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INCORPORATION OF MACH'S PRINCIPLE IN ΛFRW COSMOLOGY THAT DEPENDS DYNAMICALLY OF THE DISTANCE RANGE

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It postulates a FRW cosmological model without dark matter and cosmological term depending the distance scale, in addition to incorporate Mach's principle, is consistent with the observations: rotation curves of the galaxies, the nucleosynthesis primordial and CMB. The dynamic expression of Cosmological term is an alternative to non-baryonic dark matter and a reinterpretation of dark energy.

The Mach principle inspired the General Relativity, by postulating that the local inertial frame is determined in some way by the movement of distant astronomical objects. Assuming that the universe dynamics is prescribed only by the Newton force of gravity we encounter serious difficulties: can not explain the rotation curves of galaxies, in rich clusters of galaxies the observed mass is significantly lower than expected and, in cosmological scales, the observed baryonic matter density is much lower than predicted by the FRW models with cosmological constant and zero curvature. We assume that any particle with nonzero rest mass is subject to the Newtonian gravitational force, and an additional force that varies with the distance inter bodies. Whose origin is baryonic matter, and represents the inertia, of large-scale distribution, of the mass in the Universe (Mach's Principle). The new gravitational interaction is similar to Newton's gravity and act differently on different length scales, as MoND Theory. This potential per unit mass, is null in very near solar system, slightly attractiveness in ranges of interstellar distances, very attractiveness in distance ranges comparable to galaxies cluster and repulsive to cosmic scales(Falcon 2010): $U(r) \equiv U_0(M)(r - r_0)e^{-\alpha/r}$, where $U_0(M)$ is the magnitude that causes the field (in units of N/kg), α is the order of $2.5h^{-1}$ Mpc average value of almost smooth transition distribution of galaxies to strong agglutination, and r_0 is the orden $50h^{-1}$ Mpc average distance between clusters of galaxies (figure 1). But if $r \to 0$ the potential is null, in accordance to the experiments on Earth. For r the order of kiloparsec, we recovers the MOND–Milgrom assumptions. Let us now consider a usual FRW metric an energy-momentum tensor together with the force cosmological $\Lambda \equiv \Lambda(r)$, as dynamic variable. We can write: $\Lambda(r) = \Lambda_0(r - r_0)e^{-\alpha/r}$, where $\Lambda_0 \approx 39H_0^2/c^2 \approx 0.45h^2 10^{-50} m^{-2}$ is a coupling constant. For cosmological distance ranges, the behavior of the Λ is asymptotic and using (2) with $r_c \approx 10h^{-1}$ Mpc (r for which the potential is minimal), then(Falcon 2013): $\Omega_\Lambda \approx \Lambda_0 \frac{c^2}{3H_0^2}(r_c)$; $\Omega_{YIF} \equiv -\frac{c^2\Lambda(r_c)}{3H_0^2}$ then the Friedmann equation is now: $\frac{kc^2}{R^2(t)} = H_0^2\left[\Omega_m\left(1+\Omega_{YIF}\right)+\Omega_\Lambda - 1\right]$, where we used the standar notation for the dimensionless parameters of the density of the matter, cosmological term and the deceleration. Reeplacing (2) into (4) with $r \approx 2r_0$, of the order of $100h^{-1}$ Mpc, as inner the cosmological distance range, we obtain $\Omega_\lambda \approx 0.7$. The incompatibility between the flatness of the Universe and the density of matter in the Friedmann equation is removed, because if that $k = 0$ and $\Omega_\lambda \approx 0.7$ we obtain $\Omega_m \approx \Omega_b = 0.03$ without considering nonbaryonic dark matter.In early universe neither affects the calculation of time decoupling between matter and radiation, neither the primordial nucleosinthesys. Also fully comply the Mach Principle , through of the incorporation of the dynamic cosmological term $\Lambda(r)$. At large distances from the sources, the reduction in the Newtonian field would be offset by an interaction that is growing at much greater distances. These long–range interaction could be caused by the baryonic mass and would be calculable with physics usual.

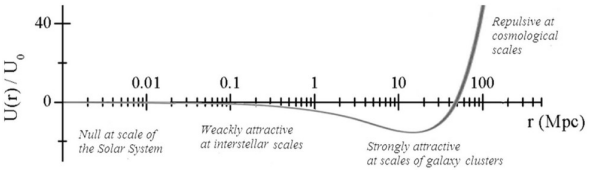

Fig. 1. Potential per unit mass versus distance scale

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