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A briefing on the expansion center universe

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Abstract

The Nobel Prize in Physics 2011 - "for the discovery of the accelerating expansion of the Universe through observations of distant supernovae" - was awarded with a motivation that conflicts with the established presence of an expansion dipole at all depths (also with many other scientific conclusions of '900), then with the cosmic deceleration represented by this dipole, now further demonstrated by the new relativistic calculation of the deceleration parameter q_0 and by the cosmic rotation evidenced through the "Magnitude anomaly" of nearby Type Ia supernovae. This briefing on the Expansion Center Universe is a summary of the results obtained through independent research, developed over 25 years (1988-2012) in the context of the observational cosmology of the twentieth century.

Keywords

Cosmology, Type Ia Supernovae

1. Introduction

The ECM papers IX-XV-XVI, referenced in section 8 and published in 2010 and 2012 on the online library arXiv.org within the Italian Astronomical Society (SAIt), represent three phases of a single work which gives new further confirmation and scientific evidence to the Universe with an expansion center. In particular paper XV, which is the fusion of paper X with paper XII, gives strong evidence of a systematic cosmic dipole, pointed towards the center of the Huge Void of Bahcall & Soneira [2], whose physical interpretation gives a high cosmic deceleration, in agreement with a new calculated value of the relativistic deceleration parameter q_0. This cosmic dipole, observable at every Hubble depth and accurately confirmed also through the fundamental data of the distant supernovae of “Supernova Cosmology Project”, is a blow to the cosmological principle and relativistic cosmology, which, as is well known, exclude any Universe with the expansion center. It is important to remark that the crucial dipole test of paper XV (like that of paper VI) is completely model independent. Moreover these same results of the test confirm the mathematical model of an "Expansion Center Universe" (ECU acronym), called "Expansion Center Model" (ECM acronym), even at the farthest distances that until now have been reached with precision through observational cosmology.

2. History of the Research

The ECM was a special mathematical development of that preliminary empirical ECU model that was studied by the author in 1988 and treated in a first series of papers and conference contributions, in the years 1989-91-93-94-95-96, respectively.

Fundamentally, the ECM is based on two papers presented at SAIt of Naples in 1999 and cited in section 8 as ECM papers I-II; then it was deepened in a series of additional contributions at the following SAIt meetings in Padua, Trieste, Milan, Turin, Florence, Teramo, Pisa, and then in Naples, Palermo and Rome. The maximum investigated distances refer to the weaker supernovae Ia observed by the Hubble Space Telescope and published along with many other SNe Ia jointly in [1] and [8], which report two Union compilations of "Supernova Cosmology Project" (SCP), whose main protagonists, scientists Saul Perlmutter, Brian Schmidt and Adam Riess, were awarded the Nobel Prize for Physics in 2011 "for the discovery of the accelerating expansion of the Universe through observations of distant supernovae". Contrary to this Nobel statement in [12], the series of the ECM papers VI-IX-X-XI-XII-XIII-XV-XVI, those referenced in section 8, shows that even the SCP Universe is undergoing a high deceleration.

3. A Crucial Confirmation of the Expansion Center Model

In a nutshell, the results of papers X-XI (2011), included in the first parts of papers XV-XVI (2012), give a crucial confirmation to the ECM dipole**.** That means the slopes of the linear fitting of the diagram of the Hubble ratio cz/D (where $\boldsymbol{D}$ is an apparent distance called Hubble depth) of very distant supernovae against the cosine of the angle γ between the source and the expansion center are in complete agreement with those of the seven diagrams of paper II (1999), which refer to the very close Universe. In other words, the angular coefficients a^* and a_0 of Figures 1-2-3 of paper XV and of Figures 8-9-10-11-12-13 of paper XVI have precisely the value predicted by the model.

These inclinations or slopes, that are not provided for by relativistic cosmology (where, by definition, $a^* = a_0 = 0$) but present at every cosmic depth systematically investigated, imply the action of a strong deceleration of the Galaxy (according to ECM) towards a point coinciding with the Huge Void Center (VC: R.A.≈ 9^h; Decl. ≈ +30° in [2]), located at a proper distance R_0 at our epoch of about 260 Mpc or 850 million light years.

