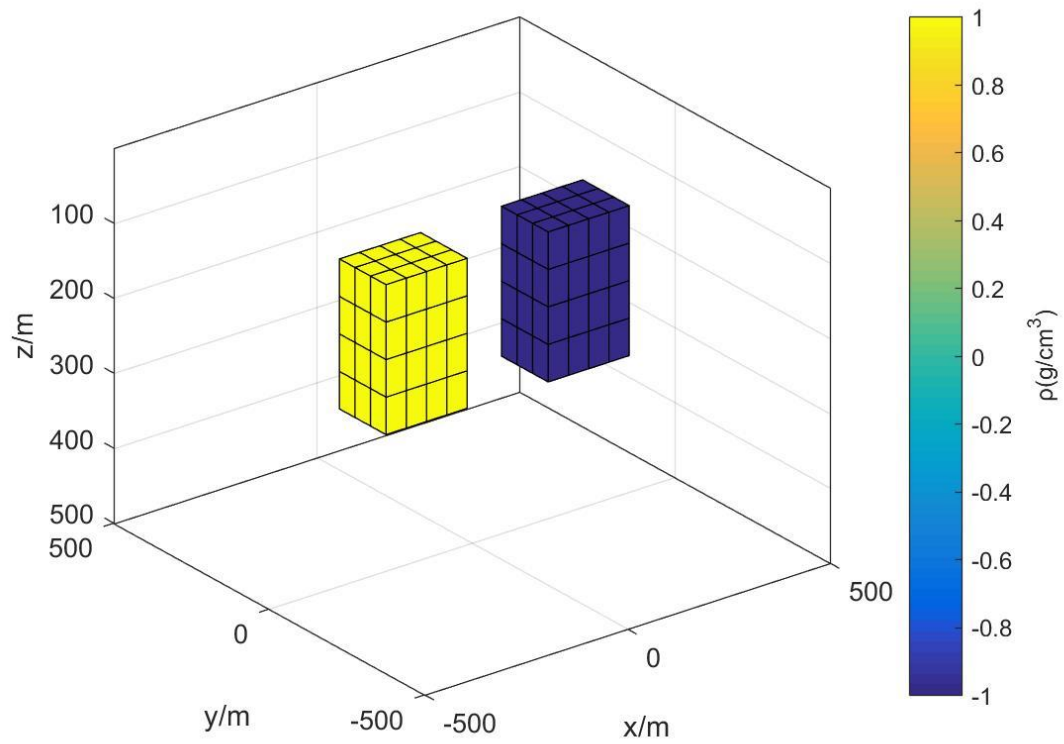
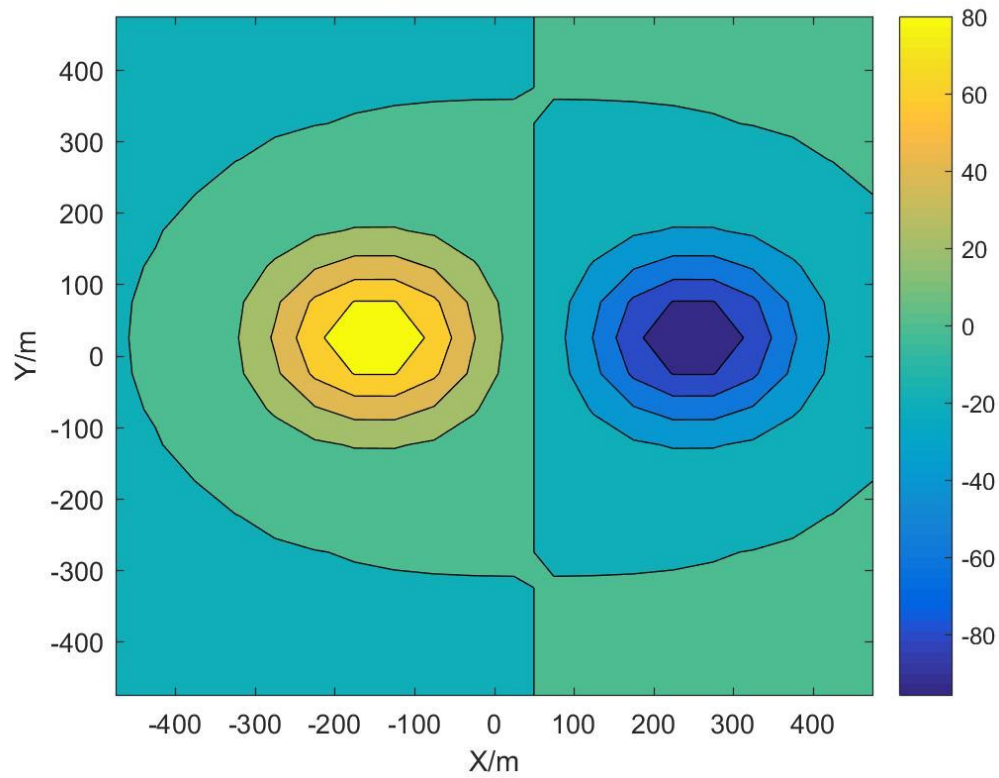


