Missing Mass In Galaxies Using Regression Analysis In Dynamic Universe Model Of Cosmology

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Abstract:

In this present work SITA simulations were used to find out Theoretical star circular velocity curves in a Galaxy (star circular velocity verses star distance from the center of galaxy), depends on various initial conditions and are never half bell shaped curves as predicted by Bigbang cosmologies. Here we are presenting four main cases. In the first case A Galaxy with a huge central mass with star like masses in presence of external galaxies were taken. Theoretical predictions of circular velocities were matching with the observed velocities. In the later cases either Huge central mass was absent or external galaxies were absent or both were absent, the theoretical circular velocities did not match the observations. Hence the question of missing mass does not arise.

Our universe is not a Newtonian type static universe. There is no Big bang singularity, so " What happened before Big bang?" question does not arise. Ours is neither an expanding nor contracting universe. It is not infinite but it is a closed finite universe. Our universe is neither isotropic nor homogeneous. It is LUMPY. But it is not empty. It may not hold an infinite sink at the infinity to hold all the energy that is escaped. This is closed universe and no energy will go out of it. Ours is not a steady state universe in the sense, it does not require matter generation through empty spaces. No starting point of time is required. Time and spatial coordinates can be chosen as required. No imaginary time, perpendicular to normal time axis, is required. No baby universes, black holes or warm holes were built in.

This universe exists now in the present state, it existed earlier, and it will continue to exist in future also in a similar way. All physical laws will work at any time and at any place. Evidences for the three dimensional rotations or the dynamism of the universe can be seen in the streaming motions of local group and local cluster. Here in this dynamic universe, both the red shifted and blue shifted Galaxies co-exist simultaneously.

Key Words

Galaxy: formation, stars: rotation, Galaxy: structure , Galaxy: nucleus , (stars:) supernovae: general, Galaxy: fundamental parameters, Galaxy: general, Galaxy: formation, Galaxy: kinematics and dynamics, cosmology: observations, cosmology: theory, (cosmology:) dark matter, Dynamic universe model, models of cosmology, Disk formation of galaxies, Stability and equilibrium of disks, Large scale structure of universe, singularity-free cosmology, Sita simulations, Dynamic balancing structures, Tautness and gravitation attraction

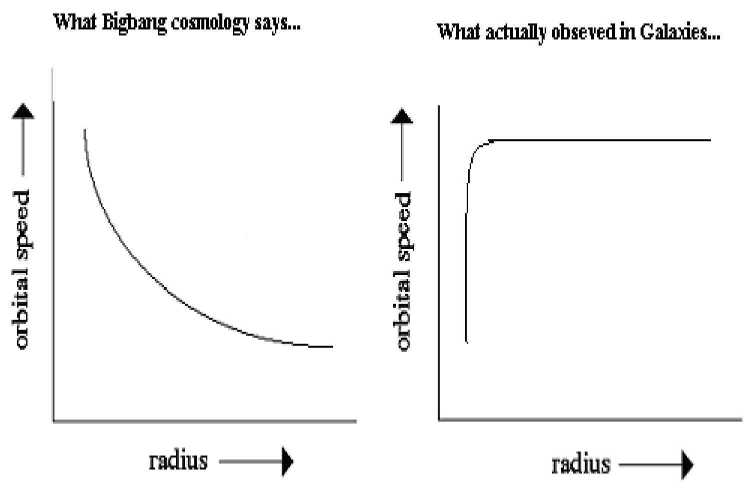
Missing mass : Concept

Theoretical star circular velocities in a Galaxy, in Bigbang cosmologies are predicted as shown in the left of Pic 1. The observed rotation curves are shown on the right side of Pic 1 To determine the rotation curve of the Galaxy, stars are not used, due to interstellar extinction. Instead, 21-cm maps of neutral hydrogen are used. When this is done, one finds that the rotation curve of the Galaxy stays flat out to large distances, instead of falling off as in the figure above. Is this means that the mass of the Galaxy increases with increasing distance from the center? {Ref 56} Here we have predicted using Dynamic universe model cosmology in four different cases and present.

SITA (*Simulation* of *Inter-intra-Galaxy* *Tautness and Attraction forces*) was successful in the formation of Dynamic universe model where Blue shifted Galaxies were also present

(Paper presented by SNP. Gupta, GR17, Dublin, 2004 & Presented in ICR 2005 International Conference on Relativity) , at Amravati University , India, Jan 11-14, 2005. Testing of model and its behavior at micro sec, 1 sec, 1 month, I year , 10 year done. The pictures show a non- collapsing mass distributions and formations of orbits due to mutual gravitational attraction forces. (Paper presented by SNP. Gupta, Brit Grav 4 , Oxford, 2004).

Astronomers started observing the dynamic motions of Galaxies in about 1960. In their study of internal motions / rotation curves of Disks of Galaxies, they were observing the starlight and light is proportional to number of stars or mass in the disk. These observations in mid 1970's started to indicate, what is known as the missing mass problem. The orbital period / speed of some star around its Galaxy center gives the idea of the mean mass inside of its orbit A general distribution plot of such speed vs. radius is depicted below in Picture 1.



Pic1: Rotation Curve of the Galaxy

Using Regression Analysis:

Data from various sources were collected. This data consists of masses, positions, velocities, accelerations, initial velocities, their time stampings etc. From these the data pertaining to Galaxy was separated. Mass center of the data was found. For finding out the present central plane of positions of all masses in the galaxy the following method was used.

Calculate the statistics for a plane by using the "least squares" method that best fits our data. The equation for the plane is: y = m1x1 + m2x2 + ... + b where the dependent y-value is a function of the independent x-values. The m-values are coefficients corresponding to each x-value, and b is a constant value. In this regression analysis, we calculate for each point the squared difference between the y-value estimated for that point and its actual y-value. The sum of these squared differences is called the residual sum of squares. We then calculate the sum of the squared differences between the actual y-values and the average of the y-values, which is called the total sum of squares (regression sum of squares + residual sum of squares). The smaller the residual sum of squares is, compared with the total sum of squares, the larger the value of the coefficient of determination, r2, which is an indicator of how well the equation resulting from the regression analysis explains the relationship among the variables. The accuracy of the plane calculated depends on the degree of scatter in our data. This uses the method of least squares for determining the best fit for the data. When we have only one independent x-variable, the calculations for m and b are based on the following formulae:

$$m = \frac{n(\Sigma xy)(\Sigma x)(\Sigma y)}{n(\Sigma(x^2)) - (\Sigma x)^2}$$

$$b = \frac{(\Sigma y)(\Sigma(x^2)) - (\Sigma x)(\Sigma xy)}{n(\Sigma(x^2)) - (\Sigma x)^2}$$

Dynamic universe model : SNP. Gupta 1B/ Street 57/ Sector 8/ Bhilai 490008,INDIA, Tel +917882242876; snpgupta2000@yahoo.co.in; snp.gupta@gmail.com; snp.gupta@indiatimes.com;

Dynamic Universe Model – Introduction

We can use Galactic dynamics say up to 30kpc (radius of the Milky-way) with out any problem. But just after 30kpc General relativity comes into picture. Why? We are using Galactic dynamics for finding out missing mass of the universe as required for General relativity, with out using General relativistic effects. Every body accepts this. But if it is a nearby galaxy named NGC6822, which is at a center-to-center distance of 48kpc from Milkyway, then General relativity comes into picture. We have to use some General relativistic models like Friedmann-Robertson-Walker model, why? Just after the boundaries of Milkyway? Why can't we use Galactic dynamic models and equations extended further to inter galactic forces also?

