An Explanation for Galaxy Rotation Rates without Requiring Dark Matter

Abstract

The rotation rates of stars in observed Galaxies are almost the same regardless of the distance from the galactic center and can currently only be explained by invoking a huge halo of invisible dark matter filling the space occupied by the galaxy. By realizing that space-time itself is an energy field that can flow, the rotation of galaxies can be explained by space-time also being consumed by the black hole at the center of a galaxy. It is also possible to explain the observed asymmetry in orbital speeds on opposite sides of many Galaxies using this model.

Explanation

The gravity field is a field of energy surrounding matter and is comprised of the sum of all the wave functions of the particles comprising that matter (Ref 1, 2).

Around a star or planet this gravity field is more or less static, and the gravitational acceleration on other matter in this field is determined by the gradient in the energy field's intensity. Thus the acceleration is greater near the star/planet than further away.

In the case of black holes, however, the waves that comprise the energy in the gravity field cannot escape from the black hole (in the same way that light cannot) once closer than the event horizon. Thus, the fabric of space-time - the energy in space due to all the masses in the causally connected Universe (including the black hole's gravity field) - will be unable to escape too. So once a black hole forms, space-time will begin to flow into the black hole.

As the region surrounding the new black hole would then start to have a lower density of energy, more space-time energy field will continue to flow in towards the black hole to fill in the gap.

So there will be a space-time energy field flowing into the black hole, following radial lines inwards, into the black hole from all directions in the space surrounding it.

The effect this flow of space towards the black hole would have on objects embedded in that space (such as other stars/planets) would be for them to flow with the space towards the black hole too. This would appear to an observer on those stars/planets as being a greater acceleration towards the black hole.

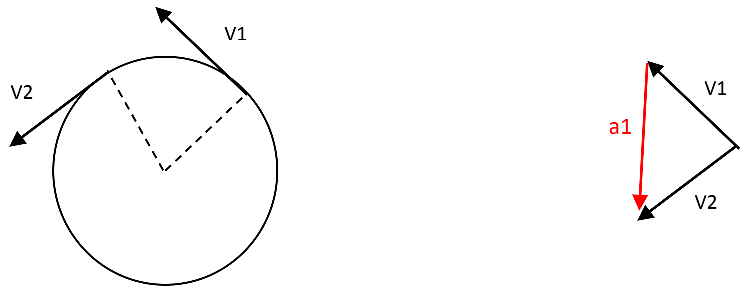
Also as the flow rate of the space-time energy field towards the black hole would be fairly constant with distance away from the black hole, the apparent extra acceleration due to the black hole would be constant with distance.

So this extra effect (that appears to be acceleration) could explain the rotation rate of galaxies which appears to be more or less constant with distance away from galaxy centers. Thus there may be no need for the apparent halo of dark matter in galaxies to explain the galaxy rotation rates that are observed. The equation for determining the gravitational acceleration is correct for space that is stationary, but if the space is flowing then this rate of flow must be considered too (in addition to the acceleration due to the gradient in the gravitational potential) to determine the motion of objects in the gravitational field.

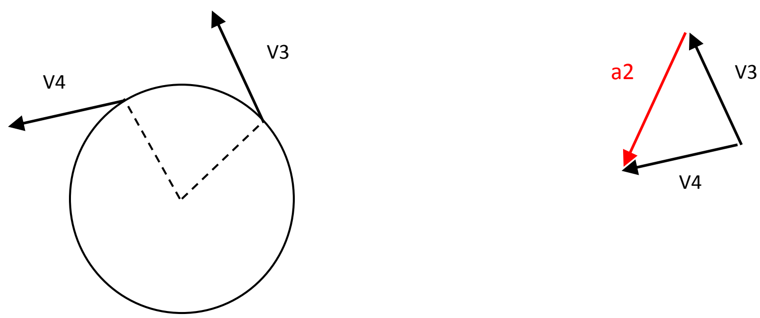
How Inflow of space results in higher orbital speeds:

Each of the following diagrams illustrate a star at two points in its orbit around a Galaxy, and the vector addition of the two velocity vectors of the star at these two points, to give the star's acceleration vector:

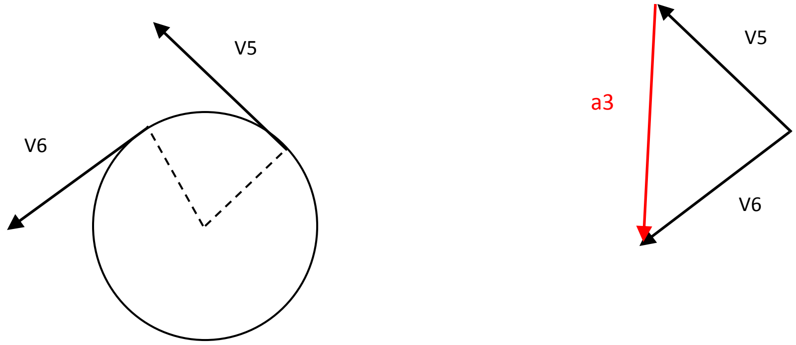
(1) A Star in orbit in a Galaxy with no Black Hole at the center – No inflow of space.