Synthetic model



Observed Gzz: observedgzz.grd



### Step1:

Parameter setting and open file:

Click right-button of mouse inside the red line to open the observed gzz file:observedgzz.grd

The screenshot shows the DenInv3D software interface. The 'Parameter Setting' panel on the left includes fields for 'Maximum Iterations' (10) and 'Convergence Precision' (1e-20). Below these are checkboxes for 'Use Depth Weight', 'Use Roughness Matrix', and 'Use Initial Model'. The 'Regularization Parameter' section has radio buttons for 'Calculate Automatically' (selected) and 'Input'. The 'Inversion Preference' section has radio buttons for 'Gravity' and 'Gradient' (selected). The 'Gradient Component' section has checkboxes for Gxx, Gxy, Gxz, Gyy, Gyz, and Gzz (checked). A 'Calculate Kernel Function' checkbox is also present. At the bottom left, an 'Opening Files List' panel is highlighted with a red border. It contains a list of file types (Gravity, Gradient Gxx, Gradient Gxy, Gradient Gxz, Gradient Gyy, Gradient Gyz, Gradient Gzz, Initial Model) and a 'Files Name' field with the text 'D:\mode3\observedgzz.grd'. An 'Open file' button is next to the field. The 'Modeling' panel on the right shows 'X-range(m)' from -500 to 500, 'Y-range(m)' from -500 to 500, and 'Z-range(m)' from 0.01 to 500. It also has an 'Observed Surface(m)' field set to 0 and a checked 'Equivalent Space Model' checkbox. Below this is a table with 5 columns: 'Grid Cell Number in X-direction', 'Grid Cell Number in Y-direction', 'Bottom Depth in Z-direction(m)', 'Depth Weight Z0(m)', and an unlabeled column. The table has 10 rows of data. At the bottom right are buttons for 'Add Layer', 'Delete Layer', 'Calculate', and 'Exit'.

Parameter Setting

Maximum Iterations: 10 Convergence Precision: 1e-20

$\alpha_s$ : 280  $\alpha_x$ : 1  $\alpha_y$ : 1  $\alpha_z$ : 1

Parameter Preferences

- ☒ Use Depth Weight
- ☒ Use Roughness Matrix
- ☐ Use Initial Model

Regularization Parameter

- ☒ Calculate Automatically
- ☐ Input

Inversion Preference

- ☐ Gravity
- ☒ Gradient

Gradient Component

- ☐ Gxx ☐ Gxy ☐ Gxz
- ☐ Gyy ☐ Gyz
- ☒ Gzz

☒ Calculate Kernel Function

Opening Files List

	Files Name
Gravity	
Gradient Gxx	
Gradient Gxy	
Gradient Gxz	
Gradient Gyy	
Gradient Gyz	
Gradient Gzz	D:\mode3\observedgzz.grd
Initial Model	

