240(1): Development of the Le Verrier Calculation by Fanside

This is based on the gravitational potential:

$$\phi(\underline{r}) = -G \sum_{i=1}^{N} \frac{m_i}{|\underline{r}_i - \underline{r}|} \quad -(1)$$

which is purely Newtonian. However, if EGR is to be applied correctly it should be based on:

$$\phi(r) = -G \sum_{i=1}^{N} \left(\frac{m_i}{|\underline{r}_i - \underline{r}|} \left(1 + \frac{\alpha m_i G}{c^2 |\underline{r}_i - \underline{r}|^2} \right) \right) \quad -(2)$$

as in note 239(9) and UFT239.

Here:

$$\frac{1}{|\underline{r}' - \underline{r}|} = \left(r^2 - 2\underline{r}\cdot\underline{r}' + r'^2 \right)^{-1/2} \quad -(3)$$

For a continuous distribution:

$$\phi(\underline{r}) = -G \int \frac{\rho(\underline{r}')}{|\underline{r}' - \underline{r}|} d^3r' \quad -(4)$$

from eq. (1), but this should be:

$$\phi(\underline{r}) = -G \int \frac{\rho(\underline{r}')}{|\underline{r}' - \underline{r}|} \left(1 + \frac{\alpha \rho(\underline{r}') G}{c^2 |\underline{r}' - \underline{r}|^2} \right) d^3r' \quad -(5)$$

For self consistency, eq. (5) must be used in

2) The gravitational N body problem.

The procedure used by Fairside is to calculate:

$$\phi(r,\theta) = -G\int_0^\infty\int_0^\pi\int_0^{2\pi} \frac{r'^2\rho(r,\theta)\sin\theta'}{|\underline{r}-\underline{r}'|}\,dr'\,d\theta'\,d\phi' \quad -(6)$$

$$= -2\pi G\int_0^\infty\int_0^\pi r'^2\rho(r',\theta')\sin\theta'\left\langle\frac{1}{\underline{r}-\underline{r}'}\right\rangle dr'\,d\theta'$$

where:

$$\left\langle\frac{1}{|\underline{r}'-\underline{r}|}\right\rangle = \frac{1}{r}\sum_{n=0}^\infty\left(\frac{r'}{r}\right)^n P_n(\cos\theta)P_n(\cos\theta') \quad -(7)$$

when

$$r > r' \quad -(8)$$

and

$$\left\langle\frac{1}{|\underline{r}'-\underline{r}|}\right\rangle = \frac{1}{r'}\sum_{n=0}^\infty\left(\frac{r}{r'}\right)^n P_n(\cos\theta)P_n(\cos\theta')$$

when

$$r < r'. \quad -(9)$$

These are well known methods involving the Legendre polynomials $P_n(\cos\theta)$. The volume integral is:

$$\int d^3r' = \int_0^\infty\int_0^\pi\int_0^{2\pi} r'^2\sin\theta'\,dr'\,d\theta'\,d\phi' \quad -(10)$$

Eq. (6) is purely Newtonian, but if EGR is to be taken seriously it should be as follows:

3)

$$\phi(r,\theta) = -G\int_0^\infty\int_0^\pi\int_0^{2\pi} r'^2\left(\frac{\rho(r')}{|\underline{r}'-\underline{r}|}\left(1+\frac{\phi(r')G}{c^2|\underline{r}'-\underline{r}|^2}\right)\right)\sin\theta'\,dr'\,d\theta'\,d\phi' \quad -(11)$$

and this introduces profound differences into the whole theory.

The Faraday theory considers a uniform ring of mass M and radius r centered at the origin, but completely neglects the second term in eq. (11). The Faraday theory produces:

$$\phi(r) = -\frac{MG}{r}\left(1+\frac{1}{4}\left(\frac{a}{r}\right)^2+\frac{9}{64}\left(\frac{a}{r}\right)^4+\cdots\right) \quad -(12)$$

for

$$r > a \quad -(13)$$

and

$$\phi(r) = -\frac{MG}{a}\left(1+\frac{1}{4}\left(\frac{r}{a}\right)^2+\frac{9}{64}\left(\frac{r}{a}\right)^4+\cdots\right) \quad -(14)$$

for

$$r < a. \quad -(15)$$

These results are applied to the solar system to produce the result for force per unit mass on one planet due to the sun and all the other planets. The mass of the sun is denoted M_0. With these definitions the result is:

4)

$$F(R_i) = -\frac{M_0 G}{R_i^2} - \frac{G}{R_i^2}\sum_{j<i} m_j\left(1+\frac{3}{4}\left(\frac{R_j}{R_i}\right)^2+\frac{45}{64}\left(\frac{R_j}{R_i}\right)^4+\dots\right)$$

$$+\frac{G}{R_i^2}\sum_{j>i} m_j\left(\frac{R_i}{R_j}\right)\left(\frac{1}{2}\left(\frac{R_i}{R_j}\right)^2+\frac{9}{16}\left(\frac{R_i}{R_j}\right)^4+\dots\right) \quad -(16)$$

In order to simplify the problem consider:

$$j<i, \quad j=1, \quad i=2 \quad -(17)$$

then:

$$F(R_2) = -\frac{M_0 G}{R_2^2} - \frac{G}{R_2^2} m_1\left(1+\frac{3}{4}\left(\frac{R_1}{R_2}\right)^2+\dots\right) \quad -(18)$$

$$= -\frac{(M_0+m_1)G}{R_2^2} - \frac{3}{4}\frac{m_1 G R_1^2}{R_2^4} \quad -(19)$$

In a rough first approximation add the term due to the EGR theory for the sun, then:

$$F(R_2) = -\frac{(M_0+m_1)G}{R_2^2} - \frac{3}{2}\frac{G}{R_2^4}\left(\frac{m_1 R_1^2}{2} + \alpha M_0 r_0\right) \quad -(20)$$

It is seen that the term consists of

precession is changed as follows:

$$\boxed{\frac{1}{2} m_1 R_1^2 \rightarrow \frac{1}{2} m_1 R_1^2 + d M_0 r_0} \quad -(21)$$

If:

R_1 = sun to mercury distance $= 5.79 \times 10^{10}$ m

R_2 = sun to earth distance $= 1.50 \times 10^{11}$ m

M_0 = mass of the sun $= 2 \times 10^{30}$ kgm

$r_0 = \frac{2 M_0 G}{c^2} = 2.950 \times 10^{4}$ m

d (Earth) $= 1.496 \times 10^{11}$ m

m_1 = mass of Mercury $= 3.3 \times 10^{23}$ kgm

then:

$$\frac{1}{2} m_1 R_1^2 = \frac{3.3}{2} \times 10^{23} \times 5.79^2 \times 10^{20}$$

$$= 5.53 \times 10^{44} \text{ kgm m}^2$$

and

$$d M_0 r_0 = 1.496 \times 10^{11} \times 2 \times 10^{30} \times 2.95 \times 10^{4}$$

$$= 8.83 \times 10^{45} \text{ kgm m}^2$$

The precession term is almost doubled by the sun's EGR effect alone. Einstein completely neglected this effect and his theory cannot be true.