Earlier authors like Chandrasekhar [1] developed energy tensor. We will use Virial theorem. We will use Special relativistic effects developed by Einstein and proved by many people with out any problem, like gravitational bending of light, perihelion of Mercury etc. We will differ our way from Einstein starting from General relativity and his cosmological constant λ. We shall ignore Einstein's trials for unified theories.

Mathematical formulation:

Lets assume a non-homogeneous and anisotropic set of N particles moving under mutual gravitation as a system, and these particles are also under the gravitational influence of other systems with a different number of particles in different systems. Also lets assume no uniformity in the particle distribution with respect to size, mass or internal distances. These particle / system distribution need not assume any homogeneity or isotropy. For a broader perspective, lets call this set of all the systems of particles as an Ensemble.

Lets further assume that there are many Ensembles each consisting of a different number of systems with different number of particles. And similarly lets further call a group of Ensembles as Aggregate. Lets further define a Conglomeration as a set of Aggregates. And let a further higher system may have a number of conglomerations and so on and so forth.

Now for the start, lets assume a set of N mutually gravitating particles in a system. Let the α th particle has mass $M\alpha$, and is in position x_{α}. In addition to the mutual gravitational force, there exists an external ϕ_{ext}, due to other systems, ensembles, aggregates, conglomerations etc., which also influence the total force $F\alpha$ acting on the particle α. Here the ϕ_{ext} is not an constant universal Gravitational field. But it is the total vectorial sum of fields at x_{α} due to all the external to its system bodies and with that configuration at that moment of time, external to its system of N particles.

Total Mass of system= $M = \sum_{\alpha=1}^{N} m_\alpha$ (2)

Total force on the particle α is Fα , Let Fαβ is the gravitational force on the α th particle due to βth particle.

$$F\alpha = \sum_{\substack{\alpha\neq\beta \\ \alpha=1}}^{N} F_{\alpha\beta} - m_\alpha \nabla_\alpha \phi_{ext}(\alpha) \qquad (3)$$

Moment of inertia tensor

Consider a system of N particles with masses Mα, at positions Xα, α=1,2,…N; The moment of inertia tensor is in external back ground field ϕ_{ext}.

$$I_{jk} = \sum_{\alpha=1}^{N} m_\alpha x^\alpha_j x^\alpha_k \qquad (4)$$

Its second derivative is

$$\frac{d^2 I_{jk}}{dt^2} = \sum_{\alpha=1}^{N} m_\alpha \left(\ddot{x}^\alpha_j x^\alpha_k + 2 \dot{x}^\alpha_j \dot{x}^\alpha_k + x^\alpha_j \ddot{x}^\alpha_k \right) \qquad (5)$$

The total force acting on the particle α is

$$F^\alpha_j = m_\alpha \ddot{x}^\alpha_j = \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N} \frac{G\, m_\alpha m_\beta (x^\beta_j - x^\alpha_j)}{|x^\beta - x^\alpha|^3} - \nabla \phi_{ext} m_\alpha \qquad (6)$$

Writing a similar formula for F^α_k

$$F^\alpha_k = m_\alpha \ddot{x}^\alpha_k = \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N} \frac{G\, m_\alpha m_\beta (x^\beta_k - x^\alpha_k)}{|x^\beta - x^\alpha|^3} - \nabla \phi_{ext} m_\alpha \qquad (7)$$

$$\text{OR} \Rightarrow \ddot{x}^\alpha_j = \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N} \frac{G\, m_\beta (x^\beta_j - x^\alpha_j)}{|x^\beta - x^\alpha|^3} - \nabla \phi_{ext} \qquad (8)$$

$$\text{and} \Rightarrow \ddot{x}^\alpha_k = \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N} \frac{G\, m_\beta (x^\beta_k - x^\alpha_k)}{|x^\beta - x^\alpha|^3} - \nabla \phi_{ext} \qquad (8a)$$

Lets define Energy tensor (in the external field ϕ_{ext})

$$\frac{d^2 I_{jk}}{dt^2} = 2 \sum_{\alpha=1}^{N} m_\alpha \dot{x}^\alpha_j \dot{x}^\alpha_k + \sum_{\substack{\alpha\neq\beta \\ \alpha=1}}^{N} \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N} \frac{G m_\alpha m_\beta}{|x^\beta - x^\alpha|^3} \{ (x^\beta_k - x^\alpha_k) x^\alpha_j + (x^\beta_j - x^\alpha_j) x^\alpha_k \}$$

$$- \sum_{\alpha=1}^{N} [\nabla \phi_{ext}] m_\alpha x^\alpha_j$$

$$- \sum_{\alpha=1}^{N} [\nabla \phi_{ext}] m_\alpha x^\alpha_k \qquad (9)$$

Lets denote Potential energy tensor = Wjk =

$$= \sum_{\substack{\alpha\neq\beta \\ \alpha=1}}^{N} \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N} \frac{G m_\alpha m_\beta}{|x^\beta - x^\alpha|^3} \{ (x^\beta_k - x^\alpha_k) x^\alpha_j + (x^\beta_j - x^\alpha_j) x^\alpha_k \} \qquad (10)$$

Lets denote Kinetic energy tensor = 2 Kjk =

$$= 2 \sum_{\alpha=1}^{N} m_\alpha \dot{x}^\alpha_j \dot{x}^\alpha_k \qquad (11)$$