Open file

Modeling

Minimum Maximum

X-range(m): -500 500

Y-range(m): -500 500

Z-range(m): 0.01 500

Observed Surface(m): 0 ☒ Equivalent Space Model

Grid Cell Number in X-direction	Grid Cell Number in Y-direction	Bottom Depth in Z-direction(m)	Depth Weight Z0(m)	
1	20	20	50	0
2	20	20	100	0
3	20	20	150	35
4	20	20	200	40
5	20	20	250	50
6	20	20	300	0
7	20	20	350	0
8	20	20	400	0
9	20	20	450	0
10	20	20	500	0

Add Layer Delete Layer

Calculate Exit

### Step2:

Input the modeling parameters or load model data from file, click right-button of mouse to open a model file in the red line area.

Load model data:model.txt

DenInv3D
File(F) Draw(D) Help(H)

Parameter Setting

Maximum Iterations: 10
Convergence Precision: 1e-20

as: 280
ax: 1
ay: 1
az: 1

Parameter Preferences
☒ Use Depth Weight
☒ Use Roughness Matrix
☐ Use Initial Model

Regularization Parameter
☒ Calculate Automatically
☐ Input

Inversion Preference
☐ Gravity
☒ Gradient

Gradient Component
☐ Gxx
☐ Gxy
☐ Gxz
☐ Gyy
☐ Gyz
☒ Gzz

☒ Calculate Kernel Function

Opening Files List

	Files Name
Gravity	
Gradient Gxx	
Gradient Gxy	
Gradient Gxz	
Gradient Gyy	
Gradient Gyz	
Gradient Gzz	D:\mode3\observedgzz.grd
Initial Model	

Modeling

Minimum
Maximum

X-range(m): -500 500
Y-range(m): -500 500
Z-range(m): 0.01 500

Observed Surface(m): 0
☒ Equivalent Space Model

Grid Cell Number	Grid Cell Number	Bottom Depth	Depth Weight	
in X-direction	in Y-direction	in Z-direction(m)	Z0(m)	
1	20	20	50	0
2	20	20	100	0
3	20	20	150	35
4	20	20	200	40
5	20	20	250	50
6	20	20	300	0
7	20	20	350	0
8	20	20	400	0
9	20	20	450	0
10	20	20	500	0

Load model data
Save model data

Add Layer
Delete Layer

Calculate
Exit

Step 3:

Click the button “calculate” to run

DenInv3D
File(F) Draw(D) Help(H)

Parameter Setting

Maximum Iterations: 10
Convergence Precision: 1e-20

as: 280
ax: 1
ay: 1
az: 1

Parameter Preferences
☒ Use Depth Weight
☒ Use Roughness Matrix
☐ Use Initial Model

Regularization Parameter
☒ Calculate Automatically
☐ Input

Inversion Preference
☐ Gravity
☒ Gradient

Gradient Component
☐ Gxx
☐ Gxy
☐ Gxz
☐ Gyy
☐ Gyz
☒ Gzz

☒ Calculate Kernel Function

Opening Files List

	Files Name
Gravity	
Gradient Gxx	
Gradient Gxy	
Gradient Gxz	
Gradient Gyy	
Gradient Gyz	
Gradient Gzz	D:\mode3\observedgzz.grd
Initial Model	

Modeling

Minimum
Maximum

X-range(m): -500 500
Y-range(m): -500 500
Z-range(m): 0.01 500

Observed Surface(m): 0
☒ Equivalent Space Model

Grid Cell Number	Grid Cell Number	Bottom Depth	Depth Weight	
in X-direction	in Y-direction	in Z-direction(m)	Z0(m)	
1	20	20	50	0
2	20	20	100	0
3	20	20	150	35
4	20	20	200	40
5	20	20	250	50
6	20	20	300	0
7	20	20	350	0
8	20	20	400	0
9	20	20	450	0
10	20	20	500	0

