3. Dark Matter and Black Holes

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In [1] and [2] we have shown that this altered structure of the universe together with Einstein's constant Λ can still be described by equation $\frac{\ddot{R}}{R} = -\frac{8\pi G}{3}(\rho + 3\frac{P}{c^2}) + \frac{c^2}{3}\Lambda$ (1).

Now we want to go even further and transfer the equation additionally to smaller regions of space, which form an approximately closed subsystem, with similar conditions.

The density is not supposed to change very much. If we assume further simplified spherical symmetry and a resting space, then we can again use the Principal Function of the Lagrange Density together with lambda as an approach.

$$S_g = -\frac{c^3}{16\pi k}\int (G + 2\Lambda)\sqrt{-g}\,d\Omega \quad (2)$$

Lambda Λ is also here a constant, which keeps the starting position in relation to every possible center seen from the outside in equilibrium to the total size. At the edge of such a space area, the motion should be equal to v_1, i.e. correspond to the respective shell velocities of the universe. Then we can make the same transformations as in [2] without change and get again the Einstein equation

$$R_{ik} - \frac{1}{2}g_{ik}R_{ik} = -\frac{8\pi k}{c^4}T_{ik} - gik\Lambda \quad (3)$$

In the same way also the Robertson-Walker Metric can be used and also the approach of a hydrodynamic model for the impulse tensor $T_{ik} = (\rho + P/c^2)u_i u_k - Pg_{ik}$, shall be used here. Thus the same equations follow for sufficiently large areas as for the universe as a whole.

$$\left(\frac{\dot{R}}{R}\right)^2 = -\frac{k}{R^2} + \frac{8\pi G}{3}\rho + \frac{c^2\Lambda}{3} \quad (4)$$

$$2\frac{\ddot{R}}{R} + \left(\frac{\dot{R}}{R}\right)^2 = -\frac{k \cdot c^2}{R^2} - \frac{8\pi G}{c^2}P + c^2\Lambda \quad (5)$$

$$\frac{\ddot{R}}{R} = -\frac{8\pi G}{3}(\rho + 3\frac{P}{c^2}) + \frac{c^2}{3}\Lambda \quad (6)$$

Let's also set k=1 and write $v_1 = c\frac{R_1}{R_U}$ that at the transition the movement size corresponds with the shell movement as boundary condition. The acceleration $\ddot{R}_N$ of the smaller space area referred to the new zero point is then zero at the edge.

Thus after (6) on a fixed radius shell a corresponding acceleration lies, which is determined only in connection with the local density (the pressure is to be neglected) and by a constant. Density is a local quantity, whereas lambda is determined by the total, self-contained system. The uniformly matter-filled universe as a whole should remain in a state of equilibrium together with lambda. The density changes with the radius, but not over a large area in time. In spatially limited extent it can come, from the purely ordered state, to movements and interactions, which lead from the ordered distribution to a more chaotic agglutination, which leads then again locally to strong density fluctuations.

The equation says nothing about how the particles work together. In particular, it does not explain how the particles move with each other and how the interactions take place. This will not be discussed further for the moment.

The starting point is an ordered, spherical symmetrically structured, uniformly distributed position system of particles that is created from the outer to the inner and in which the outer new particles initially have no connection between the particles. This becomes only gradually possible. It comes to an information exchange (interactions) and this leads to movements of the particles, which become ever more cross-linked and more complex, attract them thereby and condense to ever larger areas. Only then do the laws of Newton become macroscopically effective, the masses attract each other more and more and an acceleration towards the center of this mass concentration follows.

This connection between the particles, which still has to be clarified in detail, leads to an attraction of the particles and thus to an increase in density. If the original density distribution change then after (6) the density term dominates locally, which leads to a movement opposite to the total acceleration? In the universe as a whole, this would be acceleration towards the center. If the universe would contract, we would have a movement away from the center.

In a next step, the basic equations, which apply to the overall structure, should now also be decisive for any other system that behaves on a small scale comparable to the universe on a large scale.

In particular, there would be clusters of galaxies, galaxies or solar systems that have separated from the whole space and form a new subsystem, to which equation (6) should then apply. The space acceleration corresponds to that of the subsystem before it contracts, thus defining lambda for the subsystem.

