The Cosmological Rotation Reversal and the Gödel-Brahe model: the Modifications of the Gödel Metric

Moninder Singh Modgil [1]

Abstract

The General Relativistic Gödel-Brahe model visualizes the universe rotating with angular velocity 2π radians/day - around a stationary earth. The wave function of this model of universe ψ_{Univ}, has two chiral states - clockwise and anti clockwise. Due to instabilities in the electromagnetic fields, the wave function can tunnel between the two states. Gödel-Rindler model with a heigth varying acceleration gives the gravitational field of the earth. Gödel-Obukhov model with a sinusoidally varying scale factor gives the yearly north-south motion of the sun. Gödel-Randall-Sundram model with an angular velocity varying with height, gives the yearly rotation of sun with respect to the back ground of the fixed stars. Confinement of light rays due to rotation in the Gödel universe, coupled with an appropriate mapping, generates the illusion of sphericity over a flat earth - with half of earth lit by sun light and the other half in darkness. Finally a metric combining all these properties is given. Discussion of further work is given, namely - (1) Origin of earth's magnetic field due to a charged Gödel universe - with a relation to the Van Allen radiation belt, (2) Geomagnetic reversals due to reversals of cosmological rotation, (3) Caismir energy in the charged Gödel type universe and the energy density required for the Gödel-Brahe model and (4) Behaviour of Causality in Gödel universe and the Einstein-Podolsky-Rosen (EPR) paradox.

[1]PhD, Physics, from Indian Institute of Technology, Kanpur, India, and B.Tech. Aeronautical Engineering, from Indian Institute of Technology, Kharagpur, India.
email: msmodgil@gmail.com

1 Introduction

The endeavour here is to provide an alternative to all the parameters of the Newton-Copernicus heliocentric model, i.e., a modern, general relativistic, geocentric model. An explanation of various observations/phenomena is provided by appropriate modifications of the Gödel [1] line element. The motivation for this paper comes from the concept of periodic evolution of knowledge in a periodic universe [2]. Tycho Brahe of Denmark (in 16th Century) proposed a model of the universe in which the planets rotated around the sun, but sun itself (including rest of the universe), rotated daily around a spherical stationary earth. We identify this daily rotation with the rotation of the Gödel universe - hence the name Gödel-Brahe model. We take a modern-retro step further and do this modelling over a flat stationary earth.

2 General Relativistic Gödel-Brahe Model

Here, we consider various conceptual points of the Newton-Copernicus Heliocentric model - and provide a corresponding explanation in a general relativistic geocentric model. This is done by suitable modifications of the Gödel line element. The points considered are -

1. The relative diurnal rotation between the earth and the universe - responsible for day and night.
2. The apparent yearly north-south movement of the sun - responsible for the seasons.
3. The variation of gravitational field of earth with height.
4. The yearly rotation of sun with respect to the back ground of fixed stars.

2.1 The Gödel Model for the daily relative rotation between the earth and the universe

The line elements of Gödel universe, in various coordinate systems, are as follows are -

- The cartesian [1]-

$$ds^2 = a^2(dx_0^2 - dx_1^2 - dx_3^2 + \frac{e^{2x_1}}{2}dx_2^2 + 2e^{x_1}dx_0dx_2) \tag{1}$$

In the model being proposed here, $\omega = 2\pi$ radians/day is the angular velocity of the universe, rotating above the flat, stationary earth. The ω is given as -

$$\omega = \frac{1}{\sqrt{2}a} = 2\sqrt{\pi G\rho} \tag{2}$$

where, G is the Gravitational Constant, and ρ is the density of the universe.

- The Kundt [**?**] -

$$ds^2 = (dx_0 + \frac{dx}{\zeta y})^2 - (\frac{dx^2 + dy^2}{(\zeta y)^2} + dz^2) \tag{3}$$

- The Cylindrical [1, 4]

$$ds^2 = 4a^2[c^2dt^2 - dr^2 - dz^2 - (\sinh^2 r - \sinh^4 r)d\phi^2 + 2\sqrt{2}\sinh^2 r d\phi c dt] \tag{4}$$

The projection for flat earth used here is the Azimuthal equidistant. The north pole is at center, with a central equator and south pole is mapped as a circle. On an equinox, the Sun is above the equator. Author visualizes that as yet unexplored areas of flat earth continue beyond the south pole - with their own cosmological dynamics. Plane of the flat earth is (r, ϕ). Vertical direction is given by z.

2.2 The Gödel-Rindler model for earth's gravitational field.

The Rindler line element in cylindrical coordinates is -

$$ds^2 = (\alpha z)^2 dt^2 - dr^2 - r^2 d\phi^2 - dz^2 \tag{5}$$

with acceleration α, directed along the z axis.

