Central force fields described by m theory, Part II

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Abstract

In this paper, which completes UFT Paper 449, we investigate the force fields that are generated by the spherically symmetric geometry itself. The fields are of electric and magnetic nature or, when expressed in terms of dynamics, represent an acceleration and a gravitomagnetic field. The curl and divergence of these fields reveal topological sources, in particular, combined magnetic monopoles in the form of a dipole. The results compare well with the observed structures of galaxies and support the concept of a plasma universe.

Keywords: Unified field theory; m theory; central symmetry; gravitation; electromagnetism.

1 Introduction

In the preceding paper [1], it was shown that spaces with central symmetry generate force fields that result from the geometry itself. m theory, which was developed as a part of ECE theory [2,3], indicates that there is a central vacuum or aether force, for which no physical sources exist. In addition, there is a magnetic field with a rotational structure. We will analyze this magnetic field, in particular.

The presence of electrical and magnetic fields is revealed in galactic structures. In the traditional view of astrophysics, these structures describe mass distributions in the form of condensed matter and gases, and attempts have been made to explain them through gravitational forces. Because neither Newtonian nor Einsteinian theories have been able to explain such structures, for example spiral galaxies, dark matter has been introduced as a mechanism that holds these largescale structures together, since gravitation is not strong enough at the required distances. Meanwhile, the spiral arms of galaxies and their velocity curves have been explained elegantly by ECE theory [3], thereby negating the need for dark matter to be brought into existance as a fix, to explain the observed structures of galaxies.

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In addition to the conventional view, many structures in the universe can also be explained by electromagnetism, and this approach is particularly applicable in regions with huge plasma clouds. Electric currents in a plasma are impacted by external magnetic fields, so that the currents change their structure and generate new magnetic fields, which again lead to a modifications of the currents. This is a dynamic process of high complexity, and such processes have been investigated by researchers like Don Reed [4] and Hannes Alfven [5]. Reed introduced Beltrami fields in this context. The electromagnetic view of the universe is generally called the *plasma universe* or *electric universe*.

The force fields that have been found for central symmetry by ECE theory, in particular m theory, are unified fields. This means that they can be considered as gravitational as well as electromagnetic fields. This allows us to interpret astronomical findings in related ways. Two examples are shown in Figs. 1 and 2. A view of the center of the elliptical galaxy Messier 87 (M87) is shown in Fig. 1. The polarization of the light in this image was analyzed, and this analysis showed a magnetic field signature. This image has a strong similarity to the structure of Fig. 2 in the preceding paper [1] (shown again in Fig. 3 of this paper), where the magnetic field of central symmetry has been graphed.

Fig. 2 is an image of the galaxy Centaurus A. This is either an elliptical or a lensed galaxy; a precise identification is not possible because we see the galaxy from the side. However, there is a strong jet of gaseous matter on both sides, which supports our theoretical findings. The jet structure will be explained further in this paper.

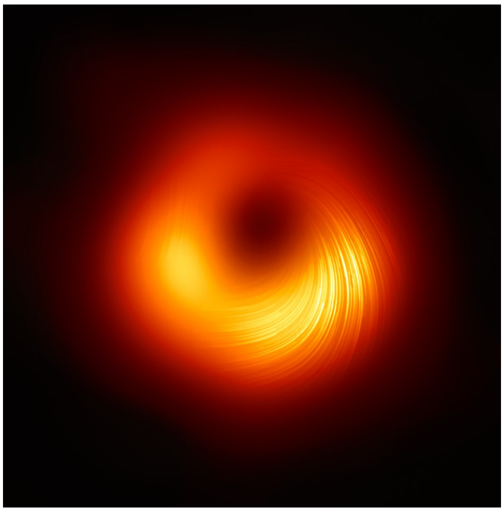

Figure 1: Image (with polarized light) of the center of galaxy M87 [7].

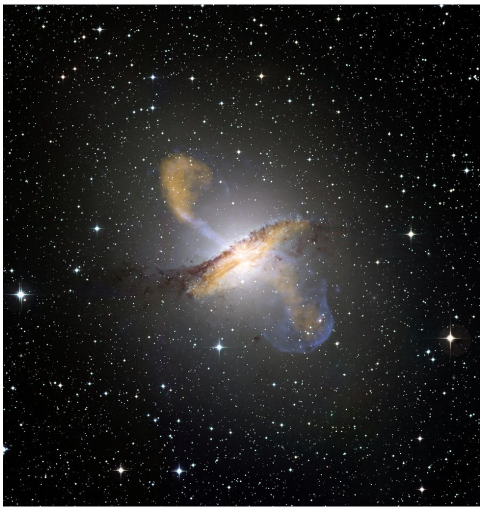

Figure 2: Jet structure of galaxy Centaurus A [8].

