

Re: Gravity and the Sun

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From: Old Man (nomail_at_nomail.net)

Date: 08/19/04

Date: Thu, 19 Aug 2004 00:25:38 -0500

"JM Albuquerque" <jm.aREMOV.E@sapo.pt> wrote in message
news:2ohuksFb04c0U1@uni-berlin.de...

>

> "Old Man" <nomail@nomail.net> wrote:

>>

>> "JM Albuquerque" <jm.aREMOV.E@sapo.pt> wrote in message

>> news:2of9t7Fa9vo1U1@uni-berlin.de...

>>>

>>> The big question is:

>>> How do you get $GM / r^2 = 0.006 \text{ m/s}^2$???

>>

>> From <http://nssdc.gsfc.nasa.gov/planetary/factsheet/sunfact.html>

>>

>> Sun: $GM = 1.3 \times 10^{20} \text{ m}^3 / \text{s}^2$

>>

>> From <http://nssdc.gsfc.nasa.gov/planetary/factsheet/earthfact.html>

>>

>> Earth's orbit: $R = 1.5 \times 10^{11} \text{ m}$

>>

>> Thus $a = -GM / R^2 = -0.006 \text{ m} / \text{s}^2$

>>

>>> No value of M and r seems to satisfy your above statement.

>>> Can you explain please?

>>

>> JM must explain it. He has made numerous arithmetic errors.

>

>

> You are right Old Man, now I made a stupid arithmetic error with

> the sign of the distance between Earth and Sun, as you have

> pointed out.

>

> Now I get the picture.

> You have assumed that the Earth is free falling around the Sun

> with an acceleration of 0.006 m/s^2 .

> Apparently it doesn't matter what is Earth mass, since that all the

> objects fall at the same rate in a gravity field.

>

sci.physics: Re: Gravity and the Sun

- > *The problem is that Earth speed is a fundamental parameter*
- > *in order that Earth orbit be stable.*
- > *An object stopped at Earth distance from the Sun will fall to the*
- > *Sun along a straight line and will not have a "circular" orbit.*
- > *Earth mass and its kinetic energy is fundamental.*
- > *Without the right mass and the right speed the Earth will not*
- > *orbit the Sun, but will either go away or fall straight to the Sun.*
- >
- > *At this point it is clear that if the Sun gravity is switched off*
- > *during a given period of time the Earth will go away and when*
- > *the Sun gravity is switched on again the new orbit is no longer*
- > *a stable orbit. The new orbit will have excess radius, or else*
- > *a speed deficit.*
- >
- > *Angular momentum must be conserved.*
- > *So, when gravity is switched on again we have already seen*
- > *that Earth speed remains the same, but with a longer radius,*
- > *so that the usual balance between the "gravity force" and the*
- > *"centrifugal force" doesn't balance anymore.*
- >
- > *I know that gravity force and centrifugal force are apparent*
- > *according to the recent physics philosophy, but I'm old and*
- > *I like them very much.*
- >
- > *If this experiment could be done in reality we will know once*
- > *and for all if inertia and centrifugal force exists, or else if the*
- > *Earth orbit radius (or Earth absolute speed) will adjust to obey*
- > *the mathematical formula of the equivalence principle.*
- >
- > *I bet that if the Earth is at a bigger orbit radius with the same*
- > *speed (same angular momentum), when the gravity of the*
- > *Sun is switched on again it must...*
- >
- > *What's your bet ?*
- > *1 – It will spiral inside up to the previous position (the initial orbit).*
- > *2 – It will spiral away and forever.*
- >
- > *I found this to be a difficult question.*
- > *Need to draw a picture on a computer graphic software.*
- >
- > *Applying the angular momentum conservation Law, my bet*
- > *is that Earth will go away due to the inverse square term on*
- > *the radius, which means that inertia really exists, being the*
- > *central force (in the centrifugal force direction) always bigger*
- > *then the central gravity force.*
- >
- > *Motion do cares on inertia, not on the equivalence principle*
- > *written on a paper (a mathematical formula).*
- >
- > *The fact is that unbalanced satellites will fall, or will go away.*
- > *Satellites don't care about the mathematical formula.*

sci.physics: Re: Gravity and the Sun

> *Satellites must have the right speed at the right distance,*
> *or else they will fall or will go away.*
> *The same with the Earth.*
>
> "Old Man" <nomail@nomail.net> wrote:
>>
>> *Old Man gave an expression for delta_R, the difference*
>> *in radial distance between the circular orbit with gravity*
>> *turned-on and the straight-line orbit with gravity turned-*
>> *off. GM / R^2 is the acceleration for the initial circular*
>> *orbit with gravity turned-on. It is assumed that*
>> *delta_R << R and that v*delta_t << R.*
>>
>> *Except for the sign of delta_R, the order of events makes*
>> *no difference. Gravity can either be turned on or off for*
>> *one second. The only difference is in the sign of delta_R.*
>
> *The order of the events is fundamental.*
> *Your vision must be wrong due to what I've explained above*
> *and I resume below.*
> - *The Earth will spiral away forever because the angular*
> *momentum is conserved (same inertia), but the force of*
> *gravity decreases inversely proportional to distance.*

If JM hadn't claimed that Old Man was wrong, Old Man wouldn't bother to reply. JM seems to have delusions of competence.

Under a central gravitational force alone, there is no such beast as "an unstable orbit". The parameters of a unique orbit, energy and angular momentum, are easily perturbed, but they are conserved thereafter. The new orbit doesn't decay or "spiral in or out". Air friction can do that, but that's an additional force not considered here.

In celestial mechanics, the spiral isn't a legal orbit. For a central force, one can have an ellipse, a parabola, or a hyperbola. That's all. No spirals! !!

Here, turning gravity off for a second, the new orbit is an ellipse with the same angular momentum, but with a little higher energy than the previous orbit. It will stay like that forever.

The gravitational and centripetal "forces" for an elliptical orbit aren't in balance. Thus, radial acceleration occurs during most of the orbit.

The mass of the Earth is much less than that of the Sun, and Earth's mass has only an extremely small effect on the solar system's center-of-mass point. That's all.

Re: Gravity and the Sun

sci.physics: Re: Gravity and the Sun

Otherwise, Earth's mass has no effect upon its orbit.

[Old Man]