The subsystem now contracts, so the density increases, this leads to a contrary motion. In the subsystem, lambda stands for a basic acceleration that is directed inwards and the density for an acceleration that is opposite to the direction of motion.

We have already found that the state of the inner particles is unstable and that the particles inside can move away from their position. In addition, we know that the density can change very much locally, that the ordered structure only has to be preserved for the edge.

If the inner particle connection changes with time due to collisions and interaction forces, then the acceleration of the particle group also changes and joins together more and more. At the edge the density is then lower and thus we have here a local acceleration towards the inside.

We try to estimate the quantities plausibly. At first we will calculate with an assumed current radius of 13.7 billion years.

Since the acceleration at R_U is zero, with (6) $\frac{8\pi G\rho}{3}=\frac{c^2}{3}\Lambda$ is valid and thus

$\Lambda = 5{,}9\cdot 10^{-53}m^{-2}$ the result is what corresponds to an acceleration $a_{Ru}=2{,}3\cdot 10^{-10}ms^{-2}$ to the outer at the edge of (or an acceleration of the same magnitude to the inside from the density term).

If we further assume that the size of the proton mass gives us the position on R in the overall structure $\left(\frac{R_1}{R_e}=\frac{M_{U_0}}{M_P}\right)$ then we are at $R_1 = 3\cdot 10^{24}m$.

Since Λ is constant, but the density within the universe increases, the acceleration is calculated according to (6) at our position $\frac{\ddot{R}}{r}=-\frac{8\pi G\rho_1}{3}$, the term Λ was neglected.

Together with the local density of $\rho_1=\frac{M_{Uo}}{4\pi R_1^2 R_e}$ and the identity $\frac{2GM_{Uo}}{R_e c^2}=1$, the value for Λ at our position to $\Lambda_1=\frac{1}{R_1^2}$ with R_1, follows $\Lambda_1 = 1{,}1\cdot 10^{-49}m^{-2}$ as a determining factor for our system.

For the vacuum, depending on the distance to the origin of the new subsystem, the additional inward acceleration is at $a_{1i}=\frac{\Lambda_1 c^2}{3}R_{1i}$.

If we know the position of the origin of the galaxy cluster belonging to us, then we could calculate how large the accelerations are there.

A precise analysis is extremely difficult because the Virgo Super Cluster, whose system we belong to, moves in the direction of the Great Attractor and probably the Shapley Super

Cluster behind it [Fig.1]. In addition, there are particulate motions that overlap the movements of the galaxies and complicate the determination of the center. The Virgo cluster itself is about 65 million ly away. Let us take for example a magnitude of about 22 mill. ly distance to the system center, then leads us to an acceleration of $a_1 = 2 \cdot 10^{-9} ms^{-2}$ and an Λ_2 that our Milky Way system determined by $\Lambda_2 = \frac{1}{R_2^2} = 2.4 \cdot 10^{-47} m^{-2}$. This constant is now a quantity that leads everywhere in our Milky Way to an additional inward acceleration, where the density in space is negligible. This increase in acceleration raises with R_{2i} the radius of the system and is at a distance from our Sun of about 26,500 ly [Fig.2] at $a_2 = \frac{\Lambda_2 c^2}{3} R_S = 1.7 \cdot 10^{-10} ms^{-2}$, which under the conditions above, corresponds exactly to the deviation of our measurement data from the theory ($1.8 \cdot 10^{-10} ms^{-2}$), whereby no additional dark matter is needed.

At an assumed distance of 26 million ly, this leads to a basic acceleration of $a = 1.2 \cdot 10^{-10} ms^{-2}$. This acceleration would then correspond to an additional quantity, which constantly increases with distance and coincides with the MOND Theory of Milgrom [3], [4].

This approach can thus describe all galaxy progressions that fit Milgrom's Theory [5], [6], [7] and his measurements of galaxies.

Anomalies, occurring in our solar system during swing-by-flights of Voyager I and II as well as at the changing astronomical unit can also be associated with these additional accelerations [8], [9], [10].