2 Curl of fields in a spherically symmetric spacetime

As described in the preceding paper [1], the results for the unified force fields in centrally symmetric spacetime are

$$\mathbf{E} = \frac{A_0 c}{2} \begin{bmatrix} -\frac{\frac{d\mathrm{m}(r)}{dr}}{\sqrt{\mathrm{m}(r)}} \\ 0 \\ 0 \end{bmatrix}, \tag{1}$$

$$\mathbf{B} = \begin{bmatrix} -C_0 r \cos\theta \\ B_0 \sin\theta \\ -B_0 \end{bmatrix}. \tag{2}$$

These fields have been shown graphically in [1] using the m function

$$\mathrm{m}(r) = 2 - \exp\left(\log(2)\exp(-\frac{r}{R})\right). \tag{3}$$

We compute the curl and divergence of both fields, using the respective formulae for the spherical coordinates. The curl of $\mathbf{E}$ vanishes, as expected:

$$\boldsymbol{\nabla} \times \mathbf{E} = \mathbf{0}, \tag{4}$$

while the curl of the $\mathbf{B}$ field is

$$\boldsymbol{\nabla} \times \mathbf{B} = \begin{bmatrix} -\frac{B_0 \cos\theta}{r \sin\theta} \\ B_0/r \\ (C_0 - B_0/r)\sin\theta \end{bmatrix}. \tag{5}$$

The vector fields $\mathbf{B}$ and $\boldsymbol{\nabla} \times \mathbf{B}$ have been graphed in Figs. 3 and 4. As in [1], we have displayed the vectors on two hemispheres. Comparing the inner (red) spheres from the two figures, we see that the curl of $\mathbf{B}$ is roughly perpendicular to the field $\mathbf{B}$ itself, while it is nearly parallel to it in the outer (blue) sphere. This has been clarified in Fig. 5, where both vector fields are plotted in the XY plane ($\theta = \pi/2$) as projections onto this plane. In the outer region, both are parallel to each other, while they are antiparallel in the inner region.

If the curl of a vector field is parallel to the field itself, the field is a Beltrami field [3], which obeys the condition

$$\boldsymbol{\nabla} \times \mathbf{B} = \kappa \mathbf{B} \tag{6}$$

with a scalar κ. In the most general case, κ is allowed to be a function. Multiplying the above equation by $\mathbf{B}$ gives

$$\mathbf{B} \cdot (\boldsymbol{\nabla} \times \mathbf{B}) = \kappa \mathbf{B}^2 \tag{7}$$

or

$$\kappa = \frac{\mathbf{B} \cdot (\boldsymbol{\nabla} \times \mathbf{B})}{B^2}. \tag{8}$$

Computer algebra gives us the results

$$\mathbf{B} \cdot (\boldsymbol{\nabla} \times \mathbf{B}) = \frac{B_0 C_0}{\sin\theta} \tag{9}$$

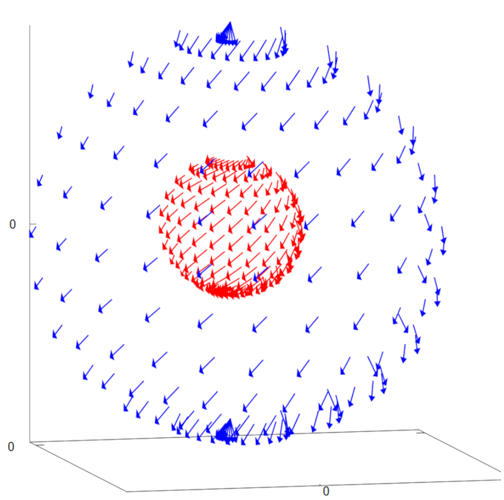

Figure 3: 3D representation of $\mathbf{B}(\mathbf{r})$.

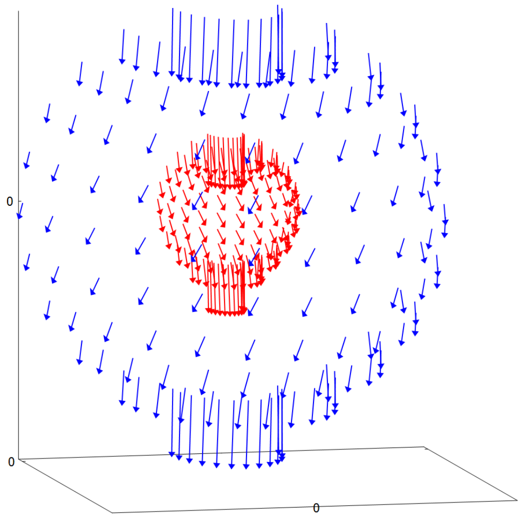

Figure 4: 3D representation of curl($\mathbf{B}(\mathbf{r})$).

