
Journal of Space Science and Astrophysics

HOAJ
Herbert Open Access Journals

Hypotheses Open Access

Scientific exploration on the earth's rotation influenced by torque force

Sepideh Iranfar

Correspondence: siranfar1@gmail.com

Astronomical and Astrophysical Research, Student's Research Committee, Medical Science University of Tabriz, Tabriz, Iran.

Abstract

Earth, the third rocky planet in the solar system is turning around the sun as other solar palents. Earth has multiple movement such as rotation, orbital motion, dance motion-based and precession movement. Each of the movement causes happenings and disturbance in one of them can threat human life. The rotation of the earth has been discussed in this article and the influence of torque force on it, has been surveyed. Two different hypotheses have been discussed in this paper to find out the reason of earth rotation with assuming the difference in the mass and volume. According the studies and analyze extracted information from provided formula, the reason of rotation influenced by torque force can be introduced and also the results are generalized to the second planet of solar system.

Keywords: Earth rotation, solar system, torque force, orbital energy

Introduction

The earth is a stony and habitable planet in the solar system, this planet exists for 4.56 billion years ago. The Earth is changeable, there are many kinds of material around the earth, it has a fluid, mobile atmosphere and oceans, a continually changing global distribution of ice, snow, and water, a fluid core that is undergoing some type of hydromagnetic motion, a mantle both thermally convecting and rebounding from the glacial loading of the last ice age, and mobile tectonic plates [1-5].

The mass of this planet is 5.9736×10^{24} kg and it has 149,597, 870,700 meters (92,955,807 miles) distance from sun, in fact this distance makes earth livable. It has 11.18 kms^{-1} Centrifugal force and 23 hours and 56 minutes and 4.2 seconds period of rotation and 365.256366 days, period of orbital, 23.44 degree Tilt axis, and 0.0167 Eccentricity and 29.78 kms^{-1} mean rates.

Earth is made up of complex, interactive systems that are often unpredictable because of changeable situation. Air, water, land, and life including humans combine forces to create a constantly changing world that we are striving to understand. The Sun drives the thermal balance of our planet and when modulated by orbit-based parameters, determines the seasonal weather cycles of our planet [6-8]. RioSurveying Earth from the unique perspective of space provides the opportunity to see Earth as a whole. Scientists around the world have discovered many investigations onearth by working together and sharing their findings. Earth is the third planet from the sun and the fifth largest in the solar system. Earth's diameter is 12,742 km and just a few hundred kilometers larger than that of Venus. The four seasons are a result of Earth's axis of rotation being tilted more than 23 degrees [9,10].

Protective atmosphere

Near the surface, an ocean of air that consists of 78 percent nitrogen, 21 percent oxygen, and 1 percent other ingredients envelops us. This atmosphere affects Earth's long-term climate and short-term local weather; shields us from nearly all harmful radiation coming from the sun; and protects us from meteors as well. Satellites have revealed that the upper atmosphere actually swells by day and contracts by night due to solar activity [11]. Earth's rotation period relative to the Sun (its mean solar day) is 86,400 seconds of mean solar time. Each of these seconds is slightly longer than an SI second because Earth's solar day is now slightly longer than it was during the 19th century due to tidal acceleration. The mean solar second between 1750 and 1892 was chosen in 1895 by Simon Newcomb as the independent unit of time in his Tables of the Sun. These tables were used to calculate the world's ephemerides between 1900 and 1983, so this second became known as the ephemeris second. The SI second was made equal to the ephemeris second in 1967. Earth's rotation period relative to the fixed stars, called its stellar day by the International Earth Rotation and Reference Systems Service (IERS), is 86,164.098

903 691 seconds of mean solar time (UT1) (23h 56m 4.098 903 691s). Earth rotation period relative to the processing or moving mean vernal equinox, misnamed its sidereal day, is 86,164.090 530 832 88 seconds of mean solar time (UT1) (23h 56m 4.090 530 832 88s) [5]. Thus the sidereal day is shorter than the stellar day by about 8.4 ms [12,13].

