global geopotential coefficient model Calculator
Calculation and analysis of spectral character of Earth's gravity field
Open global geopotential coefficient model file
Save computation process as
Algorithmic Formulas
Select calculation file format
Ellipsoidal height grid file
Open ellipsoidal height grid file of calculation surface
Select elements to be calculated
height anomaly (m)
gravity anomaly (mGal)
gravity disturbance (mGal)
vertical deflection (", SW)
disturbing gravity gradient (E, radial)
tangential gravity gradient (E, NW)
Laplace operator (E)
Minimum degree 2
Maximum degree 180
>> [Function] From global geopotential coefficient model, calculate the model value of the (residual) height anomaly (m), gravity anomaly (mGal), gravity disturbance (mGal), vertical deflection vector (", south, west), disturbing gravity gradient (E, radial), tangential gravity gradient vector (E, north, west), or Laplace operator (E).
** Click the [Open global geopotential coefficient model file] control button, or the [Open geopotential model] tool button...
>> Open global geopotential coefficient model file C:/PAGravf4.5_win64en/data/EGM2008.gfc.
** The window below only shows the geopotential coefficients data with no more than 2000 rows in it.
>> Open ellipsoidal height grid file of calculation surface C:/PAGravf4.5_win64en/examples/Terraininflexercise/GMBougEquilibrium/zero2m.dat.
>> Save the results as C:/PAGravf4.5_win64en/examples/Terraininflexercise/GMBougEquilibrium/GMgeoidh2m_180.txt.
** The record format: point no/name, longitude, latitude, ellipsoidal height, several columns of the model values of anomalous field elements.
** The program also outputs (residual) height anomaly (*.ksi), gravity anomaly (*.gra), gravity disturbance (*.rga), vertical deflection vector (*.dft), disturbing gravity gradient (*. grr), tangential gravity gradient vector (*.hgd) or Laplace operator (*.lps) model value grid file into the current directory. Where * is the output file name entered in the interface, and the program outputs the corresponding (residual) model value grid file according to the selected gravity field element type.
>> The parameter settings have been entered into the system!
Save the results as
Import setting parameters
Start Computation
Extract elements to be plot
Plot↓
1 122.01667 32.01667 0.000 13.0311
2 122.05000 32.01667 0.000 13.1534
3 122.08333 32.01667 0.000 13.2760
4 122.11667 32.01667 0.000 13.3989
5 122.15000 32.01667 0.000 13.5220
6 122.18333 32.01667 0.000 13.6452
7 122.21667 32.01667 0.000 13.7683
8 122.25000 32.01667 0.000 13.8914
9 122.28333 32.01667 0.000 14.0142
10 122.31667 32.01667 0.000 14.1366
The 2~180th degree model geoidal height grid as the gravity reduction surface grid in target area
height anomaly (m)
gravity anomaly (mGal)
The 2' land-sea topographic relief model
When the minimum and maximum degree n to be set is equal, the program calculates the contribution of the degree
employed to analyze and evaluate the spectral and space properties of the geopotential coefficient model.


