Central force fields described by m theory, part II

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June 8, 2022

Abstract

In completion of UFT paper 449, we investigate the force fields that are generated by a spherically symmetric geometry itself. The fields are of electric and magnetic character, or, 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 form of a dipole. The results compare well with observed structures of galaxies. The view of a plasma universe is supported.

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

1 Introduction

In the preceding paper [1], it was explained that spaces with central symmetry show up force fields that are results of the geometry itself. m theory, which was developed as a part of ECE theory [2, 3], leads to a central vacuum or aether force, for which no physical sources exist. In addition, there is a field of magnetic type, which has a rotational structure. We will analyse this magnetic field in particular.

The existence of both the electric and magnetic vacuum fields is revealed in galactic structures. In the traditional view of astrophysics, these structures describe mass distributions in form of condensed matter and gases, which are tried to understand by gravitational forces. Because neither Newtonian nor Einsteinian theory were able to explain such structures, for example spiral galaxies, dark matter had been introduced to find a mechanism for holding these large-scale structures together, since gravitation is not long-ranged enough. Meanwhile, the spiral arms of galaxies and their velocity curves have been explained elegantly by ECE theory [3]. Both take their forms due to conservation of angular momentum.

Besides the conventional view, many structures in the universe can alternatively be explained by electromagnetism. In particular, this is plausible in regions with huge plasma clouds. Electric currents in a plasma are impacted by

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external magnetic fields, so that the currents change their structure and generate new magnetic fields, which again lead to a modification of the currents. This is a dynamic process of high complexity. Researchers like Don Reed [4] and Hannes Alfven [5] have investigated such processes. Reed introduced Beltrami fields in this context. The electromagnetic view of the universe is generally called *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 various ways. Two examples are shown in Figs. 1 and 2. A view on the center of the elliptic galaxy Messier 87 (M87) is shown in Fig. 1. For the image, the polarization of the light was analyzed, showing a signature of magnetic fields. This image has a strong similarity to the structure of Fig. 2 in the preceding paper [1] (shown again in Fig. 3 of this article), where the magnetic field of central symmetry has been graphed.

Fig. 2 is an image of the galaxy Centaurus A. This is either an elliptic or a lense-like galaxy; a precise type attribution is not possible because we see the galaxy from the side. However, there is a strong jet of gaseous matter on both sides, supporting our theoretical findings. The jet structure will further be explained in this paper.

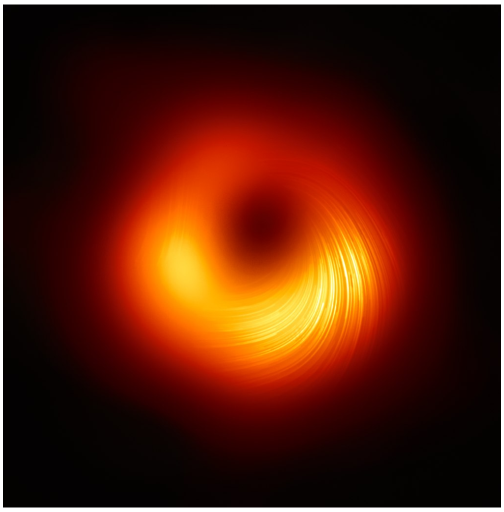

Figure 1: Image with polarized light of the center of galaxy M87 [7].

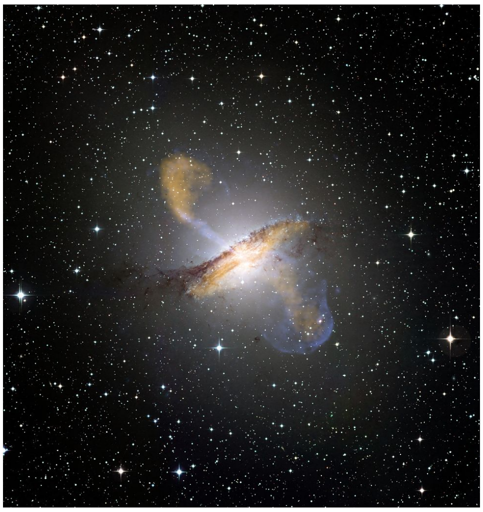

Figure 2: Jet structure of galaxy Centaurus A [8].

2 Curl of fields in spherically symmetric spacetime

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

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

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

The fields have been demonstrated graphically 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 formulas for 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 half-spheres. Comparing the inner (red) sphere, of both figures, we see that the curl of $\mathbf{B}$ is roughly perpendicular to the field $\mathbf{B}$ itself, while it is nearly in 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 in 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, it is allowed that κ is 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

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

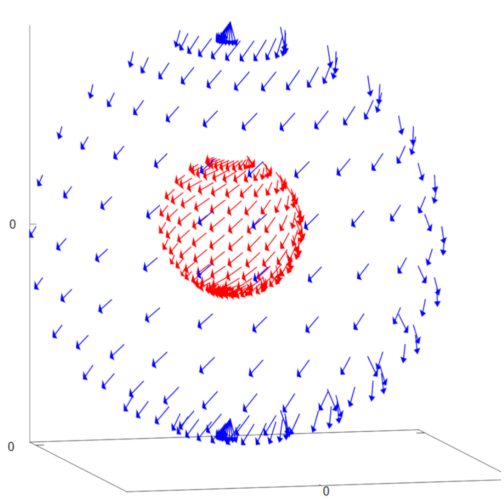

Figure 3: 3D representation of $\mathbf{B}(\mathbf{r})$.