In particular, the main message of paper X or paper XV is that, independently from the 1999 ECM, one obtains precisely the mean value a^* = 5.5 $km\,s^{-1}Mpc^{-1}$ that the model predicts at the central redshift $z_0 = \langle z \rangle = 1$, that is at a Hubble depth $D = c/H_0 \cong 4283\,Mpc$ (about 14 billion light years) where on average the Universe is seen on the run at the speed of light c, after giving to H_0 the value $70 \pm 3\,km\,s^{-1}Mpc^{-1}$ of 1999 ECM paper II, from 1975's data by Sandage & Tammann in [15].

At this Hubble depth, that is $\boldsymbol{D \cong 4283\,Mpc}$, there is a resulting difference of approximately $50000\,km\,s^{-1}$ of the mean value of cz between the direction of the Huge Void Center and the opposite sense, that means a maximum range as $275000 \lesssim \langle cz \rangle \lesssim 325000$, while relativistic cosmology predicts no difference.

The secondary message of paper XV in section 5 is in the full version of paper XII, entitled "Evidence for a high deceleration of the relativistic Universe", which presents a model independent computation of a high positive value of the deceleration parameter q_0. Here q_0 results with a value between $+2$ and $+3$, instead of -1, in full accordance with the ECM, which gives q_0 a value $+2$, but in disagreement with the statement of the Nobel Prize in Physics 2011.

4. New Cosmic Scenario

Further and more direct observational evidence of the expansion center Universe may come from paper IX, where the result of the decelerating expansion dipole is detectable, but in an approximate manner, by the wedge shape of the classic Hubble diagram between cz and Hubble depth D of 398 SCP Union supernovae, that are tabled in [8]. In fact, by comparing the diagrams of Figures 5-6 with those of Figures 7-8 of paper IX, one can find a good agreement of the experimental result with the ECM modeling prediction. Paper XI verifies and further deepens the ECM implication for 249 High-z SCP Union supernovae, highlighting the perturbed behavior of the brightness (more markedly at $z \lesssim 0.5$), which seems to be affected partially by a background noise due to cosmic rotation. Said rotation or cosmic revolution, which in ECM is included only as a rigid rotation of the very close Universe, was calculated theoretically for the Galaxy and the Local Group, with an absolute value of about 6.0 billion centimetres per second, compared to a radial velocity of escape from the expansion center of about 1.8 billion centimetres per second (cf. paper VII). In support of it, the papers XIII-XVI show a noteworthy observational proof of the cosmic rotation, that is the "Magnitude anomaly" of nearby supernovae Ia, with an observed maximum peak of deviation of about 1 absolute magnitude in the Hubble depth range:
$170\,Mpc \lesssim D \lesssim 350\,Mpc$.

The cited "Magnitude anomaly" represents the most important finding in papers XIII-XVI. Let us remark that the Huge Void Center VC, located at about $\boldsymbol{260\,Mpc}$ from Galaxy, is both the cosmic expansion center and revolution center, or also the deceleration center, according to ECM.

The radial deceleration of Galaxy towards VC, that listed in paper VII and corresponding to a relativistic $q_0 = +2$, results to have the value $\ddot{R}_0 \cong -8.2 \times 10^{-9} cm\,s^{-2}$. Subsequently a calculation of the cosmic matter density gives the value $\rho_0 \cong 2.3^{+0.7}_{-0.4} \times 10^{-28} g\,cm^{-3}$. This value agrees with the presence of dark matter at a cosmic scale.

Another key finding is the resulting age of the Universe, that is $\boldsymbol{t_0 = 4.65 \pm 0.20\,Gyr}$, as referred in papers III-V, which is slightly greater than the atomic age of the oldest meteorites, $4.53 \pm 0.02\,Gyr$, or the oldest lunar rock, $4.6 \pm 0.1\,Gyr$. The new age of the Universe is about a third of that coming out from relativistic cosmology, which gives about $14\,Gyr$. As a consequence the volume of the Universe is much smaller. That is a considerable contribution to the high density of the matter.