The length of the mean solar day in SI seconds is available from the IERS for the periods 1623-2005 (IERS Excess of the duration of the day to 86,400s) and 1962-2005 (IERS Variations in the duration of the day 1962-2005).

Recently (1999-2005) the average annual length of the mean solar day in excess of 86,400 SI seconds has varied between 0.3 ms and 1 ms, which must be added to both the stellar and sidereal days given in mean solar time above to obtain their lengths in SI seconds. The angular speed of Earth's rotation in inertial space is 7.2921150×10^{-5} radians per SI second (mean solar second). Multiplying by (180°/radians)×(86,400 seconds/mean solar day) yields, 360.9856° is mean solar day, indicating that Earth rotates more than 360° relative to the fixed stars in one solar day. Earth's movement along its nearly circular orbit while it is rotating once around its axis requires that Earth rotate slightly more than once relative to the fixed stars before the mean Sun can pass up again, even though it rotates only once (360°) relative to the mean Sun [13]. Multiplying the value in rad/s by Earth's equatorial radius of 6,378,137 m (WGS84 ellipsoid) yields an equatorial speed of 465.1 m/s, 1,674.4 km/h or 1,040.4 mi/h [14,15,16].

Physical effects

The velocity of the rotation of Earth has had various effects over time, including the Earth's shape (an oblate spheroid), climate, ocean depth andflow, and tectonic forces. (Donald L. Hamilton).

Evidence of earth's rotation

The earth's rotation implies that the equator bulges and the poles are flattened, in his Principia. Initial measurements of meridian lengths by Picard and Cassini at the end of the 17th century suggested the opposite. However measurements by Maupertuis and the French Geodetic Mission in the 1730s established the flattening, thus confirming both Newton and the Copernican position [11].

In the Earth's rotating frame of reference, a freely moving body follows an apparent path that deviates from the one it would follow in a fixed frame of reference. Because of this Coriolis effect [17], falling bodies veer eastward from the vertical plumb line below their point of release, and projectiles veer right in the northern hemisphere (and left in the southern) from the direction in which they are shot. The Coriolis effect has many other manifestations, especially in meteorology, where it is responsible for the differing rotation direction of cyclones in the northern and southern hemispheres. Hooke, following a 1679 suggestion from Newton, tried unsuccessfully to verify the predicted half millimeter eastward deviation of a body dropped from a height of 8.2 meters, but definitive results were only obtained later, in the late 18th and early 19th century, by Giovanni Battista Guglielmini in Bologna, Friedrich Benzenberg in Hamburg and Ferdinand Reich in Freiberg, using taller towers and carefully released weights.

Theory of earth rotation

Theory of Earth rotation has been recently considered as one of three pillars of geodesy, besides the subjects of the shape and gravity field of the planet. There are several reasons for that such as: 1) In the epoch of common use of the observations of artificial satellites it is necessary to know the time varisoable transformation matrix between global terrestrial and celestial reference frames, which in turn can be considered as a parameterization of Earth rotation. 2) The Earth orientation parameters (EOP) depend on the shape, internal constitution and rheology, as well as on the dynamical properties of our planet. The time variability of EOP's appear to be a sensitive indicator of global changes taking place in the fluid layers of the Earth, the atmosphere, the ocean, the land hydrology and the liquid core. 3) The use of the space geodetic techniques very long baseline interferometry VLBI, satellite and lunar laser ranging SLR/LLR, and global navigation satellite systems GNSS-increased dramatically the accuracy of EOP determination from about 30 milliarcseconds (mas) in 1970-ties to 0.05 mas, which in turn became a challenge for the modelling and interpretation efforts. This course offers a systematic and modern introduction to the theory of Earth rotation, formulated according to the recent standards and conventions. It begins with general considerations concerning the kinematics and dynamics of the rigid body moving in space, then the description is specified for the Earth by taking into account the parameters of its figure and the model of external gravitational influences. The equations of motion are derived in the linear form, then is computed the solution in the closed form. In the second part of the course the theory is refined by taking into account the deformations of the Earth. It begins with general description of the dynamics of a deformable body which is then split up into translation, rotation and deformation. Then introduced is the model elastic deformations and the corresponding equations of motion. The last part of the course is devoted to the problem of modeling the atmospheric and oceanic influences on Earth rotation [18].

