

# Dark Matter

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October 19, 2019

Abstract : This is alternate explanation for the problem related with dark matter without modifying gravity. Geometry of spacetime might work differently in large scale than we think. just adding a simple term in the Einstein field equation, we can balance out the problem related to dark matter and dark energy. Gravity is a long distance force and gets weaker on increase in distance but it never get ZERO.

Curvature in the space-time can be add up and merge together to form a bigger curvature and it gets more smoother and stable. This model helps to visualize how curvature of the space-time works from the planets to galaxy. I do believe that this theory is the ultimate answer for the dark matter, but again just I believe in this theory, it does not necessary to be right, it has to be test and verify with different data.

KEY WORDS : GRAVITY, CURVATURE , SPACETIME, V

## INTRODUCTION :

We know how gravity behave and works, from newtonian mechanic to Einstein general relativity curved space-time.

According to general relativity, there is no force, massive object curve the space around it, The Einstein field equations

$$R_{\mu\nu} - 1/2 Rg_{\mu\nu} + \Lambda g_{\mu\nu} = 8\pi G T_{\mu\nu}/c^4$$

$$\text{Curvature from matter in spacetime} + \text{curvature of spacetime itself} = \text{mass energy stress}$$

$\Lambda$  cosmological constant its a energy density of empty space

Or,

$$R_{\mu\nu} - 1/2 Rg_{\mu\nu} = 8\pi G T_{\mu\nu}/c^4 - \Lambda g_{\mu\nu}$$

$$\text{spacetime Curvature} = \text{stress from matter in spacetime} - \text{stress from the empty space itself}$$

equation without cosmological constant

$$R_{\mu\nu} - 1/2 Rg_{\mu\nu} = 8\pi G T_{\mu\nu}/c^4$$

$$\text{spacetime Curvature} = \text{stress from matter in spacetime}$$

No we gonna compare this equation with all the geometric curvature from planet to galaxy

## 1. One massive object in the spacetime:

Image of the star bending spacetime in 2d sheet of paper



**3D MODEL FOR THE CURVATURE OF SPACETIME**



**SIMPLE IMAGE OF THE STAR AND ITS CURVATURE IN THE SPACETIME**

## 2. Planet rotating around the star:

If there is another planet revolving around the star. then, they will have their own curvature in spacetime near by but further out, its merge out and its little more smooth flat curvature with planet than by star itself.

Furthermore,

planets has its own curvature in spacetime but the curvature within the star's curvature.

so

we must add stress from the star's curvature ( $V$ ) also

With stress from matter in the space-time.

So equation must be

$$R_{\mu\nu} - 1/2 R g_{\mu\nu} = 8\pi G T_{\mu\nu}/c^4 + V$$

$$\begin{array}{l} \text{spacetime} \\ \text{Curvature} \end{array} = \begin{array}{l} \text{stress from matter} \\ \text{in spacetime} \end{array} + \begin{array}{l} \text{stress from the} \\ \text{star's curvature} \end{array}$$

Or,

$$R_{\mu\nu} - 1/2 R g_{\mu\nu} - V = 8\pi G T_{\mu\nu}/c^4$$

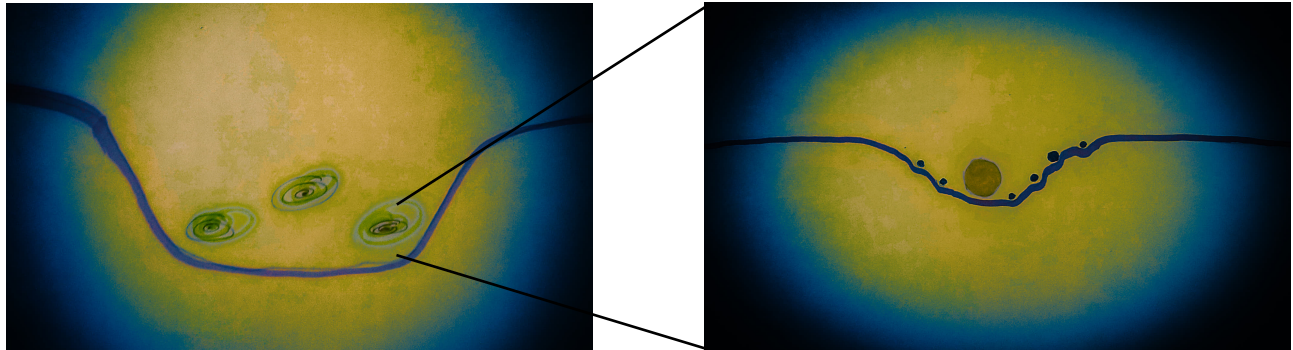
$$\begin{array}{l} \text{Curvature from the} \\ \text{Matter in spacetime} \end{array} - \begin{array}{l} \text{curvature of} \\ \text{the Star} \end{array} = \text{mass energy stress}$$

$V$  is not significant here.



**PLANET REVOLVING AROUND THE STAR**

3. **Solar system:** Now if there are more planets revolving around the star then, its the solar system and now solar system has one big whole giant curvature in the space-time. Still, gravity of the star is dominant here and gravity will weaker by distance from the star.