The first numerical solution for the Galaxy run, listed in paper VII Table 2, holds also a numerical evaluation of the usual ratio $\dot{G}_0/G_0$, being G_0 the gravitational constant at our epoch, with the resulting value $\dot{G}_0/G_0 \cong -0.94 \times 10^{-10} yr^{-1}$, in accordance with Shapiro's limit, that is $-10^{-10} yr^{-1}$ in [13].

Lastly, referring to the Cosmic Microwave Background radiation at 3K, the ECM 3K dipole is theoretically confirmed. In particular, according to the analysis carried out within paper VII section 6 and paper IX section 4, the observed CMB dipole is composed of two components, the former has a local kinematic origin while the later is generated by the ECM 3K dipole.

On the whole the previous cosmic scenario, which is based on astronomical data, results to be in good agreement with Paul Dirac's theory of 1937-38, the so-called large number hypothesis or LNH [3][4].

5. Distances of Type Ia Supernovae At $\langle z \rangle = 1$

5.1. Light-Space: $r \cong 3\ GLY$

The light-space r is fixed mathematically as

$$r = -c \cdot (t - t_0) \qquad (1)$$

Eq. (1) gives the distance covered by light at a constant speed c during the whole travel time, from the emission epoch t to the present epoch t_0. Since c is constant, r should correspond to the source distance at the emission epoch t. However the "cosmic medium" (CM), with respect to which the light moves at speed c, is expanding as does the whole Universe; as a result, the light-space r is larger than the distance at the emission epoch t, although its value in light-time represents a measure of that past epoch t. In other words the travelling light has two speeds, the former being c inside the CM, the latter that of the supporting expanding CM or Hubble flow. The observed velocity of this expanding CM is the derivative of r to t, with $dt_0/dt = \lambda_0/\lambda$ assumed, as shown in the ECM papers V and VIII, sections 4.7 and 2.1 respectively. This dr/dt becomes $c\Delta\lambda/\lambda$, that is $\dot{r} = cz$. The expansion center model (ECM) allows to compute the light-space r corresponding to a central redshift $z_0 = \langle z \rangle$. In fact, the dimensionless ECM z equation coming out from eq. (3) of paper II (see also eq. (22) of paper V or eq. (13) of paper VI or eq. (6) of paper VII or eq. (4) of paper (IX)) gives the redshift z with $\cos\gamma = 0$ the following simplified relation:

$$z_0 = \frac{x(1+x)}{3(1-x)} \quad with \quad x = 3H_0 r/c \qquad (2)$$

The application of eq. (2) to the Deep Universe SNe Ia, at the central redshift $z_0 = 1$, gives $x = 0.6457513$ or
$r \cong 922\ Mpc$, that in light-time units becomes
$r \cong 3\ GLY\ (billion\ light\ years)$.

5.2. Luminosity Distance: $D_L^* \cong 12\ GLY$

$$D_L^* = r \cdot (1+z)^2 \qquad (3)$$

Eq. (3) is the new formulation of the luminosity distance, which differs from relativistic cosmology in that here the light-space $r = -c \cdot \Delta t$ is a physical distance, representing the space run by the light during the travelling time $\Delta t = t - t_0$, in place of the relativistic proper distance r_{pr} at the emission epoch t. Such a luminosity distance has the peculiarity of giving a slowly increasing negative trend to the new absolute magnitude $M^*(z_0)$ of the Deep Universe supernovae Ia (cf. papers XIII-XVI). Then at $z_0 = 1$ one finds $D_L^* = 4r \cong 3687\ Mpc \cong 12\ GLY$

5.3. Hubble Depth: $D \cong 14\ GLY$

$$cz = (H_0 - a^* \cdot cos\gamma) \cdot D \qquad (4)$$

Eq. (4) gives the more simplified formulation of the Hubble law in Hubble units of the Expansion Center Universe, according to section 2 of paper X or XV, where D is an apparent distance called Hubble depth. The introduction of the central redshift z_0, corresponding to $cos\gamma = 0$, simplifies further the law, which takes the form $cz_0 = H_0 D$, from which one can easily draw the value of D at $\langle z \rangle = z_0$.

