



Remark on Yefremov's recent papers on gravity assist as possible test of gravitation theory in the Solar System: Evidence from Ancient Book of Astronomy (*Ethiopic Book of Enoch*)

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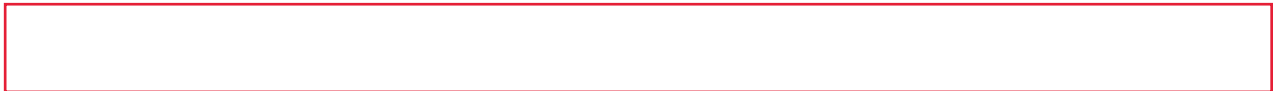
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Abstract

In this article, we give short remark on Alexander Yefremov's 3 recent papers on possibility of using gravity assist as possible test of gravitation theory, including Einstein's GTR. While we applaud at his novel idea, we would like to remark that there is more in gravitation theory to test, rather than just Venus or Jupiter's gravitation. For instance we would like to mention an evidence from the *Ethiopic Book of Enoch*, especially chapter 82, verses 6 and 11, which mentioned that a year was composed of 364 days (more known as Calendar of Solomon). Compared to our present calendar of 365 $\frac{1}{4}$ days in a year, this fact seems to point to the Earth orbiting the Sun in a widening elliptical path. Another possible explanation is that Julian/Gregorian calendar needs to be reconsidered. All in all, these evidences suggest there are more questions need careful testing of gravitation theories.

Introduction

Prof. Alexander Yefremov is a bright mathematical-physicist which held vice rector of RUDN for more than 20 years; besides he held as director of the Institute of Gravitation and

Cosmology, RUDN. This paper is intended as our expression of admiration to his dedicated service to gravitation and cosmology community.

In this article, we give short remark on Alexander Yefremov's 3 recent papers on possibility of using gravity assist as possible test of gravitation theory, including Einstein's GTR [1-3].

Among other things, he wrote on the present status of gravitation theories:

“Yes, the observations of recent years and their results seem to be quite convincing. Nevertheless, all the facts confirming the viability of the GR, in my opinion, have at least two *unpleasant qualities*. First, in all cases, we are, in fact, dealing with isolated observations of very rare natural phenomena: the motion and merging of double massive objects. And secondly, these objects are very far from the observer. And if double pulsars are observed in our Galaxy at distances within "only" 10 thousand light-years, then the range of sources of the first detected gravitational radiation is determined at about 1.3 billion light-years. That is, we are dealing with an event separated from us by a time interval close to 10% of the lifetime of the Universe. So, considering the non-zero probability of changing the law of gravity in time, it is hardly possible to say with confidence that the observed phenomena correspond to the current state of things.”[1]

While we applaud his novel idea of possible use of gravity assist, we would like to remark that there is more in gravitation theory to test, rather than just Venus or Jupiter's gravitation.

For instance we would like to mention an evidence from the *Ethiopic Book of Enoch*, especially chapter 82, verses 6 and 11, which mentioned that a year was composed of 364 days (more known as Calendar of Solomon). Compared to our present calendar of 365¼ days in a year, this fact seems to point to the Earth orbiting the Sun in a widening elliptical path. Another possible explanation is that Julian/Gregorian calendar needs to be reconsidered.

Definition of Gravity Assist (GA) of Yefremov's suggestion

Yefremov argued in favor of using Gravity Assist to test gravitation theories in solar system scale. The gravity assist (GA) maneuver is a regular method used in space missions to boost or detain a spacecraft motion by using a planet's gravity, thus saving chemical fuel [3]. He wrote:

“The GA method combines two main components, a simplified math analysis of the three-body problem and high technology (implementation of high-precision trajectories); however, it solves, in fact, an prosaic practical problem: an economy of fuel required to accelerate the spacecraft and redirect it to the designated goal.” [1]

Main purpose of using GA is to test the reliability of Newton gravitation theory:

“But among these factors, it is as well necessary to know deviation of the law of gravity from its classical Newtonian form. For obvious reasons, the details of calculations of space missions are not advertised; however, one can notice that in each individual case, the developers of such projects try to include the effects of GR.” [1]

Our proposed arguments: Evidence from the Ancient Book of Astronomy

While in principle we agree with Yefremov’s idea to test gravitation theory at the Solar System scale, i.e. a principle which can be expressed as follows “*The Solar System is our lab,*” we got a slightly different idea in mind: i.e. in order to see properly how the Solar System works, one way to check is the use of solar and lunar calendar in the past.