Hypothesis

This study had been done via content analysis, and the purpose is finding out the effect of mass and volume difference on earth rotation by two different assumptions. The mass and volume have changed in two assumptions and the difference are surveyed by international physics formula. Analysis data according to the international lows and formulas is below.

Testing hypothesis

Earth is turning around without stopping and does not fix, according to the statistics and mathematics science, a mate-

rial (substance) can be changeless and fixed whenever the summation of resultant and available forces can be zero. (It is not paid attention to the gravity in this paper) (**Figure 1**).

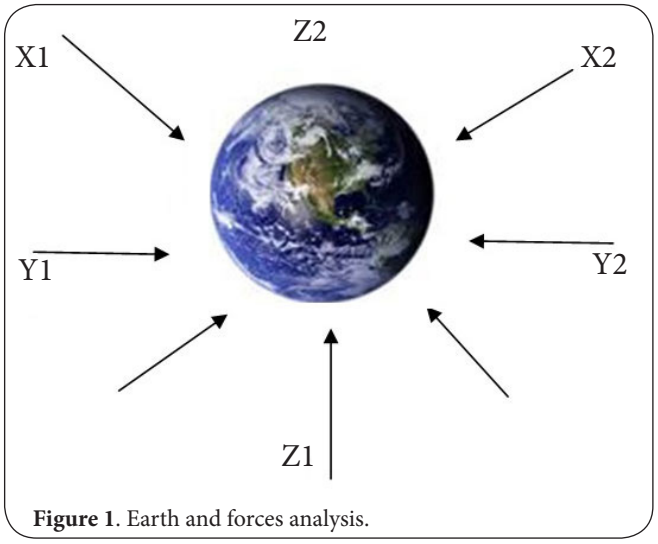

Figure 1. Earth and forces analysis.

$$Z_1=Z_2$$
$$X_1=X_2 \quad (1)$$
$$Y_1=Y_2$$

$$\Sigma F=0$$
$$\Sigma F=0 \quad (2)$$
$$\Sigma F=0$$

According to the forces earth had not any turning these sides, and as we know, everything can be fixed and without any movement when having no torque forces or the sum of resultant torque forces can be zero. (by paying attention to the base).

$$\Sigma=0 \quad (3)$$

We divided earth to two parts as eastern and western from meridian of origin. Western part called PART1 and eastern part called PART2. Imagine the volume of two parts is equal, but the mass of them is not equal, and the number of molecules of mass in PART2 is more than PART1.

In this part the hypothesis is mass difference and the first part of proving of this hypothesis equals to the other expect their masses so it's hesitated to repeat them.

V is volume, M is mass, R is density, P is pressure, H is height, G is the gravitational constant, F is force, A is Area, a is acceleration, D is distance, W is weight force, t is torque force, l is length.

$$V_1=V_2 \quad (4)$$

$$M_1<M_2 \quad (5)$$

$$p=\frac{m}{v} \text{ [19]} \quad (6)$$

$$\rho 1=\frac{m1}{v} \quad (7)$$

$$\rho 2=\frac{m2}{v} \quad (8)$$

According (4) and (5) and (6)

$$\rho_{1<}\rho_2 \quad (9)$$

$$P=\rho gh \quad (10)$$

So

$$P_1=\rho_1 gh \quad (11)$$

$$P_2=\rho_2 gh \quad (12)$$

And

$$H_1=H_2 \quad (13)$$

$$G_1=G_2 \quad (14)$$

Then

$$P_1<P_2 \quad (15)$$

$$P=\frac{N}{A} \quad (16)$$

$$A_1=A_2 \quad (17)$$

According (15) and (16) and (17)

$$N_1<N_2 \quad (18)$$

$$F=ma \quad (19)$$

$$A_1=a_2 \quad (20)$$

According (5)

$$F_1<F_2 \quad (21)$$

$$W=Fd\cos\alpha \quad (22)$$

$$D_1=d_2 \quad (23)$$

$$\cos\alpha_1=\cos\alpha_2 \quad (24)$$

According (21), (22), (23) and (24)