Then at $z_0 = 1$ one finds $D = c/H_0 \cong 4283\ Mpc \cong 14\ GLY$

5.4. Cosmological distance: $D_C \cong 28\ GLY$

$$D_C = D \cdot (1+z) \qquad (5)$$

Eq. (5) is the adopted formulation of the ECM cosmological distance, where $D = cz_0/H_0$ is the Hubble depth. The previous equation of D_C has an important meaning for at least two reasons:

I – Since D_C is practically coinciding with the relativistic luminosity distance D_L at $z_0 \ll 1$, after introducing the value $q_0 \cong -1$ of the deceleration parameter that was obtained in [7] within the SNe Ia relativistic cosmology;

II – Since D_C leads to the useful definiton of the Hubble Magnitude M (cf. papers X-XV), after assuming $D_C = D_L$ as fictitious luminosity distance D_{FL}, according to paper V.

Then at $z_0 = 1$ one finds $D_C = 2c/H_0 \cong 8566\ Mpc \cong 28\ GLY$.

6. New Absolute Magnitude of Type Ia Supernovae

$$M^* = m - 5\log D_L^* - 25 \qquad (6)$$

Eq. (6) is the adopted formulation of the new absolute magnitude, recalling that D_L^* is representing the new luminosity distance, according to eq. (3), where r is the light-space in Hubble units of a source with redshift z and apparent magnitude m.

$$\langle M^* \rangle = \langle m \rangle - 5 \cdot \langle \log[r(1+z)^2] \rangle - 25 \qquad (7)$$

Eq. (7) is the normal equation applied to the new absolute magnitudes M^* of high-redshift SNe Ia, where the r value is computed by means of the ECM z equation (4) of paper IX. A single solution, based on a linear fitting of the 4 core normal points $\langle M^* \rangle$ of paper XVI Table 8 towards the normal redshift $\langle z \rangle = z_0$, gives the result $\langle M^* \rangle \cong -17.86 - 0.11 \times z_0$, while a mean of 6 good solutions for the absolute magnitude M_0, corresponding to $z_0 = 0$, gives

$$\langle M_0 \rangle = -17.9 \pm 0.1 \qquad (8)$$

Then at $z_0 = 1$ one finds $\langle M_B^* \rangle \cong -18.0$

The mean found value for the new absolute magnitude B of supernovae Ia is much lower than the value predicted by scientific literature. As an example, the comparative study carried out by Richardson et al. in [14] gives as result: $\bar{M}_B = -19.46$, $\sigma = 0.56$.

However the Calan/Tololo survey of Type Ia supernovae has given results which seem to confirm a lower intrinsic luminosity of nearby SNe Ia. In particular Table 1 in [6], referring to a distant sample, presents 29 SNe Ia with a resulting M_B around the value -19.0, while Table 2 in [6], referring to a nearby sample, presents 9 SNe Ia with a resulting M_B around the value -18.7. The explanation of these huge differences has to be found mainly into the above cited "Magnitude anomaly", which is less active on the very close Universe, but much stronger in the Hubble's depth range $170\,Mpc \lesssim D \lesssim 350\,Mpc$, with an observed maximum peak of deviation of ~ 1 absolute magnitude.

7. Conclusions

The present briefing is an attempt at concisely describing the main results of a research developed in a quarter of century. The conclusions and consequences are indeed many and full of cosmological and astrophysical implications. On this subject, at this conclusive state of research, what that can definitely be confirmed is the reality of the expansion center. Consequently, a few main features of our Universe are the followings: - Strong radial deceleration towards the expansion center, a cosmic age significantly closer to the Moon's age, an observed volume with smaller size, a higher density in agreement with the presence of dark matter at cosmic scale, rigid rotation with Galaxy of the very nearby regions, an undetermined differential cosmic rotation at Hubble depths of the order of the expansion center distance, new cosmic flows, a strong reduction of the intrinsic luminosity of the supernovae Ia and, more generally, a new cosmic scenario that requires a drastic revision of relativistic cosmology.