**GROUP OF SOLAR SYSTEM**

**SOLAR SYSTEM**

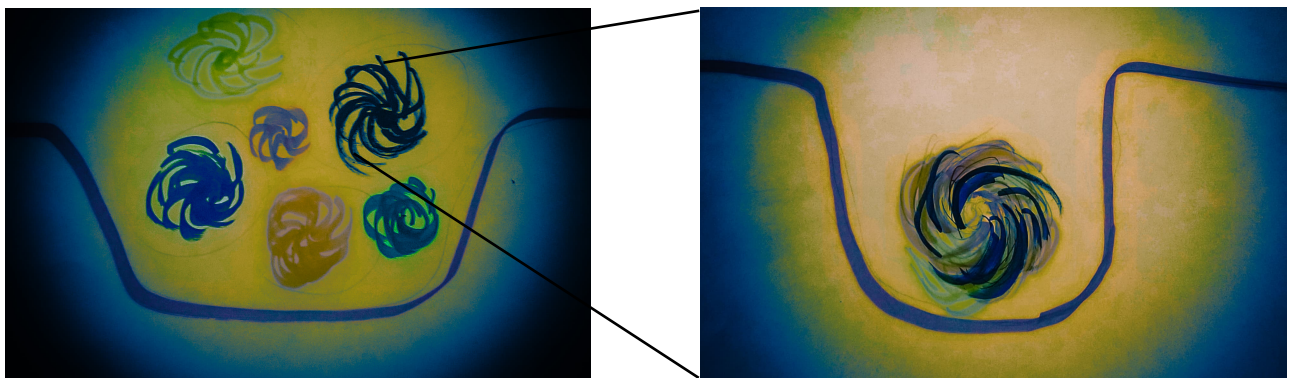
This is how gravity works, curve in the space-time due to mass-energy stress, merge together to become more smoother flat space and stable. It seems like they do need each other to balance out their curved in spacetime.

And they have their own curvature within bigger curvature of the system.

$$R_{\mu\nu} - 1/2 R g_{\mu\nu} = 8\pi G T_{\mu\nu}/c^4 + \Lambda$$

Still  $\Lambda$  not significant

4. **Galaxy:** similarly, when there are millions of star, planets, blackholes, everything will bound by this process, and become a stable galaxy with big distortion in spacetime. Curvature within curvature.



**GALAXY CLUSTERS**

**GALAXY**

Hence, Curvature in space-time and energies relation is balance out in between the two celestial bodies and value of  $V$  is not that significant.

but when there are millions of star, millions of planets, blackholes everything there will be more distorted space, more curvature within curvature and its effect will be so huge that its gonna effect the whole galaxy system And we will eventually have a beautifully bound stable form of galaxy,

And this might be the answer that we looking for

## the Dark matter

Distortion in the spacetime itself. curvature within curvature

$$R_{\mu\nu} - 1/2 R g_{\mu\nu} - V = 8\pi G T_{\mu\nu}/c^4$$

Curvature from the Matter in spacetime - curvature of that system in spacetime = mass energy stress

or,

$$R_{\mu\nu} - 1/2 R g_{\mu\nu} = 8\pi G T_{\mu\nu}/c^4 + V$$

spacetime Curvature = stress from matter in spacetime + stress from the system in spacetime

$V$  is significant

$V$  is just extra term to balance the equation, it come out from the system's curvature. Its actually opposite of  $\Lambda g_{\mu\nu}$ .

## TEST:

This theory explain the all the evidence of the dark matter with out modifying gravity.

We can test this theory with the all the problem related with dark matter.

And we will get a satisfactory answer.

this theory explain all the evidence of dark matter such as galaxy cluster, rotation curve, bullet cluster and cosmic microwave background etc

**Galaxy:** Curvature can be add up and merge out to become more big halos.

Galaxy has its own combined flat smooth curvature in the spacetime, this curvature helps to keep all the star, planets, blackholes everything inside the galaxy,

**rotation curve:** there is a big difference between the solar system and the galaxy, in the solar system star is a dominant gravity and planets revolve around it, and gravity gets weaker with distance while in the galaxy, star planets blackholes are first bound together in the their curvature and then in the whole galaxy's flat smooth sphere curvature. Curvature within curvature

**The Bullet Cluster :** clusters of galaxies has curvature in the space-time, galaxies has curvature within whole galaxy clusters curvature.

while hot gases has mass spread across, and value of  $v$  is not significant.

**Quantity:**  $V$  directly related to the matter in the universe, if you know the amount of matter then, you can know  $V$ .



**prediction :** most important evidence of this theory is that it can predict new data.

**conclusion :**

This theory explain the all the evidence of the dark matter with out modifying gravity. Gravity is not a force that propagates or some particle 'graviton' that carry it. It just a curve in spacetime

when large amount of mass is present. Einstein did it 100 years ago and it's absolutely correct.

Hence, dark matter is not particle its just a curvature of spacetime itself.

I do believe that this theory is the ultimate answer for the dark matter, but again just I believe in this theory, it does not necessary to be right, it has to be test and verify with different data.

## Dark Energy

Closer galaxy bound together and far galaxy tends to accelarate far from each other because there is more space in between the galaxies it kind of act like a self repelling force. curvature of the empty spacetime itself.

And this is **The dark energy.**

Equation with cosmological constant

$$R_{\mu\nu} - 1/2 R g_{\mu\nu} + \Lambda g_{\mu\nu} = 8\pi G T_{\mu\nu}/c^4$$



**CLUSTERS OF GALAXY FAR APART**

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