$$W_1=W_2 \quad (25)$$

Or

$$W=p\Delta V \quad (26)$$

According to the hypothesis

$$V_1=V_2$$

So

$$W_1<W_2$$

In the torque force

$$\tau=Nl \quad [20] \tag{27}$$

$$L_1=l_1 \tag{28}$$

$$\tau_1=\tau_2 \tag{29}$$

$$\Sigma\tau_1=\Sigma\tau_2$$

$$\Sigma\tau\neq0$$

Second hypothesis

In this part the hypothesis is volume difference and it's hesitated to repeat all equations because two parts of hypothesizes are completely like each other but their volumes.

$$M_1=M_2 \tag{1'}$$

$$V_2>V_1 \tag{2'}$$

$$p=\frac{m}{v} \tag{3'}$$

$$\rho_{1>}\rho_2 \tag{4'}$$

$$P=\rho gh \tag{5'}$$

And

$$H_1=H_2 \tag{6'}$$

$$G_1=G_2 \tag{7'}$$

Then

$$P_1>P_2 \tag{8'}$$

$$P=\frac{N}{A} \tag{9'}$$

$$A_1=A_2 \tag{10'}$$

According (4'), (5')…. And (10')

$$N_1>N_2 \tag{11'}$$

$$\iota_1=\iota_2 \tag{12'}$$

$$\tau=N\iota \tag{13'}$$

According (11'), (12') and (13')

$$\tau_1=\tau_2 \tag{14'}$$

$$\Sigma\tau\neq0$$

Result

Earth is turning around beam axis, but because of large volume and low difference on the parts the movement is so slow. The atoms in the core are heavy (weighty) and also have slow movement and high viscosity and because of it the destiny difference is relatively constant and does not have any changing in the time.

The convective flow caused moving the metal but this moving is quick slow as well as maybe milliard years times need for two parts to equal each other gradually (mass or volume). Equality of two parts can lid earth to have slow movement and seasons and weather disorder. Finally by equality of two parts, earth rotation will be stopped.

Implications of the hypothesis

Discussion

The purpose of this study is verifying the torque force and introducing this force as the reason of earth rotation. These results can just be generalized to the second planet. Venus is the second planet in the solar system and it is almost like earth and called earth¢s sister.

One of the topic interfered the generalization, is the difference between periods of rotation. Earth rotation period is 23hrs, 56mins and 4.2 secs. (Anti-clockwise rotation) and nevus period rotation is 243days. (Clockwise rotation), according the information, Venus rotation is slowest than earth, the generalization of Venus is below.

Analysis distance from sun

Earth distance from sun is 150×10^9 km and Venus distance from sun is 108×10^9 km, this distance causes to warm Venus more than earth, also the room of Venus is about 90 times denser than earth, these conditions make Venus as a very hot planet which has 240 degree centigrade temperature. By this temperature, internal energy raise and convective flow can be faster as well as fast convective flow causes little difference destiny and slow rotation so that the rotation of Venus is slower than earth. But may be at the beginning of earth creation, every change such as mass or volume changing was done and right now the materials changing are almost constant.

$$F=G\frac{m1.m2}{r^2} \quad [21,22]$$

After analysis the distance of planets, mass of them and forces can be computed.

Venus mass: 4.8686×10^{24}

Venus distance from sun: $1.08\times10^{11}m$

Earth mass: $5.9736\times10^{24}kg$

Earth distance from sun: $149597887.5km\sim1.5\times10^{11}m$

Sun mass: $22\times10^{30}kg$

Gravitational constant: $G=6.67\times10^{-11} n.m^2.kg^{-2}$
Computing for analysis the sun force on the earth.

$$F = 6.67\times10^{-11}\frac{2\times10^{30}\times5.9736\times10^{24}}{(1.5\times10^{11})^2}$$

$$F=3.54168106\times10^{20}\,N$$

Computing for analysis the sun force on the Venus

$$F = 6.67\times10^{-11}\frac{2\times10^{30}\times4.8686\times10^{24}}{(1.08\times10^{11})^2}$$

$$F=55.681404320\times10^{21}\,N$$

According to the calculation, it is found out that the sun force on the Venus is 158.8571 times earth, so earth is freer than Venus, and can move faster. In the other words Venus is influenced by sun more than earth, strong force on the Venus does not let it move fast.