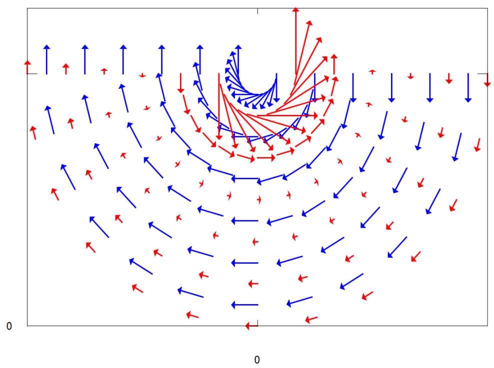

Figure 5: Projection of $\mathbf{B}(\mathbf{r})$ (blue) and curl($\mathbf{B}$) (red) onto the equatorial plane.

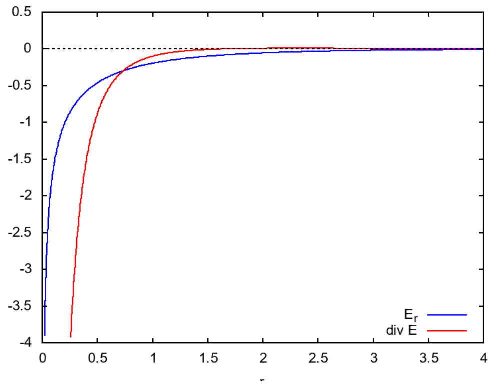

Figure 6: Radial component of $\mathbf{E}(\mathbf{r})$ and div($\mathbf{E}(\mathbf{r})$).

and

$$B^2 = B_0^2(1 + \sin^2\theta) + C_0^2 r^2 \cos^2\theta. \tag{10}$$

The simplest way to check whether $\mathbf{B}$ is a Beltrami field is computing κ from the three component equations of (6). This gives the three results

$$\kappa_1 = \frac{B_0}{C_0 r^2 \sin\theta}, \tag{11}$$

$$\kappa_2 = \frac{1}{r\sin\theta}, \tag{12}$$

$$\kappa_3 = \left(\frac{C_0}{B_0} - \frac{1}{r}\right)\sin\theta. \tag{13}$$

The κ's are different; therefore, **B** is not a Beltrami field. However, it comes close to being a Beltrami field in the outer region, where **B** and the curl of **B** are parallel.

3 Divergence of fields in a spherically symmetric spacetime

The fact that **B** is not a pure rotational field leads to the conjecture that **B** is not divergence-free. Before proving this, we compute the divergence of the **E** field. This is a central field, and from Eq. (1) we obtain

$$\nabla \cdot \mathbf{E} = A_0 c \left(-\frac{\frac{d^2}{dr^2}\,\mathrm{m}(r)}{2\sqrt{\mathrm{m}(r)}} + \frac{(\frac{d}{dr}\,\mathrm{m}(r))^2}{4\mathrm{m}(r)^{\frac{3}{2}}} - \frac{\frac{d}{dr}\,\mathrm{m}(r)}{r\,\sqrt{\mathrm{m}(r)}} \right). \tag{14}$$

This function has been graphed together with the original field $E_r(r)$, in Fig. 6. When r approaches zero, the divergence of **E** starts approaching infinite negative values sooner than the field itself. According to the Coulomb law, the divergence of **E** corresponds to a charge density ρ in the form of

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\epsilon_0}, \tag{15}$$

where ρ (in this instance) is a kind of "topological" charge density, because no real charges are present. A similar case has already been found for the vacuum, where such a charge density arose from the spin connection.

Next, we investigate the corresponding case for the magnetic field. From Eq. (2), we obtain

$$\nabla \cdot \mathbf{B} = \left(3C_0 - \frac{2B_0}{r} \right) \cos\theta. \tag{16}$$

In classical electrodynamic, however, the Gauss law is

$$\nabla \cdot \mathbf{B} = 0, \tag{17}$$

because there are no magnetic monopoles. Surprisingly, the spherically symmetric spacetime produces this type of topological magnetic monopole, similarly to how it produces a topological charge density. The magnetic divergence is graphed in Fig. 7 for the θ plane. Since the divergence does not depend on ϕ, this is the general form. Please note that the θ plane is the XZ plane in cartesian coordinates. Therefore, the image has to be rotated by 90 degrees to be correctly aligned in the spherical coordinates.