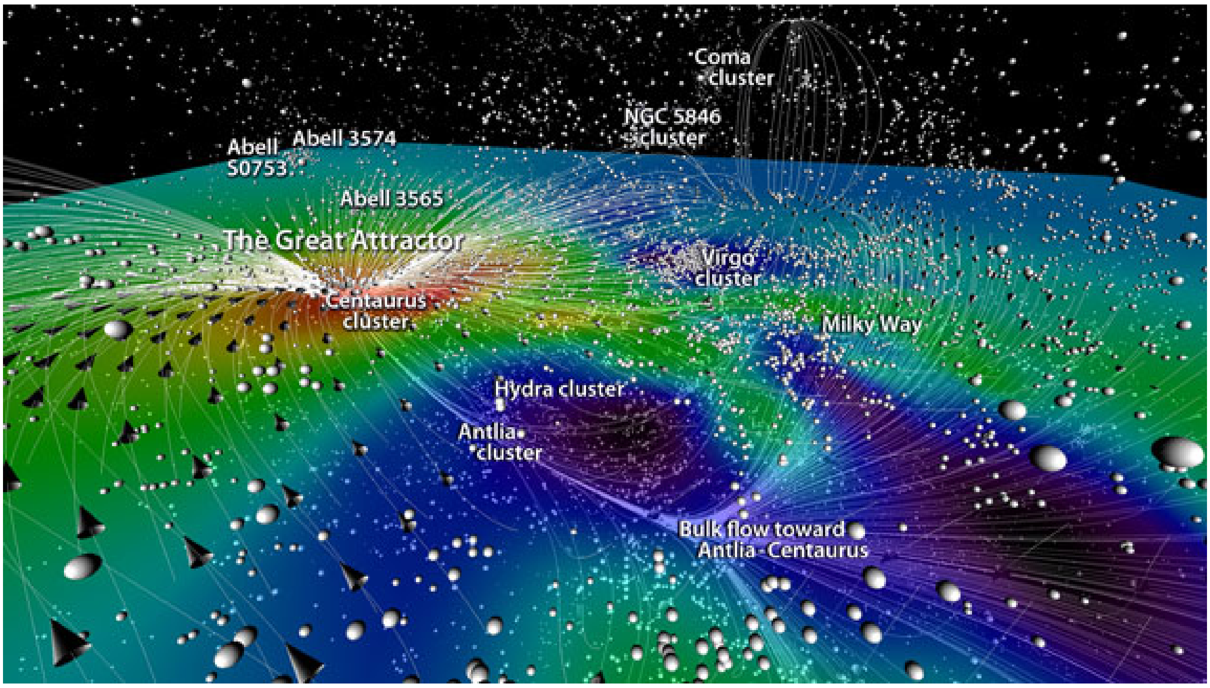

Figure 1

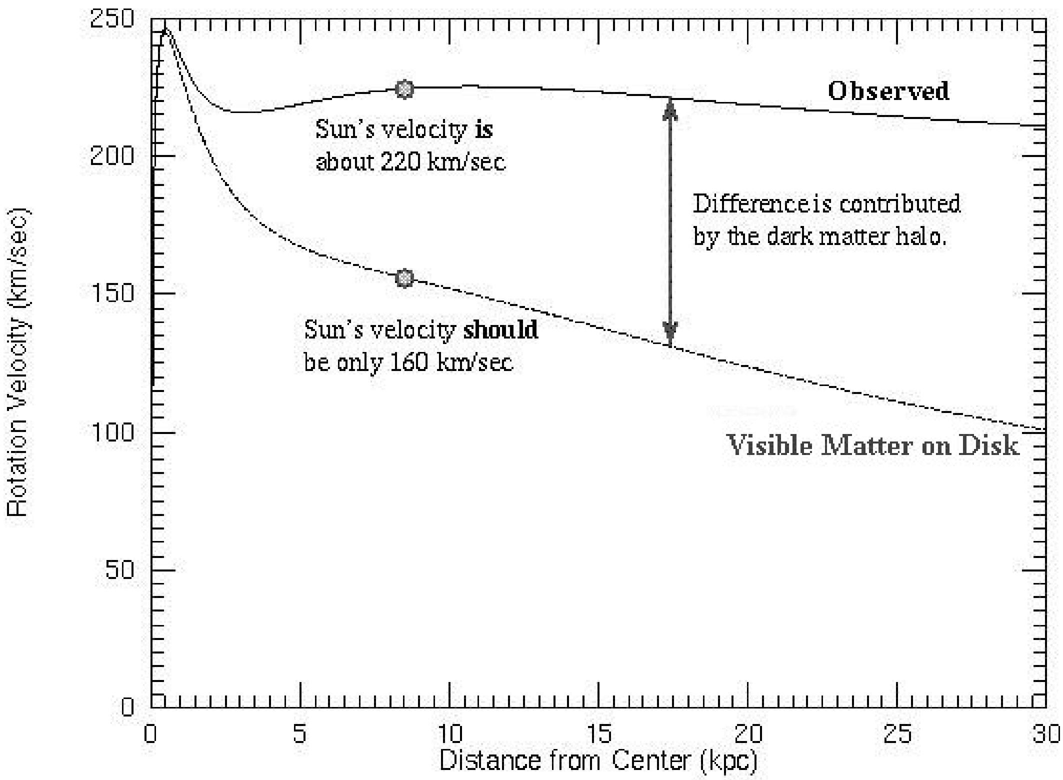

Figure 2

In the following we will take a closer look at the density and printer term in equation (6). These two sizes vary in the universe by many quantities. What happens when density rises to the order of solid matter and especially when matter can leave our space-time continuum?

A basic prerequisite in our structure is the closeness of the whole. Nothing essential may leave the closed system and it must also remain reversible. After that there must not be singularities within the universe, especially not black holes.

So it must be shown that matter on the one hand can compress enormously, but on the other hand there is a limit, so that singularities do not occur. In order to find a new stable equilibrium position for large suns after a supernova explosion, the density/pressure term can play the decisive role.

As already mentioned in [2], one thought is that the atomic nucleus is comparable with planes that have their counterpart at the surface at the edge of the universe.

The advantage of two planes at a distance d that make up a neutron is, among other things, the possibility of determining the direction. Since in quantum physics one assumes photons as interaction particles of the electrical forces and also assumes such an interaction particle for gravity, it would also be good if the nuclear particles had a specific direction.

This direction plays no role for the mass in the normal state, because it is statistically random and the $1/r^2$-law of mass attraction is still valid. Moreover, the mass attraction of atoms is too weak for measurements. This is different when matter experiences such a strong increase in density due to an ever-increasing pressure that the freedom in the phase space becomes more and more restricted. If matter compresses in such a way that neutron lies next to neutron, which corresponds to a maximum "normal" compression, then it is obvious that freedom of movement, in particular the freedom to emit isotropic in all directions, is no longer possible. As already Hawkins shows, black holes are "hairless", smooth and without liberties. But this state can also occur before the collapse of matter, in a thin, finite area.

