

四角柱モデルの磁気異常

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Blakely(1995) を参照したFORTRANプログラム

🍊 パラメーター

- 🌸 プリズムの数 nnp
- 🌸 プリズムのパラメーター (プリズムごとに与える)
 - 🌸 プリズムサイズ ; $x_2-x_1, y_2-y_1, z_2-z_1$ (m→km)
 - 🌸 プリズムの磁化 ; 伏角 (度) rinc: 水平0度、鉛直下方+90度
 - 🌸 プリズムの磁化 ; 偏角 (度) rdec: 真北0度、真東+90度
 - 🌸 プリズムの磁化 ; 強度 (A/m) tm : +の値
- 🌸 その他の設定
 - 🌸 観測位置 (x_0, y_0, z_0)
 - 🌸 外部磁場伏角 (度) einc: 水平0度、鉛直下方+90度
 - 🌸 外部磁場偏角 (度) edec: 真北0度、真東+90度
 - 🌸 X軸の角度 (度) theta : 真北0度、真東+90度
 - 🌸 計算範囲 (X) $m_{x2}-m_{x1}$ (m→km)
 - 🌸 計算範囲 (Y) $m_{y2}-m_{y1}$ (m→km)
 - 🌸 計算ステップ (X) (Y) m_{xstp}, m_{ystp} (m→km)



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c      cal-mag
c
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 azimuth of X-axis positive east of true North
c
c      magnetization rinc, rdec
c      magnetization intensity tm(A/m)
c
c      dimension x1s(100), x2s(100), y1s(100), y2s(100)
c      dimension z1s(100), z2s(100), tms(100)
c      dimension rincs(100), rdecs(100)

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```

c
c  prism number
  nnp=1
c
  data d2rad/0.017453293/
  open(2, file=' calmag-res03. dat' )
c--- magnetization
  einc=48.7
  edec=-6.8
  do 36 i=1, nnp
    rincs(i)=49
    rdecs(i)=-7
    tms(i)=2.0
  36 continue
c--- position(m)
  x1s(1)=-500
  x2s(1)=500
  y1s(1)=-500
  y2s(1)=500
  z1s(1)=10
  z2s(1)=5000
c--- survey line
  z0=-500
  theta=0
c
  z0=z0/1000
c
  mx1=-5000
  mx2=5000
  my1=-5000
  my2=5000
  mxstp=100
  mystp=100
  ix=(mx2-mx1)/mxstp
  iy=(my2-my1)/mystp

  do 10 mm=1, ix
    x0=float((mm-1)*mxstp+mx1)/1000

  do 11 nn=1, iy
    y0=float((nn-1)*mystp+my1)/1000
    gg=0
    do 20 j=1, nnp
      x1=x1s(j)
      x2=x2s(j)
      y1=y1s(j)
      y2=y2s(j)
      z1=z1s(j)
      z2=z2s(j)
c--- m to km
      x1=x1/1000
      x2=x2/1000
      y1=y1/1000
      y2=y2/1000
      z1=z1/1000
      z2=z2/1000
c
      tm=tms(j)
      rinc=rincs(j)
      rdec=rdecs(j)
c
  call mbox(x0, y0, z0, x1, y1, z1, x2, y2, rinc, rdec, einc, edec, tm, theta, t1)
  call mbox(x0, y0, z0, x1, y1, z2, x2, y2, rinc, rdec, einc, edec, tm, theta, t2)
  t=t1-t2
  gg=gg+t

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```

20 continue
    write(2, *) y0, x0, gg
11 continue
10 continue
close(2)
stop
end

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```

c
subroutine mbox(x0, y0, z0, x1, y1, z1, x2, y2, mi, md, fi, fd, m, theta, t)
dimension alpha(2), beta(2)
real mi, md, m, ma, mb, mc
data cm/1e-7/, t2nt/1.0e9/
call dircos(mi, md, theta, ma, mb, mc)
call dircos(fi, fd, theta, fa, fb, fc)
fm1=ma*fb+mb*fa
fm2=ma*fc+mc*fa
fm3=mb*fc+mc*fb
fm4=ma*fa
fm5=mb*fb
fm6=mc*fc
alpha(1)=x1-x0
alpha(2)=x2-x0
beta(1)=y1-y0
beta(2)=y2-y0
h=z1-z0
t=0.
hsq=h*h
do 1 i=1, 2
  alphasq=alpha(i)**2
  do 1 j=1, 2
    sign=1
    if(i.ne.j) sign=-1
    r0sq=alphasq+beta(j)**2+hsq
    r0=sqrt(r0sq)
    r0h=r0*h
    alphabeta=alpha(i)*beta(j)
    arg1=(r0-alpha(i))/(r0+alpha(i))
    arg2=(r0-beta(j))/(r0+beta(j))
    arg3=alphasq+r0h+hsq
    arg4=r0sq+r0h-alphasq
    tlog=fm3*log(arg1)/2+fm2*log(arg2)/2-fm1*log(r0+h)
    tatan=-fm4*atan2(alphabeta, arg3)-fm5*atan2(alphabeta, arg4)
+      +fm6*atan2(alphabeta, r0h)
    t=t+sign*(tlog+tatan)
1 continue
t=t*m*cm*t2nt
return
end

```

```

c
subroutine dircos(incl, decl, azim, a, b, c)
real incl
data d2rad/0.017453293/
xincl=incl*d2rad
xdecl=decl*d2rad
xazim=azim*d2rad
a=cos(xincl)*cos(xdecl-xazim)
b=cos(xincl)*sin(xdecl-xazim)
c=sin(xincl)
return
end

```



{東向き(km), 北向き(km), 磁気異常(nT)} というファイルを作る
プログラム中でcalmag-res3.dat

-5.00000	-5.00000	0.507163
-4.90000	-5.00000	0.572453
-4.80000	-5.00000	0.641654
-4.70000	-5.00000	0.714849
-4.60000	-5.00000	0.792275
-4.50000	-5.00000	0.873982