For instance, it is known that Ancient Mesopotamia and also many ancient calendars use lunar calendar, i.e. based on 360 days in a year (12 x 30). Furthermore, we would like to mention an evidence from the *Ethiopic Book of Enoch* [4], especially chapter 82, verses 6 and 11, which mentioned that a year was composed of 364 days (more known as *Calendar of Solomon*). In chapter 82 verse 6, it is written:

“although they belong to the computus of the year and are truly recorded forever: one in the first gate and one in the third and one in the fourth and one in the sixth (gate) and the year is completed in 364 days.”[4, p. 31]

Remark on Astronomical chapters of *Ethiopic Book of Enoch*:

“It has long been recognized that the astronomical chapters of the Book of Enoch constitute a composition of their own without much direct contact with the other parts of the treatise. This does not mean, however, that the astronomical book is unrelated to the rest of the Book of Enoch. On the contrary, its contents reflect faithfully, but in greater detail, the simple cosmologic concepts that prevailed in the communities which produced the Enochian literature.”[4, Introduction]

Compared to our present calendar of 365¼ days in a year, this fact seems to point to the Earth orbiting the Sun in a widening elliptical path. Another possible explanation is that Julian/Gregorian calendar needs to be reconsidered.

Calendar System	Ancient Mesopotamia	Solomon Calendar/ Book of Enoch chapter 82	Julian/Gregorian calendar
Length of year (days)	360 days (lunar)	364 days	365¼ days

Table 1. An indication of lengthening of duration of a year in several ancient calendars.

All in all, these evidences suggest there are more questions needed to address for careful testing of gravitation theories.

Now the question is: *Are there more recent gravitation theories which are capable to address the above fact, while keeping Newtonian gravitation theory at certain limits?*

Theoretical backgrounds

In this section, we outlined several possible theoretical backgrounds which offer us a glimpse into the ancient mysteries of transition from lunar to Solomon to present calendar.

a. A.I. Arbab. In a short review going back to around 2007, we noted:

“An interesting hypothesis has been formulated in this edition, proposed by A. I. Arbab [1,2], based on a proposition of varying gravitational constant, G. The main ideas are pointed out, and alternative frameworks are also discussed in particular because the idea presents a quite different approach compared to the present common beliefs in astrophysics and cosmology, i.e. that the Earth is not expanding because the so-called Cosmological expansion does not take place at the Solar system scale. ... Arbab’s hypothesis is mainly an empirical model based on a set of observational data corresponding to cosmological expansion [1]. According to this model, the day increases at a present rate of 0.002 sec/century.” [5]

Does it imply that the duration of a year extends slowly and gradually? This question seems to be not settled yet.

b. In a 2010 paper in this journal, one of us (VC) wrote on possibility of astrometric changes. And he calculated planetary distance variations due to that cause. He wrote among other things:

“In order to explain time varying Sun-Earth distance, one can use similar analogies, but with introducing a coefficient in order to match with the observed data of Anderson et al. (that is around 15 cm /yr) [1]. The virtue of this calculation is that one can also expect to observe the time varying displacement of the other planets too, compared to their distances to the Sun.”[6]

Result of such a procedure is as shown in Table 2 below.

Table 1. calculation of the time varying displacement of planets from the Sun

planet	distance	displcmt	observd(in cm)	log scale	log scale	log scale
	dist(10 ^{^11} m)	displac(in cm)		dist(10 ^{^11} m)	displac(in m)	observd(in m)
mercury	5,7894	5,51		0,7626	0,74	
venus	10,9506	10,42		1,0394	1,02	
earth	14,9598	14,23	15	1,1749	1,15	1,176
mars	22,7389	21,64		1,3568	1,34	
hungarias	31,4006	29,88		1,4969	1,48	
asteroid	40,3914	38,43		1,6063	1,58	
camilla	47,1233	44,84		1,6732	1,65	
jupiter	77,8358	74,06		1,8912	1,87	
saturn	142,7014	135,77		2,1544	2,13	
uranus	287,0783	273,14		2,4580	2,44	
neptune	450,2896	428,43		2,6535	2,63	
pluto	590,9116	562,23		2,7715	2,75	
2003ub313	777,9089	740,15		2,8909	2,87	

Table 2. Predicted planetary distance variations (after V. Christianto [6])

c. In a more recent paper based on expanding Solar System and expanding Earth, we presented some calculations on possible observables as effect of expanding Solar System [7-7a]. In essence, in that paper we argue that we should be able to observe the effect of varying M (instead of varying G constant) in solar system scale.

Concluding Remarks

In this article, we give short remark on Alexander Yefremov's 3 recent papers on possibility of using gravity assist as possible test of gravitation theory, including Einstein's GTR. While we applaud at his novel idea, we would like to remark that there is more in gravitation theory to test, rather than just Venus or Jupiter's gravitation.

For instance we would like to mention an evidence from the *Ethiopic Book of Enoch*, especially chapter 82, verses 8 and 11, which mentioned that a year was composed of 364 days (more known as Calendar of Solomon). Compared to our present calendar of 365 $\frac{1}{4}$ days in a year, this fact seems to point to the Earth orbiting the Sun in a widening elliptical path.

We offer several possible theoretical frameworks which may be useful for further analysis and predictions.

Nonetheless, more investigations are recommended for test of reliability of gravitation theories.

Acknowledgement

This paper is dedicated to Robert N. Boyd, PhD, for many discussions especially on the non-existence of constants in Physics. One of these authors (VC) would express sincere gratitude to Prof Alexander Yefremov and Prof. The Houw Liong for many insights. Nonetheless, the ideas presented here are our sole responsibility.

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