If one assumes further that on the one hand, the big compression leads to a counter-acceleration because of (6), as well as that the matter emits at the latest with the maximum density only in one space direction, then the state of the neutron stars changes and we regain mass stability even before matter can collapse. This leads to a maximum star density, which is in the order of magnitude of neutron stars, and which have a field-free hollow sphere inside. This hollow body region should begin with the first closed shell, in which the neutrons lie next to each other due to the external pressure and the shell thickness corresponds exactly to an electron radius.

In simplified terms, we consider two areas of a hollow sphere with different densities. The range up to R_2 should have the maximum density ρ_1, which lies in the range of atomic nucleus densities. This high density should shield the mass of the smaller density ρ_2 above it. This means that an external observer only experiences forces from points in the "visible range", in direct connection, no longer from masses behind the hollow body.

If one takes therefore only the two polarities to the observer that is in the distance x and thinks the achievable mass in the center of gravity r_s (seen from the center of the mass concentration), then $r_s = \frac{2(R_1^2 h_1 - R_2^2 h_2)\sin\alpha}{3(R_1^2 - R_2^2)\alpha}$ (7) is valid for the center of gravity with α as the point of view angular to the polar ones.

The partial volume, that is seen under the angle α, and is supposed to contribute only to the attraction, is thus $\Delta V = \frac{2\pi}{3}(1-\sin\alpha/2)(R_1^3 - R_2^3)$ (8) what then leads to an acceleration (to the inside) of $a \downarrow = -\frac{2\pi G\rho_1}{3} \cdot \frac{(1-\sin\alpha/2)(R_1^3 - R_2^3)}{\left(\frac{R_2}{\sin(\alpha/2)} - r_s\right)}$ (9) for an observer at the position with viewing angle α.