Competing interests
The author declares that he has no competing interests.

Acknowledgement
I am appreciative of my honorable family because of moral support and special thanks to my dear Eric for emotional support and editorial office of Journal of Space Science and Astrophysics.

Publication history
Editor: Muhammad Saleem, Oklahoma State University, USA.
Received: 23-Jul-2015 Final Revised: 01-Sep-2015
Accepted: 11-Sep-2015 Published: 21-Sep-2015

References
1. R. Abarca del Rio, D. Gambisb, D. Salsteinc, P. Nelsonc and A. Dai. **Solar activity and earth rotation variability**. *Journal of Geodynamics*. 2003; **36**:423–443. | Article
2. Dalrymple G.B. **The age of the earth**. *California, Stanford university press*. 1991. | Book
3. Newman, William L. **Age of earth**. *Publication service, USGS*. 2007. | Article
4. Dalrymplr and G. Brent. **The age of earth in the twenty century: a problem solved**. *Geological society London, special publications*. 2001; **190**:205-221. | Article
5. Stassen and Chris. **The age of earth**. *Talk origins archive*. 2005. | Article
6. May RM. **How many species are there in the earth?** *Science publication*. 1998; **241**:1441-1449. | Article | PubMed
7. Riazi, Nematolah, translated by Falahi loghman and Ali. **Introduction to modern astrophysics**. Publication od Avande Andishe. 2011.
8. Stern and David P. **Planetary magnetism**. *NASA*. 2001. | Website
9. Aoki et al. **The new definition of Universal Time**. *Astronomy and Astrophysics*. 1982; **105**:359-361. | Article
10. Michael E. Bakich. **The Cambridge planetary handbook**. 2000; 50. | Book
11. P. Kenneth Seidelmann and Mill Valley. **Explanatory Supplement to the Astronomical Almanac**, **ed**. **Cal**. University Science Books. 1992; 48. | Book
12. F Richard Stephenson. **Historical eclipses and Earth's rotation**. *Astronomy & Geophysics*. 2002; **44**: 22-27. | Article
13. Richard S. Gross. **Earth Rotation Variations – Long Period**. Gross, R. S., Earth Roation Variations-Long Period, in Physical Geodesy, edited by T. A. Herring, Treatise on Geophysics, Elsevier, Amsterdam, in press. 2007; 11. | Website
14. Peter J. Mohr and Barry N. Taylo. **CODATA recommended values of the fundamental physical constants**. *Reviews of modern physics*. 2005; 77. | Pdf
15. Aoki et al. **The new definition of Universal Time**. *Astronomy and Astrophysics journal.* 1982; **105**:359-361. | Article
16. Shank J. B. **The Newton Wars and the Beginning of the French Enlightenment**. *U of Chicago Press*. 2008; 324-355.
17. Arthur N. Cox. **ed.**, **Allen's Astrophysical Quantities**. 244. | Book
18. Aleksander Brzeziński. **Introduction to the theory of Earth rotation**. Faculty of Geodesy and Cartography Astronomy and Geodesy Observatory Warsaw University of Technology. | Pdf
19. Jearl Walker. **Fundamentals of Physics Extended, 9th Edition**. Binder Ready Version Edition. | Book
20. Robert T. Dixon. **Dynamic Astronomy**. *Seattle Pacific University*, Addison-Wesley. | Website
21. Mayer Degani. **Astronomy in plain language, translated by Muhammad R khaje pour**. *Gittishenasi publication*, Tehran.
22. Elske V.P. Smith, Kenneth C. Jacobs and M. Zeilik. **Introductory Astronomy and Astrophysics**. *Published by Saunders College Publishing/ Harcourt Brace*. 1987. | Book

Citation:
Iranfar S. **Scientific exploration on the earth's rotation influenced by torque force**. *J Space Sci Astrophys*. 2015; **1**:1. http://dx.doi.org/10.7243/97-1-1