Acceleration can be made a function of height (the vertical coordinate z), i.e., $\alpha(z)$, over the flat, stationary, earth. Accordingly, the line element for modelling gravitational field of flat, stationary earth is -

$$ds^2 = 4a^2[(\alpha(z)z)^2c^2dt^2 - dr^2 - dz^2 - (\sinh^2 r - \sinh^4 r)d\phi^2 \\ +(\alpha(z)z)2\sqrt{2}\sinh^2 r d\phi c dt] \tag{6}$$

This gives the Newtonian gravitational acceleration of earth with -

$$\alpha(z) = \frac{GM}{z^2} \tag{7}$$

2.3 The Gödel-Obukhov Model for the yearly north-south oscillation of the Sun

The Gödel Obukhov model has been analyzed in considerable detail in [5]. It introduces an expansion of the Gödel universes by attaching a scale factor $R(t)$, to the spatial radial coordinate r, - i.e.,

$$dr \rightarrow R(t)dr \tag{8}$$

Accordingly Gödel-Obukhov line element reads as follow -

$$ds^2 = 4a^2[c^2dt^2 - R(t)^2(dr^2 + dz^2 + (\sinh^2 r - \sinh^4 r)d\phi^2) \\ +2\sqrt{2}R(t)\sinh^2 r d\phi c dt] \tag{9}$$

In [6] an spatially oscillating version of this model is given.

$$ds^2 = 4a^2[c^2dt^2 - (A\sin t + B)^2(dr^2 + dz^2 + (\sinh^2 r - \sinh^4 r)d\phi^2) \\ +2\sqrt{2}(A\sin t + B)\sinh^2 r d\phi c dt] \tag{10}$$

Below we give an element in which the oscillation is yearly, is anisotroic, in north-south direction along the plane (r, ϕ) of the flat earth.

$$ds^2 = 4a^2[c^2dt^2 - (A\sin\frac{2\pi t}{T} + B)^2dr^2 - dz^2 - (\sinh^2 r - \sinh^4 r)d\phi^2 \\ +2\sqrt{2}\sinh^2 r d\phi c dt] \tag{11}$$

In the above equation -

- The sin term gives the yearly north-south oscillation of the sun, of period $T = 1$ year.
- A is the amplitude of the oscillation and is equal to the distance between the equator and tropic of Cancer or Capricorn.
- B is the distance between the north pole and the equator.

2.4 The Gödel-Randal-Sundrum Model for the yearly rotation of the sun with respect to the background of fixed stars

The Randall-Sundrum [?] line element is -

$$ds^2 = e^{f(y)} g_{\mu\nu} dx^\mu dx^\nu + dy^2 \tag{12}$$

where $g_{\mu\nu}$ is the metric on the brane, $f(y)$ is a function of y which corresponds to the bulk direction. In [9] rotation is introduced in the bulk by reinterpreting this line element in context of Gödel universe, as follows. Angular velocity $\omega(z)$ is related to $f(z)$ as -

$$\omega(z) = \frac{1}{\sqrt{2e^{f(z)}}} \tag{13}$$

In the model of flat stationary earth being exposed here following conceptual changes are introduced -

1. The vertical direction z is interpreted as the direction of the bulk.
2. The brane is two dimensional and corresponds to the flat stationary earth.
3. Angular velocity $\omega(z)$ decreases with height z, with appropriate choice of $f(z)$.

In our model, the required line element is (with the term $4a^2$ removed)-

$$\begin{aligned} ds^2 = e^{f(z)}[c^2dt^2 - dr^2 - (\sinh^2 r - \sinh^4 r)d\phi^2 \\ +2\sqrt{2}\sinh^2 r d\phi c dt] - dz^2 \end{aligned} \tag{14}$$

Note that the metric component g_{zz}, corresponding to the vertical direction z, is not being multiplied by the term $e^{f(z)}$. Also note that the term $4a^2$ has not been incorporated, as it is only a scale factor.

Let h_{Moon}, h_{Sun} and h_{Stars}, be the heights of the Moon, Sun and background of fixed stars (assumed to be equidistant from earth and lying on the celestial sphere), respectively. These heights can be calculated from the their observed angular velocities for various forms of $e^{f(z)}$. Note that the moon comes back to its position in approximately one month, about 28 days. Therefore the angular velocity of Moon -

$$\omega_{Moon} = 2\pi(1 - 1/28)\, radians/day \tag{15}$$

Similarly, the Sun takes 1 year (365 days approximately) to return to its initial position. Therefore its angluar velocity is -

$$\omega_{Sun} = 2\pi(1 - 1/365)\, radians/day \tag{16}$$

For the background of fixed stars, ω_{Stars}, can be approximated as -

$$\omega_{Stars} = 2\pi\, radians/day \tag{17}$$

2.5 The consolidated Gödel-Brahe line element

The consolidated Gödel-Brahe line element keeping in mind the discussion in the previous four sub sections is -

$$\begin{aligned} ds^2 = e^{f(z)}[c^2(\alpha(z)z)^2dt^2 - (A\sin\frac{2\pi t}{T} + B)^2dr^2 - (\sinh^2 r - \sinh^4 r)d\phi^2 \\ +2\alpha(z)z\sqrt{2}\sinh^2 r d\phi c dt] - dz^2 \end{aligned} \tag{18}$$

It incorporates elements of - (1) diurnal rotation, (2) yearly north-south oscillation of the sun, (3) variation of acceleration due to gravity with height, and (4) yearly rotation of sun with respect to the background of the fixed stars.