More specifically, we can refer to a meaningful listing of technical remarks and concluding statements, those collected in section 7 of paper XVI. The last listed conclusion, numbered 20, is here reported integrally, in that able to recall the crucial importance of the Expansion Center Universe for an easier comprehension of the Big Bang mechanics and, likely, of the same nature of gravitation, according to paper XIV:

"20) After the strong experimental evidence for the expansion center and some mechanical investigations about the Universe as a whole, this paper XVI presents a noteworthy observational proof of the cosmic rotation, that is the "Magnitude anomaly" of nearby supernovae Ia. Thus Gamow was right to propose a "Rotating Universe?" [5] to Einstein, however unsuccessfully according to [9]. Actually there are other important astronomical proofs on the topic, like that in [11]. The conclusion might be in favour of a Big Bang as a Big Crush, when the ECM cosmic mechanics with angular momentum conserved is applied even to Lemaitre's primitive atom [10]."

8. Web References to the ECU Papers

About the cited ECM references, papers XV (X+XII) and XVI (XI+XIII) of 2012, with paper IX of 2010 and papers I-II of 1999, are included in the online archive arXiv.org, created in Los Alamos National Laboratory by Paul Ginsparg and operated by Cornell University Library - Ithaca – New York State.

These online papers are at the following addresses:

http://arxiv.org/abs/1105.3699 (paper XVI (XI+XIII))

http://arxiv.org/abs/1105.3697 (paper XV (X+XII))

http://www.astropa.unipa.it/SAIT2011/Proceedings/Lorenzi2.pdf (paper XI)

http://www.astropa.unipa.it/SAIT2011/Proceedings/Lorenzi1.pdf (paper X)

http://arxiv.org/abs/1006.2112 (paper IX)

http://arxiv.org/abs/astro-ph/9906292
1999b, in MemSAIt, 71, 1183 (paper II: reprinted in 2003, MemSAIt, 74)

http://arxiv.org/abs/astro-ph/9906290
1999a, in MemSAIt, 71, 1163 (paper I: reprinted in 2003, MemSAIt, 74)

Paper XIV, that was posted at EWASS 2012, at present is under revision.

For a historical and general overview, the ECM paper VIII "Steps towards the expansion center cosmology" (abstract in English and text in Italian), presented in Pisa in the International Year of Astronomy at the meeting SAIt2009 "The Universe four centuries after Galileo", is at

http://astro.df.unipi.it/sait09/presentazioni/AulaMagna/08AM/lorenzi.pdf (paper VIII)

Other ECM papers, VII-VI-VIbis-V-IV-III-IIIbis, are at the following addresses:

http://www.oa-teramo.inaf.it/sait08/slides/I/ecmcm9b.pdf (paper VII)

http://sait.oat.ts.astro.it/MSAIS/5/PDF/347.pdf (paperVI)

http://sait.oat.ts.astro.it/MSAIS/5/POSTER/LLORENZI.pdf (paper VIbis)

http://sait.oat.ts.astro.it/MSAIS/3/POST/Lorenzi_poster.pdf (paper V)

http://sait.oat.ts.astro.it/MSAIS/3/PDF/277.pdf (paper IV)

http://sait.oat.ts.astro.it/MSAIt740203/PDF/2003MmSAI..74..480L.pdf (paper III)

http://sait.oat.ts.astro.it/MSAIt740203/PDF/poster/39_lorenzil_01_long.pdf (paper IIIbis)

Referring to the empirical preliminary model ECU, developed since 1988, two conference papers - "Abell test of a modelled Hubble expansion from the Bahcall & Soneira void center" (Grado, Italy, 24-27 October 1994) and "A cosmic dipole pointed towards the center of the huge void of Bahcall & Soneira?" (Asiago, Italy, 21-22 October 1993) - are on the Web, at the addresses:

http://articles.adsabs.harvard.edu/full/1996ApL%26C..33..143L

http://adsabs.harvard.edu/full/1995MmSAI..66..249L

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arXiv:0804.4142v1[astro-ph] 25 Apr 2008, arXiv:1004.1711v1[astro-ph.CO] 10 Apr 2010 and http://www-supernova.lbl.gov/Union/
Finally the author wishes to express his sincere gratitude to the Italian Astronomical Society, specifically to the President Roberto Buonanno, for the constant official attention given to the research on the Expansion Center Universe.

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