Lets denote External potential energy tensor = 2 Φjk =

$$= \sum_{\alpha=1}^{N} [\nabla \phi_{ext}] m_\alpha x^\alpha_j$$

$$+ \sum_{\alpha=1}^{N} [\nabla \phi_{ext}] m_\alpha x^\alpha_k \qquad (12)$$

Hence

$$\frac{d^2 I_{jk}}{dt^2} = W_{jk} + 2 K_{jk} - 2\Phi_{jk} \qquad (13)$$

Here in this case

$$F(\alpha) = \sum_{\substack{\alpha \neq \beta \\ \beta = 1}}^{N} F_{\alpha\beta} - m_\alpha \nabla_\alpha \phi_{ext}(\alpha) \qquad (14)$$

$$= \sum_{\substack{\alpha \neq \beta \\ \beta = 1}}^{N} \frac{G\, m_\alpha m_\beta (x^\beta - x^\alpha)}{|x^\beta - x^\alpha|^3} - \nabla \phi_{ext}\, m_\alpha$$

$$= m_\alpha \left(\ddot{x}^\alpha(\text{int}) - \nabla_\alpha \phi_{ext}(\alpha) \right) \qquad (15)$$

$$\ddot{x}(\alpha) = \sum_{\substack{\alpha \neq \beta \\ \beta = 1}}^{N} \frac{G\, m_\beta (x^\beta - x^\alpha)}{|x^\beta - x^\alpha|^3} - \nabla \phi_{ext} \qquad (16)$$

we know that the total force at $x(\alpha)$ is $F_{tot}(\alpha) = - \nabla_\alpha \phi_{tot}(\alpha)\, m_\alpha$)

⇨ Total PE at $\alpha = m_\alpha\ \phi_{tot}(\alpha) = - \int F_{tot}(\alpha)\, dx$

$$= - \int [\sum_{\substack{\beta = 1 \\ \alpha \neq \beta}}^{N} m_\alpha\ \ddot{x}^\alpha_{int} - m_\alpha \nabla \phi_{ext}(\alpha)]\, dx$$

$$= \int \sum_{\substack{\alpha \neq \beta \\ \beta = 1}}^{N} \frac{G\, m_\beta m_\alpha (x^\beta - x^\alpha)}{|x^\beta - x^\alpha|^3}\, dx - \int m_\alpha \nabla \phi_{ext}\, dx \qquad (17)$$

There fore total Gravitational potential $\phi_{tot}(\alpha)$ at $x(\alpha)$ per unit mass

$$\phi_{tot}(\alpha) = \phi_{ext} - \sum_{\substack{\alpha \neq \beta \\ \beta = 1}}^{N} \frac{G\, m_\beta}{|x^\beta - x^\alpha|} \qquad (18\text{-s})$$

Lets discuss the properties of ϕ_{ext} :-

ϕ_{ext} can be subdivided into 3 parts mainly

ϕ_{ext} due to higher level system, ϕ_{ext} -due to lower level system, ϕ_{ext} due to present level. [Level : when we are considering masses in the same system (Galaxy) it is same level, higher level is cluster of galaxies, and lower level is planets & asteroids].

ϕ_{ext} due to lower levels : If the lower level is existing, at the lower level of the system under consideration, then its own level was considered by system equations. If this lower level exists anywhere outside of the system, center of (mass) gravity outside systems (Galaxies) will act as unit its own internal lower level practically will be considered into calculations. Hence consideration of any lower level is not necessary.

Same argument holds good for ϕ_{ext} due to same level system anywhere. ϕ_{ext} -same level is being calculated in the system under consideration. Later due to C.G. consideration, to gravitational field of same level system outside where taken cared off.

SYSTEM – ENSEMBLE:

Until now we have considered the system level equations and the meaning of ϕ_{ext} Now lets consider an ENSEMBLE of system consisting of N_1, N_2 … Nj particle in each. These systems are moving in the ensemble due to mutual gravitation between them. For example of each system is a Galaxy, then ensemble represents a local group. Then number of Galaxies are j, Galaxies are systems with particles N1, N2 ….NJ, we will consider ϕ_{ext} as discussed above. That is we will consider the effect of only higher level like external Galaxies as a whole, or external local groups as a whole.

Ensemble Equations (Ensemble consists of many systems)

$$\frac{d^2 I^{\gamma}_{jk}}{dt^2} = W^{\gamma}jk + 2 K^{\gamma}jk - 2\Phi^{\gamma}jk \qquad (18\text{-E})$$

Here $^{\gamma}$ denotes Ensemble.

This $\Phi^{\gamma}jk$ is the external field produced at system level. And for system

$$\frac{d^2 I_{jk}}{dt^2} = Wjk + 2 Kjk - 2\Phi jk \qquad (13)$$

Assume ensemble in a isolated place. Gravitational potential $\phi_{ext}(\alpha)$produced at system level is produced by Ensemble and $\phi^{\gamma}{}_{ext}(\alpha) = 0$ as ensemble is in a isolated place.

$$\phi^{\gamma}{}_{tot}(\alpha) = \phi^{\gamma}{}_{ext} - \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\gamma}} \frac{G\ m^{\gamma}{}_{\beta}}{\left| x^{\gamma\beta} - x^{\gamma\alpha} \right|} \qquad (19)$$

There fore

$$\phi_{ext}(\alpha) = \phi^{\gamma}{}_{tot} = - \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\gamma}} \frac{G\ m^{\gamma}{}_{\beta}}{\left| x^{\gamma\beta} - x^{\gamma\alpha} \right|} \qquad (20)$$

And $2\Phi jk =$

$$= - \frac{d^2 I_{jk}}{dt^2} + Wjk + 2\ Kjk$$

$$= \sum_{\alpha=1}^{N} [\nabla \phi_{ext}] m_\alpha \quad x^\alpha{}_j$$

$$+ \sum_{\alpha=1}^{N} [\nabla \phi_{ext}] m_\alpha \quad x^\alpha{}_k \qquad (21)$$

<u>AGGREGATE Equations</u>(Aggregate consists of many Ensembles)

$$\frac{d^2 I^{\delta\gamma}{}_{jk}}{dt^2} = W^{\delta\gamma}jk \quad + 2 \; K^{\delta\gamma}jk \; - 2\Phi^{\delta\gamma}jk \qquad (18\text{-A})$$

Here $^\delta$ denotes Aggregate.