(2) Calculate the gravity anomaly and gravity disturbance on geoid from the geopotential coefficient model.
Calculation of gravity field elements from global geopotential model
Calculation of model value for residual terrain (complete Bouguer) effects
Global geopotential coefficient model Calculator
Calculation and analysis of spectral character of Earth's gravity field
Open global geopotential coefficient model file
Save computation process as
Algorithmic Formulas
Select calculation file format
Ellipsoidal height grid file
Open ellipsoidal height grid file of calculation surface
Select elements to be calculated
height anomaly (m)
gravity anomaly (mGal)
gravity disturbance (mGal)
vertical deflection (", SW)
disturbing gravity gradient (E, radial)
tangential gravity gradient (E, NW)
Laplace operator (E)
Minimum degree 2
Maximum degree 1800
>> Open global geopotential coefficient model file C:/PAGravf4.5_win64en/data/EGM2008.gfc.
** The window below only shows the geopotential coefficients data with no more than 2000 rows in it.
>> Open ellipsoidal height grid file of calculation surface C:/PAGravf4.5_win64en/examples/Terraininflexercise/GMBougEquilibrium/GMgeoidh2m_180.ksi.
>> Save the results as C:/PAGravf4.5_win64en/examples/Terraininflexercise/GMBougEquilibrium/EGM2008_2m_1800.txt.
** The record format: point no/name, longitude, latitude, ellipsoidal height, several columns of the model values of anomalous field elements.
** The program also outputs (residual) height anomaly (*.ksi), gravity anomaly (*.gra), gravity disturbance (*.rga), vertical deflection vector (*.dft), disturbing gravity gradient (*. grr), tangential gravity gradient vector (*.hgd) or Laplace operator (*.lps) model value grid file into the current directory. Where * is the output file name entered in the interface, and the program outputs the corresponding (residual) model value grid file according to the selected gravity field element type.
>> The parameter settings have been entered into the system!
** Click the [Start Computation] control button, or the [Start Computation] tool button...
** The calculation process need wait, during which you can open the output file to look at the calculation progress...
>> Computation start time: 2023-03-19 00:07:22
Save the results as
Import setting parameters
Start Computation
Extract elements to be plot
Plot↓
1 122.01667 32.01667 13.031 4.2037 8.2077
2 122.05000 32.01667 13.153 2.6153 6.6517
3 122.08333 32.01667 13.276 1.3041 5.3727
4 122.11667 32.01667 13.399 0.3653 4.4667
5 122.15000 32.01667 13.522 -0.2572 3.8777
6 122.18333 32.01667 13.645 -0.6185 3.5509
7 122.21667 32.01667 13.768 -0.6312 3.5738
8 122.25000 32.01667 13.891 -0.0317 4.2101
9 122.28333 32.01667 14.014 1.4957 5.7760
10 122.31667 32.01667 14.137 4.0866 8.4071
gravity anomaly (mGal)
gravity disturbance (mGal)
vertical deflection (", S
The 2~1800th model gravity disturbance on geoid
When the minimum and maximum degree n to be set is equal, the program calculates the contribution of the degree
employed to analyze and evaluate the spectral and space properties of the geopotential coefficient model.

(3) Calculate the total Bouguer effects and total equilibrium effects on gravity.

Call the function [Computation of land-sea unified classical gravity Bouguer / equilibrium effect], input the land-sea topographic relief model file extlandseadtm2m.dat and land-sea surface ellipsoidal height grid file extlandseahgt2m.dat, and set the land integral radius 90km, sea integral radius 200km and equilibrium compensation depth 30km. to generate the 2′×2′ total Bouguer effect grid file BougEquinfl2m.bgr and total equilibrium effect grid file BougEquinfl2m.ist.

Because the normal gravity field has nothing to do with the terrain effect, the Bouguer / equilibrium effect on the gravity anomaly, gravity disturbance and gravity is equal everywhere and does not need to be distinguished.



(4) Generate the 2′×2′ land-sea unified classical Bouguer / isostatic anomaly grid model.

Subtract the gravity anomaly grid EGM2008_2m_1800.gra and gravity disturbance grid EGM2008_2m_1800.rga on geoid from the total Bouguer effect grid (the grid edge removed) BougEquinfl2m0.bgr respectively to get the classical Bouguer gravity anomaly grid model Clsbggravanom2m.dat and classical Bouguer gravity disturbance grid model Clsbgdistgrav2m.dat.

Subtract the gravity anomaly grid EGM2008_2m_1800.gra and gravity disturbance

grid EGM2008_2m_1800.rga on geoid from the total isostatic effect grid (the grid edge removed) BougEquinfl2m0.ist respectively to get the classical isostatic gravity anomaly grid model lstbggravanom2m.dat and classical isostatic gravity disturbance grid model lstbgdistgrav2m.dat.