For the counter-acceleration we have $a \uparrow = \frac{8\pi G\rho_1}{3} \cdot \frac{R_2}{\sin(\alpha/2)}$ (10) and a total acceleration of $a_{ges} = \frac{2\pi G\rho_1}{3}\left(\frac{4R_2}{\sin(\alpha/2)} - \frac{(1-\sin\alpha/2)(R_1^3 - R_2^3)}{\left(\frac{R_2}{\sin(\alpha/2)} - \frac{2}{3}\frac{\sin\alpha(R_1^3 - R_2^3)}{\alpha(R_1^2 - R_2^2)}\right)^2}\right)$ · (11)

In order to make the further considerations clearer we only undertake a first attempt to describe the very difficult procedures in detail with the changed conditions in our structure. If we analyze only the function value related to R_2 = 1 AE, for R_1 = 1.9; 2.5 and 4 AE as a graph related to α the angle of view, then we get the following for the three example values of the function curve.

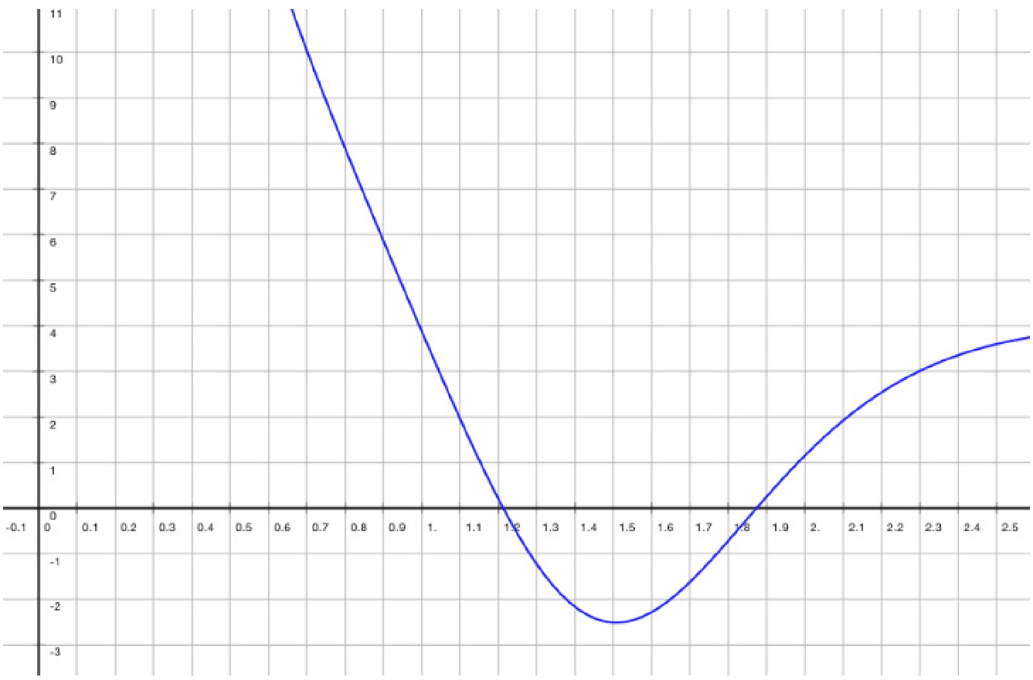

Fig.3.a

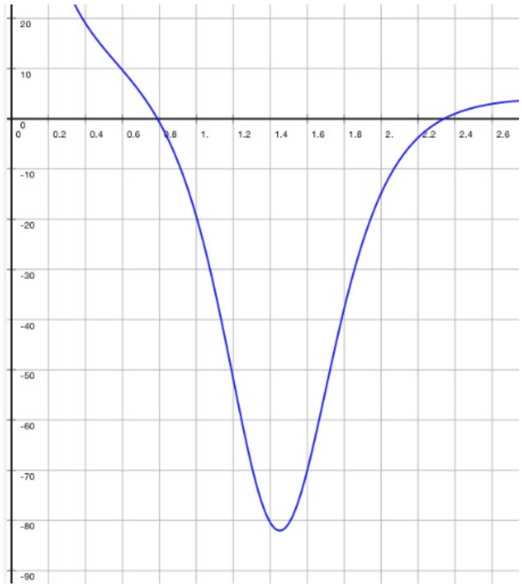

Fig. 3.b

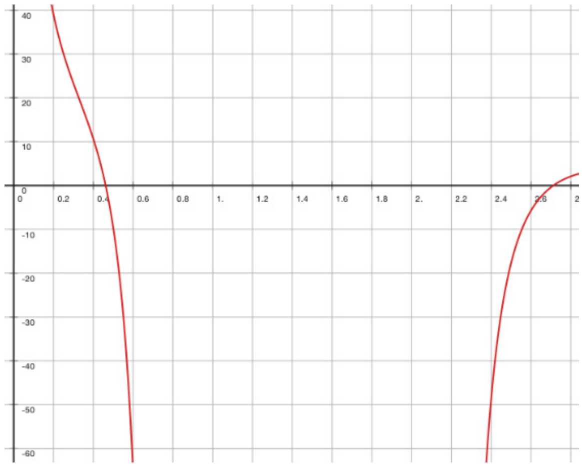

Fig. 3.c

The density ρ_1 should be the maximum density corresponding to the density of the atomic nucleus. It is therefore much higher than the density around it. It should have only a very thin layer thickness and since it is also hollow and the acceleration contribution is additive, the attraction can be neglected. This means that this density range, because it is thin and shell-shaped, is mainly affected by a very strong repelling force, which tries to enlarge the shell rather than further compress it. This is only valid inside the shell and does not apply to the outside area. Here ρ_2 is decisive.

In figure 3.b, the range from 0.41 to 2.3 rad lies within ρ_2. You can see from the course that the acceleration at the edge is repulsive, the density term then becomes smaller (because proportional to r) and thus the attraction gets the upper hand. The maximum is not at ρ_1 but within ρ_2. Outside of both density-areas, within matter diluted space, again only gravity attraction of masses affects, so matter as a whole cannot leave the area. Further it becomes clear by means of fig. 3.a and 3.b, that with increasing density, the area at which at all an attraction could begin within becomes smaller and smaller.