(2) A star in orbit in a Galaxy WITH a Black Hole at the center – space is flowing inwards, causing the star's motion vectors to shift towards the source of the flowing space (as the space field is what defines the star's inertia), resulting in an acceleration with a component tangential to the orbital path.



(3) After the orbital speed has increased due to the tangential acceleration, the star stabilizes in its new orbit (now with higher orbital speed), and the acceleration is now pointing towards the Galactic center again.

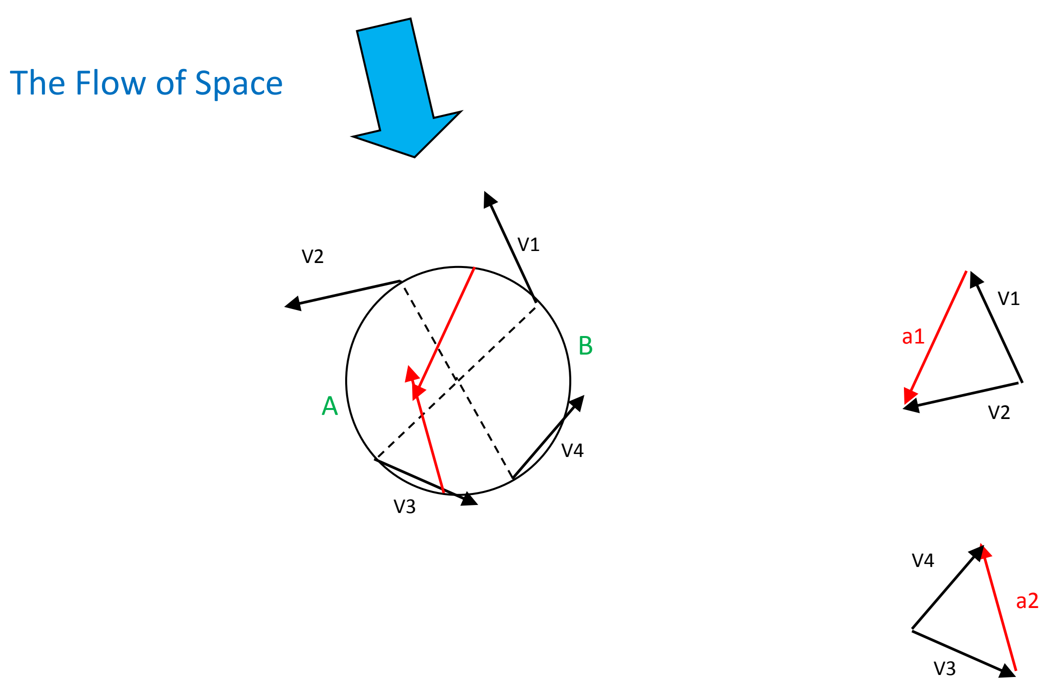


The known asymmetry in orbital speeds explained:

There is a very common feature of observed spiral Galaxies; an asymmetry in the observed orbital speeds of stars on one side of the Galaxy compared to the opposite side. Currently, the only explanation for this is to model the Galaxies as having a lopsided halo of Dark Matter (Ref [4]), such that the gravitational attraction is greater on one side and less on the opposite side. The question remains as to how such a lopsided halo could come into existence, let alone remain stable, as it should naturally equalize and center around the center of mass of the Galaxy (i.e. the Galactic center). My model of space flow can explain this observation in much the same way that it can account for the higher orbital speed of orbiting stars.

See the following diagram that illustrates the explanation for this asymmetry:

Due to the flow of the space field, all of the star's motion vectors are tilted towards the source direction of the space flow, such that the vector difference of two moments in time on each side of the Galaxy gives the acceleration vector for this part of the orbit (at the point mid-way between the star's location at the two moments in time). The acceleration vectors (shown in Red) are pointing towards the center of the Galaxy, as expected, but on one side of the Galaxy the acceleration has a component tangential to the orbit in the direction of motion (so the star's orbital speed increases), and on the opposite side it has a component against the direction of motion (so the star's orbital speed decreases). Thus, the result after the acceleration/deceleration is that the star is orbiting at a higher speed at point A, and a lower speed at point B. Effectively the speed of the space-flow is added onto the star's normal orbital speed at point A, and subtracted from its normal orbital speed at point B. The observed asymmetry in a Galaxy's orbital speed can be used to determine the direction and magnitude of the flow of space at the Galaxy's location.



