A Mechanism for Gravitational Force and Observed Rotation in Spiral Galaxies

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Abstract

While general relativity provides an accurate description of spacetime and gravitational forces and effects, it does not provide a mechanism for gravity itself. By explaining the mechanism of gravitational force as a resistance of massive and high energy objects to the observed accelerating expansion of the universe, we simplify and provide a model that does not rely on unobserved particles or other hypothetical factors while staying in agreement with general relativity.

Keywords: general relativity, gravity, galactic rotation, universal expansion

Introduction

A trampoline is often used to demonstrate the curvature of space-time by gravity to students by placing a bowling ball in the center and allowing golf balls to roll across its surface, showing how the mass of the bowling ball produces curved lines of travel. If we instead put this trampoline in deep space and accelerated it against the stationary bowling ball, the same curving effect would be produced by the bowling ball on the golf balls. Much as this bowling ball resists the acceleration of the trampoline against it, mass resists the accelerated expansion of space-time and the effect we observe is gravity.

Discussion

1. Mechanism of Gravitation

According to general relativity, spacetime is warped by massive objects, and therefore causes gravity, but it does not explain the mechanism of gravity.[1][2] I propose that spacetime is warped because massive objects resist the expansion of spacetime and cause a drag on the fabric of spacetime as the universe continues to expand. The expansion of the universe is what creates the effect of gravity as massive objects slow down the expansion of relatively localized areas of space and leads to dips in the expansion rate when compared to areas of lower mass, areas of more empty space. Gravity does not play much of an effect at smaller scales because the particles have such low mass and therefore cause less drag on spacetime. Too much mass over too small of a spacetime area results in a black hole, mass overcomes the expansion of spacetime and as expansion continues, this large mass drags spacetime beyond its normal limits. The mass needed to form a black hole is the mass needed to effectively cancel out the rate of expansion.

If gravity is a localized resistance to universal expansion, then gravitational force is the measure of inertia caused by a mass resisting the change of an expanding universe.

As space and time are connected, time would be the direct measure of expansion of the universe. As you move away from massive bodies, time accelerates just as expansion accelerates. The expansion at extremely massive bodies is halted and therefore time does not just appear to be stopped, it is stopped.

Fig. 1. shows a rough diagram of massive bodies interacting with a simplified 2D model of space time expansion

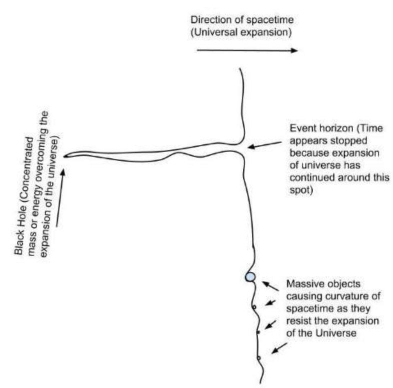

Fig. 1

From my research, this is a novel way to think about the mechanism behind gravity without adding new particles or other unobserved factors while explaining and simplifying the underlying mechanism of gravity.

1.1 Consequences and Predictions

This hypothesis removes the need for several components utilized by competing hypotheses presently proposed for the mechanism of gravitation. New particles, such as the graviton are no longer needed.

This hypothesis would also remove gravity from the fundamental forces category by combining it with mass as a result of expansion on matter/energy instead of a separate, unique entity. An additional explanation for unification is no longer needed as it is already unified with the fundamental forces through mass. This change explains the unusual observation of seemingly universal range and extreme weakness when compared to the other fundamental forces. This range is instead described by universal expansion and force of interaction is defined by the interaction between mass and energy in response to this expansion.

Besides greatly simplifying the idea of the mechanisms that cause gravitation, there are several consequences that can be directly observed with current techniques.

The largest direct consequence of this line of thinking would be in explaining the observed rotation of galaxies. Current models look at rotation from the galactic core outward, which would cause the rotation of outer stars to taper off in rotational velocity. This does not match observations even with the addition of dark matter and energy.[3] However, if gravitation is caused by resistance to expansion, the rotation would occur from the outer parts of the galaxy inward, as less dense regions would have less resistance to change in velocity. This would more closely match the observed rotational velocity curve of spiral galaxies that stays nearly uniform throughout the disk and tapers of as it approaches the galactic core.

Another possible consequence would be the cause of the observed discrepancy in accelerated expansion and predicted expansion between the Planck telescope and the Hubble/Gaia telescopes, with expansion happening faster than expected between the two observations.[4] If relative bubbles of quick expansion were happening between galaxies, galaxies would tend to cluster together as areas of density sorted out with low-density bubbles of spacetime expanding at an ever-increasing pace between mass/energy "anchors".

There are other consequences that may be linked, such as a better description of dark energy in relation to gravitational force and the directionality of time being directly linked to universal expansion.

Conclusions

Since gravity is defined solely by the interaction between mass and energy in response to this expansion, changes in expansion rate would affect the gravitational force observed. Although the rate of expansion has been nearly constant for most of the history of the universe, faster early expansion would result in a model of cosmology with a higher force of gravity correlated to the faster expansion rate.

As always, the testability of an idea is the crux of the problem. There may be a mathematical model based on this thinking that correlates observed trends with future trends in the observed rotation in spiral galaxies versus elliptical, barred, and other galaxy types. There may also be a way to predict expansion between various types of galactic clusters based on the calculated gravitational resistance and rate of expansion that is observed. Addition input from the scientific community will be required to further expand on and test this proposed hypothesis.

References

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