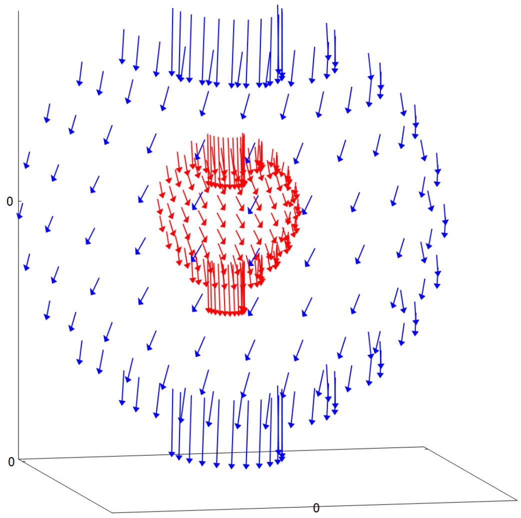

Figure 4: 3D representation of curl($\mathbf{B}(\mathbf{r})$).

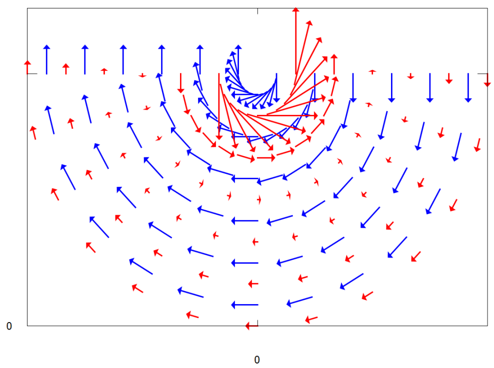

Figure 5: Projection of $\mathbf{B}(\mathbf{r})$ (blue) and curl($\mathbf{B}$) (red) onto the equatorial plane.

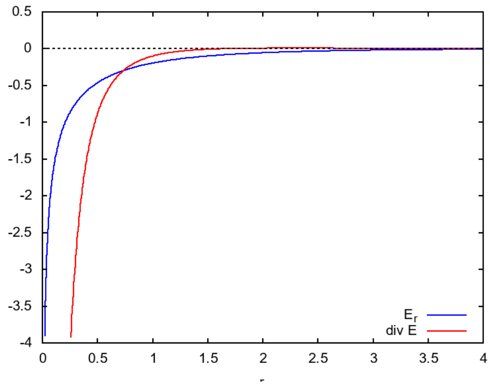

Figure 6: Radial component of $\mathbf{E}(\mathbf{r})$ and div($\mathbf{E}(\mathbf{r})$).

and

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

Checking if $\mathbf{B}$ is a Beltrami field is simplest by 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 near to a Beltrami field in the outer region, where **B** and the curl of **B** are parallel.

3 Divergence of fields in spherically symmetric spacetime

The fact that **B** is not a pure rotational field leads to the conjection 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

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

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

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

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

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

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

In classical electrodynamic, however, the Gauss law is

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

because there are no magnetic monopoles. Surprisingly, the spherically symmetric spacetime produces a kind of such topological monopoles, in a similar way, as 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 notice that the θ plane is the XZ plane in cartesian coordinates. Therefore, the image has to be rotated by 90 degrees to relate it with a correct position in the spherical coordinate system.

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

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

where ρ_{eh} is the "homogeneous" density of magnetic monopoles. The situation is not completely exotic here, because we have a dipole, but this seems to be

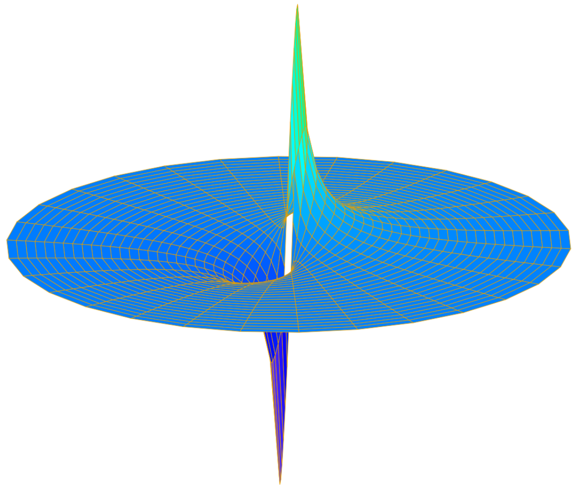

Figure 7: div($\mathbf{B}(\mathbf{r})$) in the θ plane (corresponding ot the XZ plane).

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 apply this situation to galaxies, the result would describe a feature of the electric or plasma universe. We can apply the same results to mechanics and find from the corresponding ECE field equations of dynamics:

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

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

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

where $\mathbf{g}$ is the gravitaional 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 becomes visible 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. So 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 holds in general.

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 go 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 sort of particle (differently charged) can leave the central region at another end, without sacrificing the model. So, if astronomers are sure that the jets go out on both sides, this would be a strong hint that the universe is essentially electric and not mechanic.

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