This $\Phi^{\delta\gamma}jk$ is the external field produced at Ensemble level. And for Ensemble

$$\frac{d^2 I^{\gamma}{}_{jk}}{dt^2} = W^{\gamma}jk \quad + 2 \; K^{\gamma}jk \; - 2\Phi^{\gamma}jk \qquad (18\text{-E})$$

Assume Aggregate in an isolated place. Gravitational potential ϕ_{ext} (α) produced at Ensemble level is produced by Aggregate and $\phi^{\delta\gamma}{}_{ext}(\alpha) = 0$ as Aggregate is in a isolated place.

$$\phi^{\delta\gamma}{}_{tot}(\alpha) \quad = \phi^{\delta\gamma}{}_{ext} \quad - \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\delta\gamma}} \frac{G \; m^{\delta\gamma}{}_\beta}{\left| x^{\delta\gamma\beta} - x^{\delta\gamma\alpha} \right|} \qquad (22)$$

There fore

$$\underset{(\text{Aggregate})}{\phi^{\delta\gamma}{}_{tot} \; \alpha} \quad = \underset{(\text{Ensemble})}{\phi^{\gamma}{}_{ext} \, (\alpha)} \quad = - \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\delta\gamma}} \frac{G \; m^{\delta\gamma}{}_\beta}{\left| x^{\delta\gamma\beta} - x^{\delta\gamma\alpha} \right|} \qquad (23)$$

And $\quad 2\Phi^{\gamma}jk =$

$$= \sum_{\alpha=1}^{N^\gamma} [\nabla \phi^\delta{}_{ext}] m_\alpha \quad x^{\delta\alpha}{}_j$$

$$+ \sum_{\alpha=1}^{N} [\nabla \phi^\delta{}_{ext}] m_\alpha \quad x^{\delta\alpha}{}_k \qquad (24)$$

<u>Total AGGREGATE Equations</u> (Aggregate consists of many Ensembles and systems)

Assuming these forces are conservative, we can find the resultant force by adding separate forces vectorially from equations (20) and (23).

$$\phi_{ext}(\alpha) = - \sum_{\substack{\alpha \neq \beta \\ \beta=1}}^{N^{\gamma}} \frac{G\, m^{\gamma}{}_{\beta}}{\left| x^{\gamma\beta} - x^{\gamma\alpha} \right|} - \sum_{\substack{\alpha \neq \beta \\ \beta=1}}^{N^{\delta\gamma}} \frac{G\, m^{\delta\gamma}{}_{\beta}}{\left| x^{\delta\gamma\beta} - x^{\delta\gamma\alpha} \right|} \qquad (25)$$

This concept can be extended to still higher levels in a similar way.

Corollary 1:

$$\frac{d^2 I_{jk}}{dt^2} = Wjk + 2\ Kjk - 2\Phi jk \qquad (13)$$

The above equation becomes scalar Virial theorem in the absence of external field, that is $\phi=0$ and in steady state,

i.e. $$\frac{d^2 I_{jk}}{dt^2} = 0 \qquad (27)$$

$$\Rightarrow\ 2K + W = 0 \qquad (28)$$

But when the N-bodies are moving under the influence of mutual gravitation without external field then only the above equation (28) is applicable.

Corollary 2:

Ensemble achieved a steady state,

i.e. $$\frac{d^2 I^{\gamma}{}_{jk}}{dt^2} = 0 \qquad (29)$$

$$\Rightarrow\ W^{\gamma}jk + 2\ K^{\gamma}jk = 2\ \Phi^{\gamma}jk \qquad (30)$$

This Φjk external field produced at system level. Ensemble achieved a steady state; means system also reached steady state.

i.e. $$\frac{d^2 I_{jk}}{dt^2} = 0 \qquad (27)$$

⇨ $Wjk + 2\,Kjk = 2\,\Phi^{\gamma}jk$ (31)

Assuming Ensemble situated in an isolated place, Gravitational potential $\phi_{ext}(\alpha)$ present at system levels only due to ensemble see eqn (19)

$$\phi^{\gamma}_{tot}(\alpha) = \phi^{\gamma}_{ext} - \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\gamma}} \frac{G\, m^{\gamma}_{\beta}}{\left| x^{\gamma\beta} - x^{\gamma\alpha} \right|} \qquad (19)$$

As Ensemble situated in an isolated place, Gravitational potential $\phi^{\gamma}_{ext}(\alpha) = 0$

$$\phi^{\gamma}_{tot}(\alpha) = \phi_{ext}(\alpha) = - \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\gamma}} \frac{G\, m^{\gamma}_{\beta}}{\left| x^{\gamma\beta} - x^{\gamma\alpha} \right|} \qquad (20)$$

Equation (20) gives $\phi^{\gamma}_{tot}(\alpha)$, that is external potential field present at the system level . Combining Eqn (31) and eqn (9).

$$2\Phi jk = \sum_{\alpha=1}^{N} [\nabla\ \phi_{ext}]\, m_{\alpha}\ x^{\alpha}_{k}$$

$$+ \sum_{\alpha=1}^{N} [\nabla\ \phi_{ext}]\, m_{\alpha}\ x^{\alpha}_{j}$$

$$2\Phi jk = Wjk + 2\,Kjk$$

$$= \sum_{\alpha=1}^{N} [\nabla\ \phi_{ext}]\, m_{\alpha}\ (x^{\alpha}_{k} + x^{\alpha}_{j})$$

$$= \sum_{\alpha=1}^{N} G\, m_{\alpha}\ \{$$

$$- \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\gamma}} \nabla \left(\frac{G\, m^{\gamma}_{\beta}}{\left| x^{\gamma\beta} - x^{\gamma\alpha} \right|} \right) . (x^{\alpha}_{k})$$

$$- \sum_{\substack{\alpha\neq\beta \\ \beta=1}}^{N^{\gamma}} \nabla \left(\frac{G\, m^{\gamma}_{\beta}}{\left| x^{\gamma\beta} - x^{\gamma\alpha} \right|} \right) . (x^{\alpha}_{j}) \qquad (32)$$

SITA (*Simulation* of I*nter-intra-Galaxy* T*autness and* A*ttraction forces*).

SITA is a totally non-general relativistic algorithm. Here in NO way GR effects are taken into consideration. No space-time continuum. No λ factor to introduce repulsion between Galaxies at any distance. In this SITA Simulation Universe is assumed to be dynamically moving & rotating. This is not a static model as assumed by Newton. Additionally on SITA, a inhomogeneous and anisotropic lumpy universe was assumed. Details of the structure formations are given below.

Table 1: Simulation: The different masses and their coordinates in three dimensions and the distances are given in the following table. The masses are in Kilograms, and the distances are given in Metre.