Obviously, there is a pole in the divergence for $r \to 0$, because $\cos\theta$ changes sign at $\theta = \pi/2$, and the factor $1/r$ diverges for small radii. This corresponds to a dipole source. Magnetic dipoles are well known, but the divergence of the magnetic field vanishes outside as well as inside the dipole because of Gauss' law. The situation is different here. According to the ECE field equations, the divergence of **B** appears in the generalized Gauss law

$$\nabla \cdot \mathbf{B} = -\mu_0 \rho_{eh}, \tag{18}$$

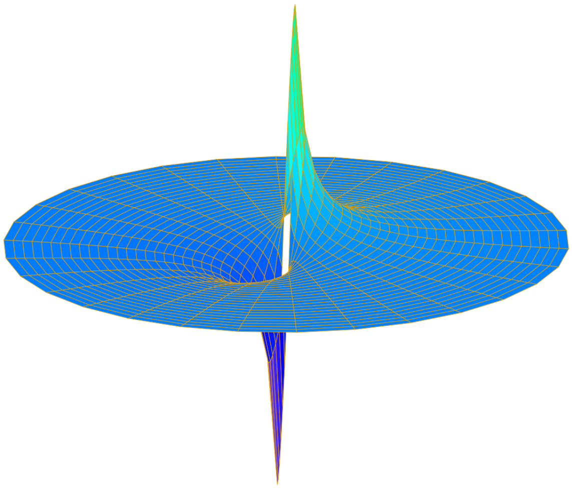

Figure 7: div($\mathbf{B}(\mathbf{r})$) in the θ plane (corresponding to the XZ plane).

where ρ_{eh} is the "homogeneous" density of magnetic monopoles. This situation is not atypical here, because we have a dipole, but this seems to be the first case where the existence of magnetic monopoles has been predicted by ECE theory.

From the Ampère-Maxwell law, it follows that there is a charge current density $\mathbf{J}$ with

$$\boldsymbol{\nabla} \times \mathbf{B} = \mu_0 \mathbf{J}. \tag{19}$$

This is an "electric" current density, representing a topological structure again, which can be considered as the source of the topological magnetic field.

If we applied this to galaxies, the result would describe a feature of the electric or plasma universe. If we apply the same results to mechanics, we find (from the corresponding ECE field equations of dynamics) that

$$\boldsymbol{\nabla} \cdot \mathbf{g} = -4\pi G \rho_m, \tag{20}$$

$$\boldsymbol{\nabla} \cdot \boldsymbol{\Omega} = 4\pi G \rho_{mh}, \tag{21}$$

$$\boldsymbol{\nabla} \times \boldsymbol{\Omega} = -\frac{4\pi G}{c^2} \mathbf{J}_m, \tag{22}$$

where $\mathbf{g}$ is the gravitational acceleration field, $\boldsymbol{\Omega}$ is the gravitomagnetic field, ρ_m is a topological mechanical charge density, ρ_{mh} is a topological monopole density, $\mathbf{J}_m$ is a topological mass current density, and G is Newton's gravitational constant.

The curl of $\boldsymbol{\Omega}$, as well as the curl of $\mathbf{B}$ (in the case of the electric universe), represent a current that is observed as jets in Fig. 2. This is expressed through the theory in Fig. 4, where the current has by far its highest density on the vertical axis. The current goes in at the upper end and leaves the structure at the lower end. Consequently, it must flow back over the outer regions. According to the continuity equation,

$$\frac{\partial \rho_m}{\partial t} + \boldsymbol{\nabla} \cdot \mathbf{J}_m = 0, \tag{23}$$

there would have to be time variations in the density, if $\mathbf{J}_m$ were not divergence-free, but we have

$$\boldsymbol{\nabla} \cdot \mathbf{J}_m = \boldsymbol{\nabla} \cdot (\boldsymbol{\nabla} \times \mathbf{B}) = 0, \tag{24}$$

which always holds.

Concerning the interpretation of the observed jets, the question is whether they leave the galactic center in both directions, or go out on one side and come in on the other side. If they are matter currents, they cannot leave the central region at both ends. However, if they are currents of charged particles, each type of particle (differently charged) can leave the central region at a different end, without sacrificing the model. So, if astronomers are sure that the jets go out on both sides, then this would point to the universe being predominantly controlled by electrical forces, rather than gravitational forces, on the grand galactic scale. So we could then say we are living in an electric or plasma universe.

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