重力モデル計算のメモ

単独プリズム

$$g = G\rho\sum_{i=1}^{2}\sum_{j=1}^{2}\sum_{k=1}^{2}\mu_{ijk}\left[z_k \arctan\frac{x_i y_j}{z_k R_{ijk}} - x_i \log\left(R_{ijk} + y_j\right) - y_j \log\left(R_{ijk} + x_i\right)\right]$$

ここで

$$R_{ijk} = \sqrt{x_i^{\,2} + y_j^{\,2} + z_k^{\,2}}$$

$$\mu_{ijk} = (-1)^i (-1)^j (-1)^k$$

一辺が 20km×20km で厚さが 3km のプリズムが地表から上面深度 1km にある。周囲との密度差は＋0.5g/cm3

```
c       cal-grv
c                          BLAKELY(1995)
c
c       set prisms
c
c       observed point (x0,y0,z0)
c       prism x1-x2, y1-y2, z1-z2 (km)
c       external einc,edec : positive below horizontal,
c                                  positive east of true North
c       theta azimth of X-axis positive east of true North
c
c       density contrast rho(kg/m**3)
c
        dimension x1s(100), x2s(100), y1s(100), y2s(100)
        dimension z1s(100), z2s(100), tms(100)
        dimension rincs(100), rdecs(100)
c
c     prism number
        nnp=1
c--- density
        rho=500
c--- position
```

```
      x1s(1)=-10
      x2s(1)=10
      y1s(1)=-10
      y2s(1)=10
      z1s(1)=1
      z2s(1)=4
c
      open(2,file='gtest_result.txt')
c
      mx1=-50
      mx2=50
      my1=-50
      my2=50
      mxstp=1
      mystp=1
      ix=(mx2-mx1)/mxstp
      iy=(my2-my1)/mystp
      do 10 mm=1,ix
      x0=float((mm-1)*mxstp+mx1)
      do 11 nn=1,iy
      y0=float((nn-1)*mystp+my1)
      gg=0
      do 20 k=1,nnp
        x1=x1s(k)
        x2=x2s(k)
        y1=y1s(k)
        y2=y2s(k)
        z1=z1s(k)
        z2=z2s(k)
c
      call gbox(x0,y0,z0,x1,y1,z1,x2,y2,z2,rho,g)
      gg=gg+g
   20 continue
      write(2,*) y0,x0,gg
   11 continue
   10 continue
```

```
      close(2)
      stop
      end
c
      subroutine gbox(x0,y0,z0,x1,y1,z1,x2,y2,z2,rho,g)
      dimension x(2),y(2),z(2),isign(2)
      real km2m
      data isign/-1,1/
c
      km2m=1000.
      si2mg=100000.
      gamma=6.670e-11
      twopi=6.2831853
c
      x(1)=x0-x1
      x(2)=x0-x2
      y(1)=y0-y1
      y(2)=y0-y2
      z(1)=z0-z1
      z(2)=z0-z2
      sum=0.
      do 1 i=1,2
       do 1 j=1,2
        do 1 k=1,2
         rijk=sqrt(x(i)**2+y(j)**2+z(k)**2)
         ijk=isign(i)*isign(j)*isign(k)
         arg1=atan2((x(i)*y(j)),(z(k)*rijk))
         if(arg1.lt.0) arg1=arg1+twopi
         arg2=rijk+y(j)
         arg3=rijk+x(i)
         if(arg2.le.0) write(6,*) 'bad point'
         if(arg3.le.0) write(6,*) 'bad point'
         arg2=alog(arg2)
         arg3=alog(arg3)
         sum=sum+ijk*(z(k)*arg1-x(i)*arg2-y(j)*arg3)
    1 continue
```

```
g=rho*gamma*sum*si2mg*km2m
return
end
```

この計算結果は