Sl No.	Name	Qty	Approx mass for each (Kg)	Typical mass	Approx xyz coordinates (M)	Typical distance
1	System	10	7.0e+29	Solar mass	1.0e+20	Inside of Galaxy
2	System*10^9	100	5.0e+39	Galaxy Mass /100	1.0e+20	Inside of Galaxy
3	Ensemble	8	5.0e+41	Galaxy Mass	5.0e+23	Inside of cluster
4	Aggregate	8	5.0e+43	Cluster Mass	2.0e+24	Inside of super cluster
5	Conglomeration	7	5.0e+45	Super Cluster	2.0e+25	Inside of Mega cluster
6	Total	133	2.5e+46	Less than Mega cluster	-	-

Please note number of particles in different system is different. The number of system in different ensembles is different. The number of ensemble in different aggregate is different. The number of aggregate in different conglomerates is different. Each particle represent Star, Sun, or Globular Cluster. Each system represents Galaxy. Each Ensemble represents local group. Each aggregate represent cluster. Each conglomerate represents groups of clusters. The masses & distances were simulated according to near real value. Using the equations developed in the mathematic formulation section, calculations are done to find vectorial resultant forces on each particle for above configuration. Starting with one- micro second time step. Later the time step was changed to, one second , one minute, one hour, one day, one week, one month , and one year. These steps were given to give a better resolution of initial stages of formations from the starting of simulation. [SNP. Gupta,2004] (3) Longer time steps were given for seeing the long time effects of the model and were presented in GR17 at Dublin. [SNP. Gupta,2004] (2) Ring formations were observed.

How missing mass problem arouse?

There is a usual conceptual mistake. Newtonian Gravitation or Einstein's General theory of Relativity treated the Multi-body dynamical problem as a single body static problem. The usual situation is, there are many Galaxies present in the universe. In each Galaxy there is a Galaxy center of huge mass and many stars rotating about it. How to tackle this problem? It is usual consider the Galaxy is a solid rotating child's top about a central axis. It may be of disk shape or sphere shape. No external Galaxies, no heavy-duty center, but with uniform density. Hence the rotation curves are drooping curves. But the observations *star circular velocities in a Galaxy,* gives us a different picture. People went for speculating invisible missing mass. There is a search but in vain.

Here I have shown five cases as explained below. In two cases I have not taken the bulky Galaxy center at all, but some stars with or without external Galaxies. In another two cases, I have taken the Galaxy with huge center and stars with or without external Galaxies. It is clearly seen that the predicted *theoretical star circular velocities in a Galaxy* are same as the observations made by the astronomers, in only one case when both the Galaxy center and External Galaxies are present.

Resulting Graphs

In all these cases, I have used SITA simulations for Multi-body dynamic systems, with same initial conditions. I took some stars at star distances and external Galaxies at Galactic distances. I made 100 iterations for uniformity.

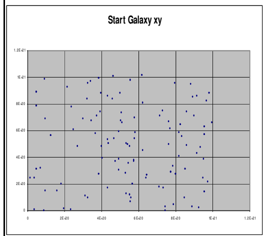
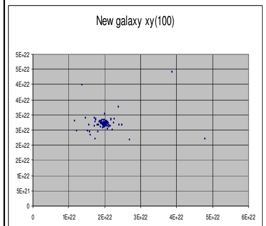
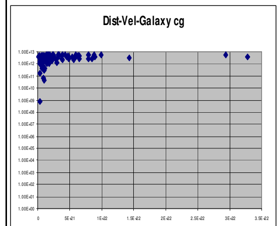
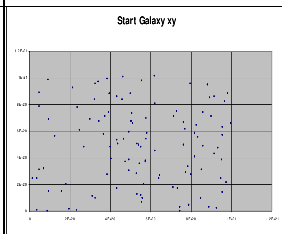
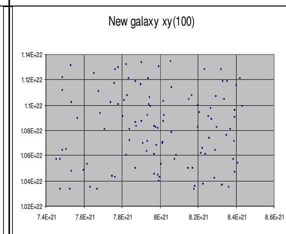
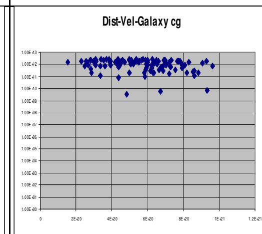
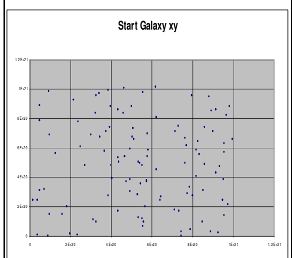
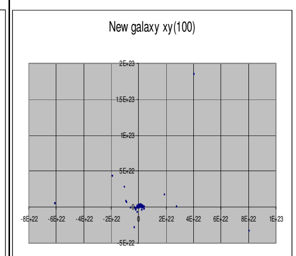
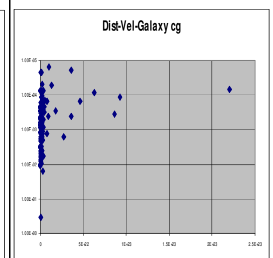
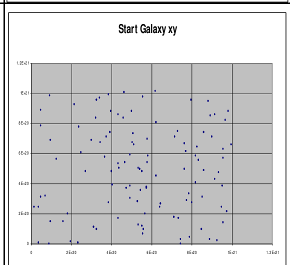
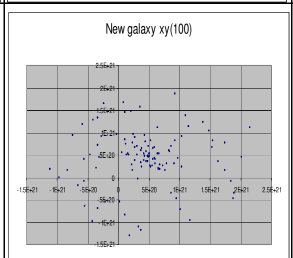
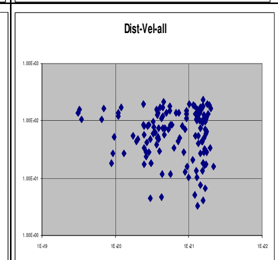
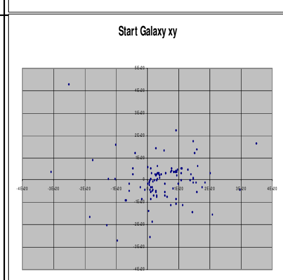
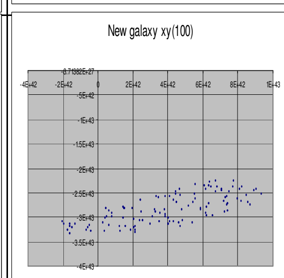
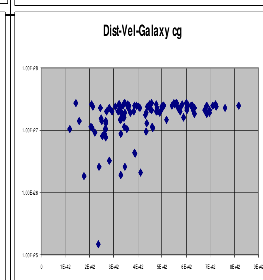
Case 1 : From starting positions to positions after 100 iterations showing disk formation and velocities achieved graph. This is with a *Huge central mass at the center of galaxy, sun like stars and external galaxies xy,* zx position graphs. This Graph shows the theoretical star circular velocity curves in a Galaxy (star circular velocity verses star distance from the center of galaxy)

Case 2 : Similar as above, showing disk formation and velocities achieved graph. This is *without a Huge central mass at the center* of galaxy, sun like stars and external galaxies xy, position graphs

Case3. Similar ascase1, showing disk formation and velocities achieved graph. This is *wih a Huge central mass at the center* of galaxy, sun like stars and *no external galaxies* xy, position graphs.

