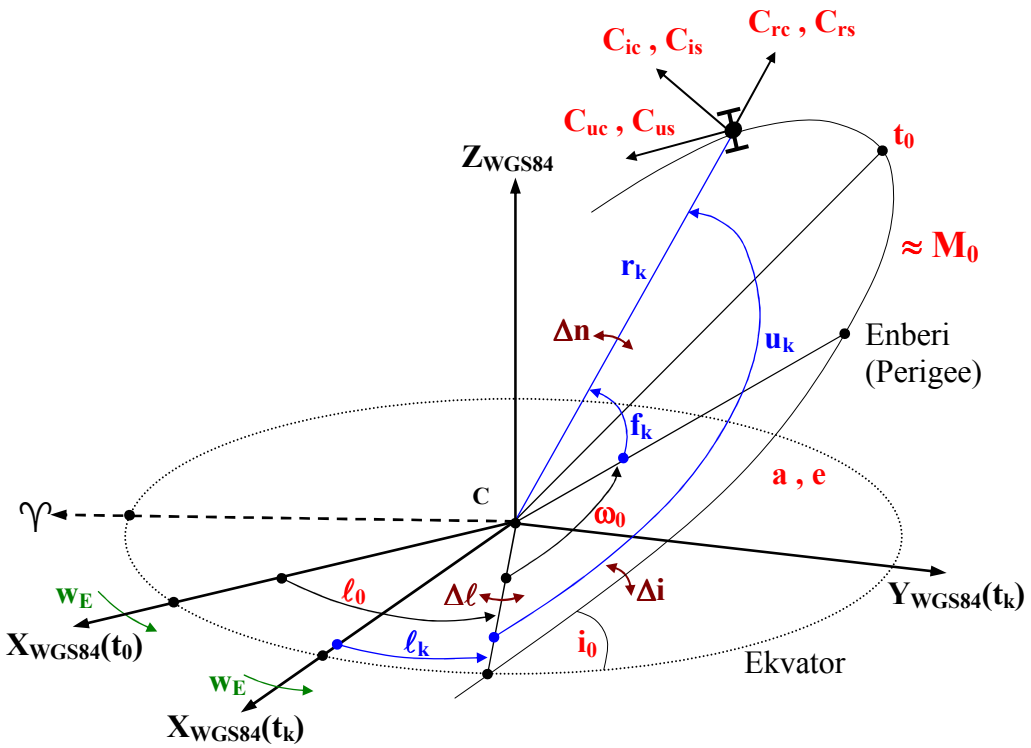
UYGULAM 2: RINEX YÖRÜNGE FORMATI ve UYDU KOORDİNAT HESABI

GPS uydularının yörünge bilgilerin RINEX formatı ve birimleri. Buradaki [sn] birimler GPS zamanındadır. GPS zamanı GPS sistem zaman ölçeğinde GPS Haftası + Saniyesi (Max=604800sn) şeklinde verilir.

Yayın Yörünge Veri Formatı:

PRN Yil Ay Gn ST DK SN		a_0	[sn]	a_1	[]	a_2	[1/sn]
AOE	[sn]	C_{rs}	[m]	Δn	[rad/s]	M_0	[rad]
C_{uc}	[rad]	e	[]	C_{us}	[rad]	$a^{1/2}$	[$m^{1/2}$]
t_0	[sn]	C_{ic}	[rad]	ℓ_0	[rad]	C_{is}	[rad]
i_0	[rad]	C_{rc}	[m]	w_0	[rad]	$\Delta\ell$	[rad/sn]
Δi	[rad/sn]	PL2	[m]	W_{GPS}	[]	iPL2	[m]
Acrc	[]	Helt	[]	GpDy	[sn]	EOT	[sn]
t_c	[sn]						



ÖRNEK: G03 numaralı uydunun 2009 04 25 07 30 00.00 zamanındaki uydu koordinatlarını hesaplayınız.

```
03 09  4 25  6  0  0.0  .384223181754D-03  .522959453519D-11  .000000000000D+00
     .900000000000D+01 -.433750000000D+02  .581559938591D-08  .190797926197D+01
    -.242888927460D-05  .117997978814D-01  .655464828014D-05  .515374227905D+04
     .540000000000D+06 -.262632966042D-06 -.931836266058D+00 -.195577740669D-06
     .926027391409D+00  .238437500000D+03  .897673072235D+00 -.859678666210D-08
    -.606096674931D-09  .000000000000D+00  .152800000000D+04  .000000000000D+00
     .200000000000D+01  .000000000000D+00 -.419095158577D-08  .900000000000D+01
     .539999000000D+06
```

ÇÖZÜM:

GM= 3.98600500000e+14
w_E= 7.2921151467e-05

2009 04 25 07 30 00.00 → $W_{GPS}=W_k=1528$ $W_{second}=t=545400.0$

t = 545400.0
t_0 = 540000.0

$t_k = (W_k - W_0)\,604800 + t - t_0$ = 5400.0 sn

$$M_k = M_0 + \left\{\sqrt{GM/a^3} + \Delta n\right\} t_k \qquad = 2.69559050085380 \text{ rad}$$

$$\left|E_k^{(i+1)} - E_k^{(i)}\right| \le 1e-14 \qquad E_k^{(0)} = M_k$$

$$E_k = M_k + e \sin E_k \qquad = 2.70062680934917 \text{ rad}$$

$$f_k = arctg\left\{\frac{\sqrt{1-e^2}\,\sin E_k}{\cos E_k - e}\right\} \qquad = 2.70563655214907 \text{ rad}$$

$$u_k = w_0 + f_k + C_{uc}\cos\{2(w_0+f_k)\} + C_{us}\sin\{2(w_0+f_k)\} \qquad = 3.60331338805248 \text{ rad}$$

$$r_k = a(1 - e\cos E_k) + C_{rc}\cos\{2(w_0+f_k)\} + C_{rs}\sin\{2(w_0+f_k)\} \qquad = 26844.602472 \text{ km}$$

$$i_k = i_0 + \Delta i\, t_k + C_{ic}\cos\{2(w_0+f_k)\} + C_{is}\sin\{2(w_0+f_k)\} \qquad = 0.92602380408915 \text{ rad}$$

$$\ell_k = \ell_0 + (\Delta\ell - w_E)\, t_k - w_E\, t_0 \qquad = -3.00396685573025 \text{ rad}$$

	BRODCAST	PG03(igs.sp3)	Pre-Brod
$X_k = r_k\,(\cos\ell_k\cos u_k - \sin\ell_k\sin u_k\cos i_k)$	= 22820.3**08336** km	22820.3**10146**	**1.810 m**
$Y_k = r_k\,(\sin\ell_k\cos u_k + \cos\ell_k\sin u_k\cos i_k)$	= 10416.802**264** km	10416.80**2068**	**-0.196 m**
$Z_k = r_k\sin u_k\sin i_k$	= -9558.05**6283** km	-9558.05**5088**	**1.195 m**
r_k	= 26844.60**2472** km	26844.60**3509**	**1.037 m**
$\delta = a_0 + a_1(t-t_c) + a_2(t-t_c)^2$	= 384.2**51427** µs	384.2**39196**	**0.012231 µs**