Add Layer
Delete Layer

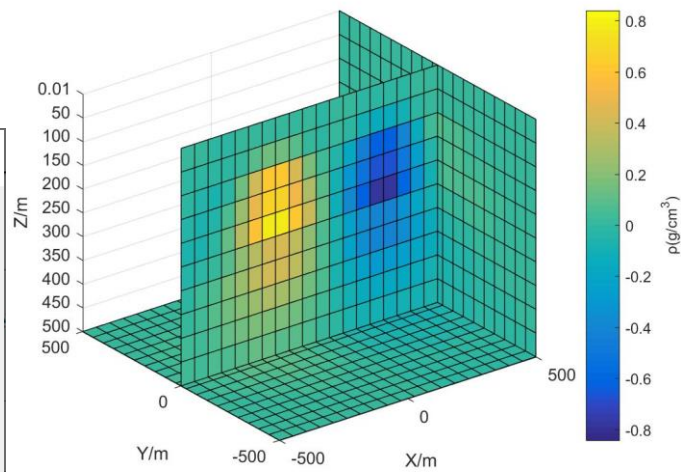
Calculate
Exit

coordinate of slice in X-direction:  
500

coordinate of slice in Y-direction:  
0

coordinate of slice in Z-direction:  
500

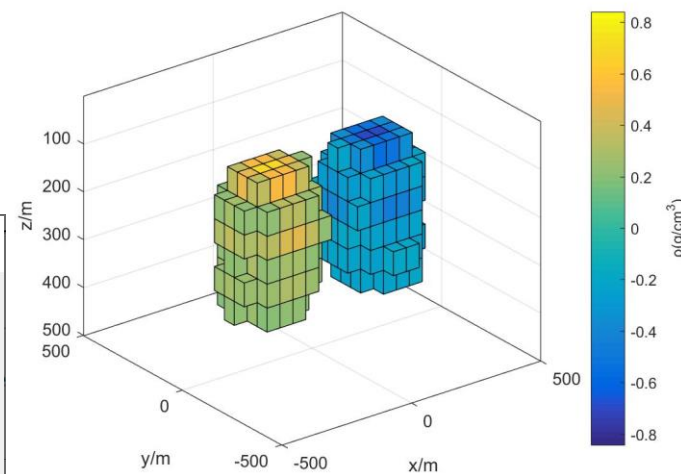
OK Cancel



Density 1:  
-0.2

Density 2:  
0.2

OK Cancel



If Density 1 < Density 2,  $\rho < \text{Density 1}$  or  $\rho > \text{Density 2}$  will be shown.

If Density 1 > Density 2, then the  $\rho$  between Density1 and Density 2 will be shown.

observedgzz.grd: the observed data, the Golden Software Surfer GRD ascii format.

model.txt: the modeling file.

Inversiondensity.dat: inversion result.

4 columns: x,y,z,rho

Inirho\_inputfile.dat: the initial density for inversion

Inirho\_originalfile.dat: to show the data order of inirho\_inputfile.dat.

How to input the modeling data?

According to the observedgzz.grd, we have:

$X_{min}=-475$  m,  $X_{max}=475$  m,  $N_x=20$ ,  $dx=(X_{max}-X_{min})/(N_x-1)=50$  m

$Y_{min}=-475$  m,  $Y_{max}=475$  m,  $N_y=20$ ,  $dy=(Y_{max}-Y_{min})/(N_y-1)=50$  m

Model:

$X_{minm}=X_{min}-dx/2=-475-50/2=-500$

$X_{maxm}=X_{max}+dx/2=475+50/2=500$

$Y_{minm}=Y_{min}-dy/2=-475-50/2=-500$

$Y_{maxm}=Y_{max}+dy/2=475+50/2=500$

$N_{xm}=20$ ,  $N_{ym}=20$

$dxm=(X_{maxm}-X_{minm})/N_{xm}=50$

$dym=(Y_{maxm}-Y_{minm})/N_{ym}=50$

For the first observed point:  $(x,y)=(-475,-475)$

The center of the first prism model:  $(x_m,y_m)=(-475,-475)$

It means that the center of prism model corresponding to the observed point.

The coordinate of the inversion density is the center of the prism model.