Case 4. Similar as case 1, showing *no* disk formation and velocities achieved graph. This is *wihout a Huge central mass at the center* of galaxy, sun like stars and *no external galaxies* xy, position graphs.

Case 5. Theoretical star circular velocity curves in a Galaxy (star circular velocity verses star distance from the center of galaxy) in gravitationally stabilized system of masses after forming a galaxy disk. I did it's stability analysis tests, by giving perturbations and Jeans swindle test.

Table : Theoretical Galaxy Circular Vel vs radius Graphs in different cases with start end of 100 iterations positions				
	Case	Starting positions	End of 100 iterations	Velocity vs Gal Radius
1	Case 1 : From starting positions to positions after 100 iterations showing disk formation and velocities achieved graph. This is with a *Huge central mass at the center of galaxy, sun like stars and external galaxies xy,* zx position graphs.			
2	Case 2 : From starting positions to positions after 100 iterations showing disk formation and velocities achieved graph. This is *without a Huge central mass at the center* of galaxy, sun like stars and external galaxies xy, zx position graphs.			
3	**Case 3 : From starting positions to positions after 100 iterations showing disk formation and velocities achieved graph. This is *wih a Huge central mass at the center* of galaxy, sun like stars and *no external galaxies* xy, zx position graphs.**			
4	Case 4 : From starting positions to positions after 100 iterations showing *no* disk formation and velocities achieved graph. This is *wihout a Huge central mass at the center* of galaxy, sun like stars and *no external galaxies* xy, zx position graphs.			
5	Case 5: Theoretical star circular velocity curves in a Galaxy (star circular velocity verses star distance from the center of galaxy) in gravitationally stabilized system of masses after forming a galaxy disk when it's stability analysis was done by giving perturbations and jeans swindle test			

Cases 1,2,3 & 4 show cases with and without central mass and / or external galaxies. We can see clearly ext Galaxies and Central mass in Galaxy is required as dist velocity curves are near to actual observational results. These N-body calculations and results are showing theoretical star circular velocity curves. Do the Galaxies to be assumed to have some missing mass? Is that required**?**

Other Cosmologies - Comparison

Newton's static universe model requires fine balancing of bodies in all directions, so that all bodies stay in static equilibrium of attraction forces. This was described as such equilibrium as though a set of needles is finely balancing on their noses, any small disturbance will cause all to fall. Here in our Dynamic universe model, gravitational attractional forces are balanced, by centrifugal forces not by balancing attraction forces. SITA proves that bodies will not collapse but revolve about each other. Dynamic universe model will not have Big-bang singularity, as we are proposing a nonexpanding anisotropic and heterogeneous universe model without considering the General relativity. This is a Dynamic Universe Model without space-time continuum. No Big bang singularity. Hence singularity theorem is not applicable here. Hawking and Penrose (1969,1996) in their singularity theorem said that ' Isotropic and homogeneous expanding universe, there must be a Big bang singularity some time in the past according to General theory of relativity. PCP was not considered true here as in steady state universe we need not assume any homogeneity and isotropy here at any point of time. This is a non expanding universe and matter need not be created to keep the density constant. The Steady state cosmological model was presented by Hoyle (1948). The perfect cosmological principle (PCP) stated by Hoyle is that, Isotropy and homogeneity and other statistical properties of the universe are time independent. Universe has no beginning. No starting point for time scale. Matter is required to be created to keep the density ρ constant in the expanding universe. { In a recent paper Aguirre and Gratton (2002), time like geodesic are not complete in Hoyle's Steady-state model. They proposed a geodesically complete Steady-state model, in which two universes are simultaneously present. In one of them, the universe is expanding and time is moving forwards, and in the other, it is contracting and time is moving backwards.} Friedmann-Robertson-Walker models are popular. These are standard Bigbang models. Naturally all the problems inherent in the Bigbang models are present here also. In the absence of other working cosmological models, many workers choose these next. Missing mass, lesser age of the universe, anisotropy of cosmic microwave background, Bigbang singularity etc., are some of the problems present in these models. Bowen and Ferreira (2002) said, In models by de Sitter or any other matter filled models, there will be mass loss by scalar charges in these types of expanding universe models. That means a point like particle carrying charge q , acts like a source for mass less scalar field ϕ. It looses its mass in time. There is one more popular line of thought, which is being seen now a days. They are CYCLIC UNIVERSE models presented by many workers. We will see some the recent work done by Steinhardt and Turok, in which the universe starts from Bigbang to end up in Big-crunch only to start again in Bigbang to start the cycle. They attempted to say a little about, what happened before Bigbang. Hawking and Penrose (1960, 1996), (for detailed work see Hawking and Ellis (1973)), in their singularity theorem, showed that Big-crunch heads towards a cosmic singularity, where General relativity fails. After big crunch what happens, nobody knows. There is a basic problem in all these models, including String theory and M-theory; the matter density is significantly low, which makes these models impractical. In these models the universe is flat but not closed. So the question comes what happens to all these radiation? Steinhardt and Turok (2002), presented another model of CYCLIC universe, to overcome the problem of failure of General relativity after Big-Crunch. They pushed the Big-crunch singularity into 5th dimension, so that other three spatial and one time coordinates will be intact. It may be Steady state model or CYCLIC universe model; one thing is there in common. Both types of models ask for the CREATION of matter from vacuum. Earlier on this point the Bigbang people were criticizing the Steady state people. Now lets see about Rotation models presented various authors from Gödel (1949) to Korotky and Obukhov (1996). There were many authors. Gödel (1949) metric described the solution of General relativity with homogeneous space-time and with casualty condition violated. All these people gave mainly a line element as a solution to Einstein's General relativity and tested that solution. No body talked about revolution. Mainly they argued about the rotation of universe, saying "when every thing rotating, why not universe also?" But they have not considered the revolution of parts of the universe. Another difficulty faced by Korotky and Obukhov (1996), is that it is impossible to combine pure rotation with expansion of universe in a solution of General relativity for a pure simple source. There were many authors who faced problems like closed time like curves (CTCs). See Yu. N. Obukhov (1992), and Saulo Carneiro (2000). The problems like non linearity of coordinate axes and interdependency between coordinate axes is still present inherently in all these models.