That means space-areas with extremely high densities cannot develop so, because the attracting accelerations become too weak. As soon as a first space shell reaches maximum density and shields the inner area, all layers above are no longer accelerated and forces are more likely to occur which try to achieve a new equilibrium at lower densities than to break through the Schwarzschild Radius.

Source List:

[1] 1. Is our Universe closed?: / Hermenau, Christian,
Link: http://nbn-resolving.de/ urn:nbn:de:gbv:46-00107651-10

[2] 2. Is this universe growing, is it closed and at rest inside?: /
Hermenau, Christian, Link: http://nbn-resolving.de/ urn:nbn:de:gbv:46-00107680-10

[3] Mordehai Milgrom: *"Does Dark Matter Really Exist?"*, Scientific American, August, (2002)

[4] M. Milgrom. MOND - theoretical aspects. *New Astr. Rev.*, 46:741, 2002.

[5] R.H. Sanders and S.S. McGough. Modified newtonian dynamics as an alternative to dark matter. *Ann. Rev. Astron. Astrophys.* , 40:263, 2002

[6] T. Sumner. Experimental searches for dark matter Living Rev. Relativity, 5:http://www.livingreviews.org/lrr-2002-4 (cited on 20.11.2005), 2002.

[7] R.H. Sanders. Anti-gravity and galaxy rotation curves. *Astron. Astrophys.* , 136:L21, 1984.

[8] J.D Anderson, P.A. Laing, E.L. Lau, A.S. Liu, M.M. Nieto, and S.G. Turyshev. Indication, fror Pioneer 10/11, Galileo, and Ulysses Data, of an Apparent Anomalous,Weak, Long-Range Acceleration. Phys. Rev. Lett. , 81:2858, 1998

[9] J. D. Anderson, P.A. Laing, E.L. Lau, A.S. Liu, M.M. Nieto, and S.G. Turyshev. Study of the anomalous acceleration of Pioneer 10 and 11. Phys. Rev. , D 65:082004, 2002.

[10] J.D. Anderson and B. Mashhoon. Pioneer anomaly and the helicity- rotation coupling. Phys. Lett. , A 315:199, 2003.

[Fig.1] "Cosmography of the Local Universe" published in The Astronomical Journal, 146 (2013) 69 by Helene Courtois, Daniel Pomarede, R. Brent Tully, Yehuda Hoffman and Denis Courtois; on arXiv

[Fig.2] http://universe-review.ca/I05-21-Milkyway.jpg