Proof of Concept:

Open this URL to see the orbital velocity profile for stars in a classical spiral galaxy such as the M33 galaxy:

https://en.wikipedia.org/wiki/File:M33_rotation_curve_HI.gif

By modeling the orbital velocity based on the acceleration experienced by stars orbiting a galaxy where the space-time is flowing in towards the galactic centre at a fixed rate, we can see that the orbital velocity profile matches the observed profile (shown here in the range of distance from 10 to 50 (thousand light years) away from the galactic center:

If the additional acceleration experienced by the stars is a then the orbital velocity can be calculated using the equation:

$$a = \frac{v^2}{r} \quad (1)$$

So rearranging gives:

$$v = \sqrt{ar} \quad (2)$$

Then by plotting the orbital velocity based on distance gives the following graph:

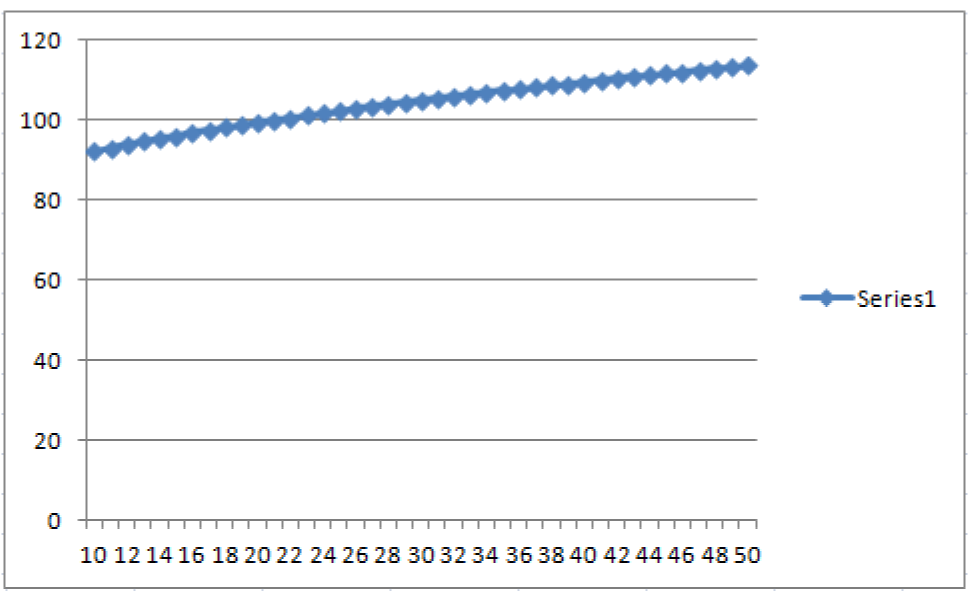


Figure (1) The orbital velocity profile for stars in a spiral galaxy.

Proposed change to the General Relativity Schwarzschild Metric

In order to take account of the flow of space into Black Holes, it is necessary to modify the metric used in General Relativity to describe the gravity around Black Holes. For a spherically symmetrical, non-rotating body this metric is the Schwarzschild Metric [3]. This metric is as follows:

$$ds^2 = -\left(1 - \frac{2GM}{rc^2}\right)c^2dt^2 + \left(1 - \frac{2GM}{rc^2}\right)^{-1} dr^2 + r^2 d\Omega^2 \qquad (3)$$

The inward flow of space into a Black Hole is along the radial direction r and there is no dependence on angle Ω. It represents additional space curvature other than that due to the Gravitational Potential, so the metric should be modified to give a new Metric for Black Holes:

$$ds^2 = -\left(1 - \frac{2Gm}{rc^2} + F(m)\right)c^2dt^2 + \left(1 - \frac{2Gm}{rc^2} + F(m)\right)^{-1} dr^2 + r^2 d\Omega^2 \qquad (4)$$

Here, $F(m)$ is a function defining the flow rate of space into the Black Hole. It is dependent only on the Black Hole's mass; thus a larger Black Hole results in a greater inflow of space. As a Black Hole grows larger over time due to consumption of more mass, the flow rate $F(m)$ will gradually increase also.

CONCLUSION

If you compare the orbital velocity profiles between the URL and Figure (1) above you can see that they are almost identical – showing that this concept works to explain orbital velocities of stars in Galaxies, and the observed asymmetry in orbital speeds of stars on opposite sides of spiral Galaxies. Dark Matter is no longer necessary to explain the observations. A suggested change to the General Relativity Schwarzschild Metric has been made to allow this flow of space into Black Holes within galaxies to be modeled.

REFERENCES

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