There is a fundamental difference between galaxies / systems of galaxies and systems that normally use statistical mechanics, such as molecules in a box. The molecules repel each other. But in gravitation we have not yet experienced any repulsive forces. (See for ref: Binny and Tremaine 1987[7]). Only attraction forces were seen. Einstein introduced cosmological constant λ to introduce repulsive forces at large scales like inter galactic distances in his General relativity based cosmological considerations in for expanding universe 1917 [38]. This was not liked by many, and created turbulence in the scientific world. One of the reasons for his cosmological constant λ is that he disliked the picture at infinity given by Newtonian gravitation. Though his ideas about infinity were good, the cosmological constant λand repulsive forces created havoc in the scientific community for at least last hundred years! Almost every worker / scientist in this field faced problems either conceptually or mathematically. Singularities were big hurdles for many of us.

Here Blue and Red shifted galaxies will be present simultaneously. We need not introduce large correction factors to convert Blue shifted galaxies into Red shifted galaxies.

Dynamic Universe Model: EVIDENCES:

Presence of Blue shifted galaxies in the universe, is the main evidence. HUBBLE DEEP SPACE houses thousands of Blue shifted Galaxies which is one of the greatest mysteries for expanding universe models could not explain.

Our galaxy the Milky way is moving with a speed 454 ± 125 km/sec towards l=63° ± 15° and b=-11° ± 14°relative to distant part of samples and 474 ± 164 km/sec towards l=167° ± 20° and b=5° ± 20°relative to nearer part of samples. (JV.Narlikar, (1983)[41]). The local group comprising of Milky way, NGC6822, Andromida galaxy and other dwarf elliptical galaxies, Magellanic clouds rotate about their centers and revolve around a common center. S.M.Faber and David Burstain (1988) in their paper " Motions of galaxies in the neighborhood of Local group " {presented in a symposium,' Large scale motions of universe' Princeton 1988,p118} described the STREEMING motions towards the Great Attractor (located at l =309° and b=+18°) by the local group, Virgo cluster, Ursa major, Centaurus, Camelopardalis, Perseus-Pisces etc ., clusters with speeds ranging up to 1000km/sec. PLEASE NOTE THE DIFFERENCE IN DIRECTIONS OF MOVEMENT AS WELL AS SPEEDS. All these clusters form a super cluster which also rotate and revolve about each other.. Groups of super clusters form Filament structures and to grate walls and so on. This is how our universe is LUMPY and anisotropic even at large scale.

Another piece of supporting evidence for the Dynamic Universe Model was there. There is a considerable discussion was as to whether GA: the Great attractor exists at all. For example D.A. Mathewson, V.L. Ford, M. Buckhorn have measured the peculiar velocities 1355 spiral Galaxies. They find no backside in fall into GA region, rather a bulk flow of about 400 km/sec on the scales of 100 h_o^{-1} MPC. Thus there is a considerable doubt about the existing of an attracting mass there. Both the parties find STREEMING MOTIONS OR BULK FLOW. IF THERE IS NO attracting MASS, THEN WHY THEY ARE MOVING? *THIS SUPER CLUSTER MUST BE IN REVOLUTION MOTION.*

Birch (1982)[44], has discovered the asymmetric distribution of the angles of rotation of polarization vectors of 132 radio sources and tried to explain this via the Global rotation. We think that the asymmetric distribution of the angles of rotation of polarization vectors is due to the galaxies or parts of clusters revolving in different directions.

MISSING MASS CONCLUSION

Multi-body systems can't be approximated by single body system. The external Galaxies and the universe create some forces similar to Gravitational repulsion, which cannot be approximated otherwise. The systems are stable because of the dynamic movement of bodies. It is only the calculation method that is different, and there is no missing mass in any Galaxy. By properly considering different masses, distances and velocities as exactly as possible, all the cosmological problems will be solved to a better degree.

Dynamic Universe Model: Conclusion

We proposed a practical Dynamic Universe Model, which we feel it is sufficient for most of the purposes. If the some people feel, a universe model should discuss about the origin of universe, we feel sorry for them. They're no Bigbang here. This Universe is continuously moving, but going nowhere! Statistical properties are same in the past and in the future. Non-expanding.

Results of SITA:

All the calculations were done using a small number of particles. But the results were extremely encouraging. Always similar pictures formed same mutual Orbits in three dimensions showing good orbiting nature of the universe. Super computers can take up more number of particles and show the non-uniform nature of the universe in a greater detail in a much faster manner.

Irrespective of time step for calculations, and various initial positions of masses, the final stabilized formations of masses were similar. The higher the distance between the masses like mega great walls, the faster the movements are. That is also a similar result in the present universe. The extremely distant galaxies are moving faster with huge red and blue shifts and with higher velocities.

Singularities:

The above sets of equations were used tested many times for calculating different positions in SITA simulations starting with different initial conditions in xyz and time coordinates using some near real values of distances. THEY NEVER GAVE ANY SINGULARITY or any divided by zero error. These equations were tested for a large range of +/- 1e50 meters for xyz coordinate values upto +/- 1e25 seconds for time values. All the equations are working in unison and giving good results. About 15 Digit Accuracies are used through out the calculations and repeatability of getting same number is good in the computer programs and algorithms.

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References

a. SNP.GUPTA, "DYNAMIC UNIVERSE MODEL of cosmology: *Missing mass* in Galaxy" Presented at OMEG05 Origin of Matter and Evolution of Galaxies, November 8-11, 2005 at Koshiba Hall, University of Tokyo, Tokyo

b. SNP.GUPTA, "*Missing mass* in Galaxy using regression analysis in DYNAMIC UNIVERSE MODEL of cosmology" Presented at PHYSTAT05 Conference on 'Statistical Problems in Particle Physics, Astrophysics and Cosmology'' held in Oxford, UK on Sept 12th to 15th, 2005.

c. SNP.GUPTA, "DYNAMIC UNIVERSE MODEL of cosmology: *Missing mass* in Galaxy" Presented in 7th Astronomical conf by HEL.A.S,. Kefallinia, Greece 8-11,Sept, 2005

1. SNP.GUPTA, DYNAMIC UNIVERSE MODEL of cosmology and SITA (*Simulation of Inter-intra-Galaxy Tautness and Attraction forces*). Presented in ICR 2005 (International Conference on Relativity) , at Amravati University , India, Jan 11- 14, 2005 .

2. SNP.GUPTA, DYNAMIC UNIVERSE MODEL of cosmology and SITA (*Simulation of Inter-intra-Galaxy Tautness and Attraction forces* with higher time step). This paper was formally presented in GR17; The 17th international conference on gravitation and relativity, in Dublin, Ireland, 18-24 July 2004.