3 Further Work

3.1 Wave function of the Consolidated Gödel-Brahe universe - and the Cosmological Rotation Reversals

Let Ψ represent wave function of the Consolidated Gödel-Brahe universe with $\psi^{\rightarrow}$ and $\psi^{\leftarrow}$ as its eigenfunction - corresponding to the two chiral states. Let $\psi^{\rightarrow}$ corresponding to east-west rotation of the universe - which is the presently the observed one and $\psi^{\leftarrow}$, corresponding to the expected west-east rotation of the universe - which would come about through some instabiities. Let $C^{\rightarrow}$ and $C^{\leftarrow}$ be the corresponding probability amplitudes. We have -

$$\Psi = C^{\rightarrow}\psi^{\rightarrow} + C^{\leftarrow}\psi^{\leftarrow} \tag{19}$$

with the normalization condition -

$$|C^{\rightarrow}|^2 + |C^{\leftarrow}|^2 = 1 \tag{20}$$

Certain instabilities such as those which occur in the electromagnetic field - with c, the velocity of light attaining a value 1000 times its present value would lead to rotation reversal - with the sun rising from the west. Other possibilites mentioned in ancient texts are sun standing still. In fact there may be a large number of Rotational Chiral functions e.g., corresponding to different directions of the rotation axis.

$$\Psi = \sum_{i=1}^{n} C_n \psi_n \tag{21}$$

with the normalization condition -

$$\sum_{i=1}^{n} |C_n|^2 = 1 \tag{22}$$

We may have eras of Rapid-Rotation Reversal (abbreviated as R^3), interspersed with periods of simple Rotation Reversals (abbreviated as R^2). Electromagnetic devices may not function during R^2 and R^3.

3.2 Electromagnetism in the Gödel Type Metrics and the Origin of Earth's Magnetic Field: The Van Hallen Radiation Belts

Romano [4], developed the following Gödel type metric -

$$d\sigma_{\mu}^{2} = dt^{2} + 2\mu sh^{2}r d\phi dt + [(\mu^{2} - 1)sh^{4}r - sh^{2}r]d\phi^{2}, \tag{23}$$

For $\mu = \sqrt{2}$ this line element reduces to the Gödel line element. For all other values of μ, it supports a matter tensor which is having electromagnetic fields and sources. A μ, as a function dependent on spatial coordinates and time, would allow an anisotropic and inhomogenous charge, electric and magnetic distribution -

$$\mu \to \mu(i, r, \phi, z) \tag{24}$$

The field thus generated would be be responsible for earth's magnetic field. The electric field and charge distribution would be responsible for Van Hallen radiation belts.

3.3 Geomagnetic Reversals

Upon cosmological rotation reversals, the earth's Magnetic field described above, would reverse.

3.4 The "No-Jerk Experience", on Rotation Reversals, and the anti-Machian nature of the Gödel universe

In the Newton's rotating bucket experiment, the water surface assumes a parabolic shape after equilibrium. Mach suggested, that if the universe revolved around a stationary bucket - then also the surface of water, would assume a parabolic shape. In spherical rotating earth model, if the earth were to stop and start rotating in the opposite direction - we would feel a monstrous jerk. Now as per Mach's principle, if it is the universe which reverses its rotation, over a spherical earth - the denizens of earth should experience a similar jerk. However, the anti-Machian nature of the Gödel universe does not allow it to happen. Cosmological transitions would be smooth for people on earth [10].

3.5 Sun's Illumination of the Flat Earth - bifurcation of day and night - the Mappings

In the Gödel universe, propagation of Light rays in the (r, ϕ) plane is confined by a horizon. The radius of the Gödel horizon in our model is -

$$R_{Gödel\ Horizon} = 17139.9\ Kilometers \tag{25}$$

In spherical earth model, radius of earth is -

$$R_{Spherical\ Earth} = 6371\ Km \tag{26}$$

In the spherical earth model, on the hemisphere of the area lit up by the sun, the distance along the surface, between equator and north polr is -

$$R^{Day}_{Spherical\ Earth} = 2\pi R_{Spherical\ Earth}/4 = (\frac{\pi}{2})6371\ Km = 10007.5\ Km \tag{27}$$

i.e., one fourth of the circumference of spherical earth. It is reassuring to note that $R_{Gödel\ Horizon}$ and $R^{Day}_{Spherical\ Earth}$ are of the same order of magnitude. The value of horizon with various modifications of Gödel metric may yeld more insight.

3.6 Caismir energy in the charged Gödel type universe and the energy density required for the Gödel-Brahe model

In the Gödel universe with $\omega = 2\pi$ rads/day - the density of the universe is -

$$\rho = 6.3 \times 10^{-3}\ gm/cc \tag{28}$$

While this density is quite high, it has to be investigated, if it can come about by zero point energy considerations - using regularization.

3.7 Behaviour of Causality in Gödel universe and the Einstein-Podolsky-Rosen (EPR) paradox

In [6], acausal nature of Gödel universe is related to acausality of Einstein-Podolsky-Rosen (EPR), experiments. The problem is intertwined with the concept of collapse of wave function.

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