3. SNP.GUPTA, DYNAMIC UNIVERSE MODEL of cosmology and SITA (*Simulation of Inter-intra-Galaxy Tautness and Attraction forces* with variable time step). The simulations in above paper

were changed to small time steps and were accepted in British Gravity Meeting, in UK. 15-18 Sept 2004 the international conference on gravitation.
4. Chandrasekhar S. :Ellipsoidal figures of equilibrium, Yale university press, 1969.
5. Gödel . K.(1949) Rev. Mod. Phy. 21, 447.
6. SNP. GUPTA :'Multiple bending of light ray can create many images for one Galaxy: in our dynamic universe- A computer simulation' presented in SIGRAV, 18-22 September 2000 , Italy; Edited by R. Cianci, R. Collina, M. Francaviglia, and P. Fré (Eds) in Book "Recent Developments in General relativity Genoa 2000" published by Springer- Verlag Italia, Milano 2002, Page 389.
7. SNP.GUPTA, MULTIPLE BENDING OF LIGHT RAY IN OUR DYNAMIC UNIVERSE; A COMPUTER SIMULATION. Gr15: 15th international conference on gravitational conference on gravitation and relativity, pune, India. 16-21 DEC 1995\7. P116; a6.32 (1997)
8. Jeans J.H., 1919, Phyl.Trans.Roy.Soc. , London, A 218,157.
9. F. Hoyle, MNRAS, 108,372(1948).
10. James Binny, Scott Tremaine in Galactic Dynamics 1987,Princeton Uty Press, Princeton New Jersey, USA.
11. Einstein, A. 1911, "On the influence of Gravitation on the propagation of light", Methuen and company, 1923, Reprinted, Dover publications, 1952, New York, USA.
12. V.A. Korotky, Yu. N. Obukhov, (1996), In Gravity Particles and Space time- edited by P. Pronin, and G. Sardanashvly, (world Scientific, Singapore) p 142. also preprint gr-qc / 9604049.
13. S.W. Hawking, MNRAS **142**, 129, (1969).
14. Einstein, A. 1916, "The foundation of General theory of relativity ", Methuen and company, 1923, Reprinted, Dover publications, 1952, New York, USA.
15. Yu. N. Obukhov, GRG, 1992, Vol 24, No2 , Page 121.
16. Saulo Carneiro,, PRD, (2000), Vol 61, 083506
17. Korotky V. A., Yu. N. Obukhov, (1996), In Gravity Particles and Space time- edited by P. Pronin, and G. Sardanashvly, (world Scientific, Singapore) p 142. also preprint gr-qc / 9604049
18. Pavelkin. V.N, and Panov V.F. (1995), Int. J. Mod. Phy. D4, 161.
19. G. Burbidge, in ' Cosmological parameters and Evolution of the universe,' proceedings of the IAU symposium No183, Kyoto, Japan, 1997, Edited by Katsuhiko Sato (Kluwer Academic, Dordrecht, 1999)
20. Adi Nusser, 2002, MNRAS, 331, 909-916.
21. Kauffmann. G, Nusser. A., Steinmetz. M., 1997, MNRAS, 286, 795.
22. Benson A.J., Cole S., Frenk C.S., Baugh C. M., Lacey C.G. 2000, MNRAS, 311, 793.
23. Diaferio A., Kauffmann. G, Balogh M. L., White S.D.M., Schade., Ellingson E., 2001, MNRAS, 323, 999.
24. Paul J. Steinhardt,, Neil Turok, 2002, PRD, Vol 65, 126003
25. Paul J. Steinhardt,, Neil Turok, hep-th 0111030
26. J.M.M. Senovilla, Phy. Rev. Letter. 64, 2219 (1990).
27. L.F. Jambrina, L.M.G. Romero, PRD 66, 2002, 024027
28. R. Bowen., And P. G. Ferreira , PRD, 66, 2002, 041302®
29. A. D. Miller et al, Astrop, J. Lett. 524, L1, !999.
30. P. de Bernardis et al, Nature London, 404, 955, 2000
31. L.M. Burko., A. I. Harte., E. Poisson, In PRD, vol 65, 2002, 124006
32. S. Perlmutter et al, Astro-ph, / o812133,1998.
33. M.V. John, K.B. Joseph, PRD, Vol 61, 2000, 087304
34. A. Aguirre, & Steven Gratton, PRD, Vol 65, 2002, 083507
35. For a review see, N. Bahcall, J.P. Ostriker, S. Perlmutter et al,., P. J. Steinhardt, Science, 284, 1481, (1999).
36. E.V. Votyakov, H.I. Hidmi, A. De. Martino. DHE. Gross, Phy. Rev . Letter, Vol 89, No.2., 15 July 2002, 031101.
37. T. Padmanabhan, Phys. Rep. 188, 286, (1990)
38. M. Cerruti-sola, P. Cipriani, M. Pettini, Astron- Astro Phy, 328, 339 (2001)

39. P.H. Chavanis, Astron- Astro Phy, 381, 371 (2002).
40. S.N.P. Gupta, 'Absolute Rest frame of reference is not necessary', presented in Symposium on Early Universe SEU, Dec 20-22; 1994, IIT, Madras, India, Proceedings Page 54.
41. Einstein, A. 1917, "Cosmological considerations of General theory of relativity ", Methuen and company, 1923, Reprinted, Dover publications, 1952, New York, USA.
42. S.W. Hawking and G.F.R. Ellis 1973, ' The large scale structure of space time', Cambridge university press.
43. S. Hawking and R. Penrose, 1996, The nature of space time, Princeton University press, Princeton.
44. Jayant. V. Narlikar 1983, 'Introduction to cosmology', Cambridge University press, In India Foundation books 2/19 Ansari Road, Daryaganj New Delhi-110002.
45. Lorenz, Einstein, Minkowski&Hweyl-1923 The principle of relativity, Methuen and company, 1923, Reprinted, Dover publications, 1952, New York, USA
46. Einstein, A. 1911, "On the influence of Gravitation on the propagation of light", Methuen and company, 1923, Reprinted, Dover publications, 1952, New York, USA
47. Birch P. (1982), Nature **208**, 451
48. Korotky V.A., Yu. N. Obukhov, (1994), Gen. Rel. Grav. 26, 429.
49. Broadhurst, T. J., Ellis, R. S. , Koo, D.G., and Szalay, A. S., (1990), Nature, **343**, 726.
50. Phinney, E.S., and Webster, R. L., (1983), Nature, **301**, 735.
51. Birch P. (1983), Nature 3**01**, 736
52. Li-Xin Li, (1998), Gen. Rel. Grav. 30, No3, page 497.
53. Hymn of Creation in Rugveda sloka (10-129-1) to sloka (10-129-7)
54. Aristotle 1952
Robert Temple (2003), Astrophysics and space sciences285; pages 471-477, 2003
56. Further rotation curve of the Galaxy can be found at the following link :
http://abyss.uoregon.edu/~js/images/Gal_rotation.gif

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