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UNIFICATION OF THE GRAVITATIONAL AND ELECTROMAGNETIC FIELDS THROUGH NONLINEAR PHYSICS

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I. SIMILARITY OF THE ELECTROMAGNETIC AND GRAVITATIONAL FIELDS

The electromagnetic radiation of a source, moving with a speed much less than the speed of light, is described by the vector potential \mathbf{A} , which originate from the time-changing electric dipole moment \mathbf{p} of the source.

$$A_j = (\mu_0/4\pi D) dp_j/dt \quad (1)$$

Where D is the distance from the source, μ_0 = the permeability of the space, index j labels one of the three space coordinates. The dipole moment \mathbf{p} is the integral of the charge density of the source taken over its volume

$$\mathbf{p} = \int \rho_c \mathbf{r} dV \quad (2)$$

In 1918, Albert Einstein introduced a tensor h_{jk} to describe the gravitational dynamic in general relativity, where the indexes vary over four coordinates – three of space and one of time. Many of the properties of the tensor h_{jk} describing gravitation are analogous to the

vector potential A_j , which characterizes electromagnetic radiation¹.

Also, both electromagnetic and gravitational waves have two polarizations in the plane perpendicular to their direction of propagation. One polarization stretches and squeezes along the x - and y -directions (conventionally labeled h_{+}) and the other stretches and squeezes along axes rotated at 45° from the x - and y -axes (conventionally named h_{\times}).¹

Are the similarities between the electromagnetic and gravitational fields accidental or they point to something the fields have in common? Einstein intuitively felt that they belong together and spent the second half of his life (1920 – 1955) trying the unite electromagnetism and gravitation into one united field theory with common geometrical representation for them. However, his project remained unfinished.²

Meanwhile, the superstring theory came to the realization that the collective description of strongly interacting quantum matter can be modeled in terms of a higher dimension gravitational physics. This approach is referred to as gauge/gravity duality, holography, or holographic duality.³ It means that holographic quantum matter can be modeled as gravitational physics.³

It also means that the gravitational field can be modeled as a quantum matter or that the gravitational field is a quantum field (see the article of the author⁸). We are going to show in this article that the gravitational field is a special type of nonlinear torus-shaped electromagnetic field. But let us first introduce some terminology of nonlinear physics, which will help the reader understand better the subject.

II. TERMINOLOGY OF NONLINEAR PHYSICS

Let us introduce some concepts of nonlinear physics, which we would need. The flux of running-river water would be linear, if the bottom of the river is smooth. However, if there is a big stone on the bottom of the river, the water needs to flow around the stone and the water flux becomes nonlinear. Behind the stone, turbulence would be observed manifested with a couple of: vortex spinning clockwise and anti-vortex spinning counterclockwise.

Following the law of the folded fingers of the right hand in physics, when the folded fingers show the

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direction of the electric currents (or direction of spinning), the vertical thumb show the direction of the induced magnetic field. Following this law, the vortices (which spin clockwise) would induce magnetic field inward, which would make the vortices to suck energy in. Following the same law, the anti-vortices (which spin counterclockwise) would induce magnetic field outward, which would make the anti-vortices to emit energy.

III. THE TORUS-SHAPED NONLINEAR ELECTROMAGNETIC FIELD

Let us consider the electromagnetic field of the Sun. Our Sun and the other stars of our galaxy were born from the Black Hole at the center of the galaxy⁴. However, to create the stars the light energy flux, which exits the anti-vortex of the Black Hole creating matter, needed to be cut off with a vortex. This made all stars to be a vortex on top of anti-vortex, which resulted in their torus-shaped NEMFs (details presented in our article⁴).

In our article⁵, which explains the cycle of solar activity, the Sun is active when it spins clockwise because the induced magnetic field is inward and the Sun sucks energy in through both ends of the axis of spinning passing through the hole of the donut-shaped NEMF. This increases the energy of the Sun, which starts spinning faster. Its turbulence increases manifested as two chains of alternating vortices and anti-vortices running on both sides of the equator, seen as solar spots.

When the vortex and anti-vortex spin faster, they create more powerful magnetic fields and they attract each other stronger. This is the basis of their torus-shaped NEMF when the Sun is active. Thus, the sun is active when it spins fast clockwise, sucks energy in through both ends of the axis of spinning, and becomes more and more bulged at the equator.

When the horizontal pressure on the plasma at the equator reaches the critical point, which the solar plasma can tolerate, the Sun starts spinning counterclockwise to release the pressure and starts emitting energy through both ends of the axes of spinning. The energy of the Sun decreases, and its spinning slows down. The turbulence in the equatorial area disappears and the solar activity drops down to zero.

The period of low or no solar activity continues until the shrinking at the equator reaches the critical point of vertical pressure, which the solar plasma can tolerate. To release the pressure the Sun starts spinning in opposite (clockwise) direction and sucking energy in through both ends of the axis of spinning, which results in increased solar activity. And this switching between high and low activity goes on and on.

To be able to suck energy through both ends of the axis of spinning during solar activity and to release

energy through both ends of the axis of spinning during low solar activity, the Sun must be a vortex on top of anti-vortex. When the Sun spins clockwise, it sucks energy in through both ends of the axis of spinning, it spins faster and becomes more active. The vortex and anti-vortex go deeper into each other, which leads to the torus shape of the Sun's NEMF.

When the Sun spins counterclockwise, both ends of its axis of spinning emit energy, which makes the Sun elongated toward the axis of spinning. The lost energy decreases the Sun's spinning, which decreases the attraction between the vortex and anti-vortex and they distance each other. This makes the stars (including our Sun) elongated toward the poles during the period of their low activity. The Solar Dynamic Observatory (SDO) launched in space in 2010 can confirm this.

As said in our article⁴, when the Black Hole of the galaxy was creating the stars of the galaxy, anti-vortex of the Black hole initiated the flux of light matter (because only anti-vortices emit energy) and vortex (spinning in opposite direction) was necessary to end the flux of light matter, so that the star can be born. This makes the NEMF of all stars vortex on top of anti-vortex.

As we will show in another article, the planets orbiting the Sun were born from anti-vortices of the Sun, which spin counterclockwise and emit energy. To cut the spinning counterclockwise plasma flux, spinning in opposite direction (vortex-like) was necessary, which made the NEMF of all the planets to be also vortex on top of anti-vortex and to have a torus shape (Fig. 2).

Prigogine, who created the nonlinear theory, defined attractor as the final state of the evolution of dissipative systems, which loose energy as dissipating heat. In the Prigogine's theory, the torus-shaped NEMF is the tri-dimensional attractor.⁶ This is a shape with maximal energy in storage and maximal stability, to which all self-organized systems adhere.⁶ For this reason, all self-organized systems have torus-shaped NEMF. And this peculiar torus-shape form of NEMF of stars and planets is what we know as gravitational field.

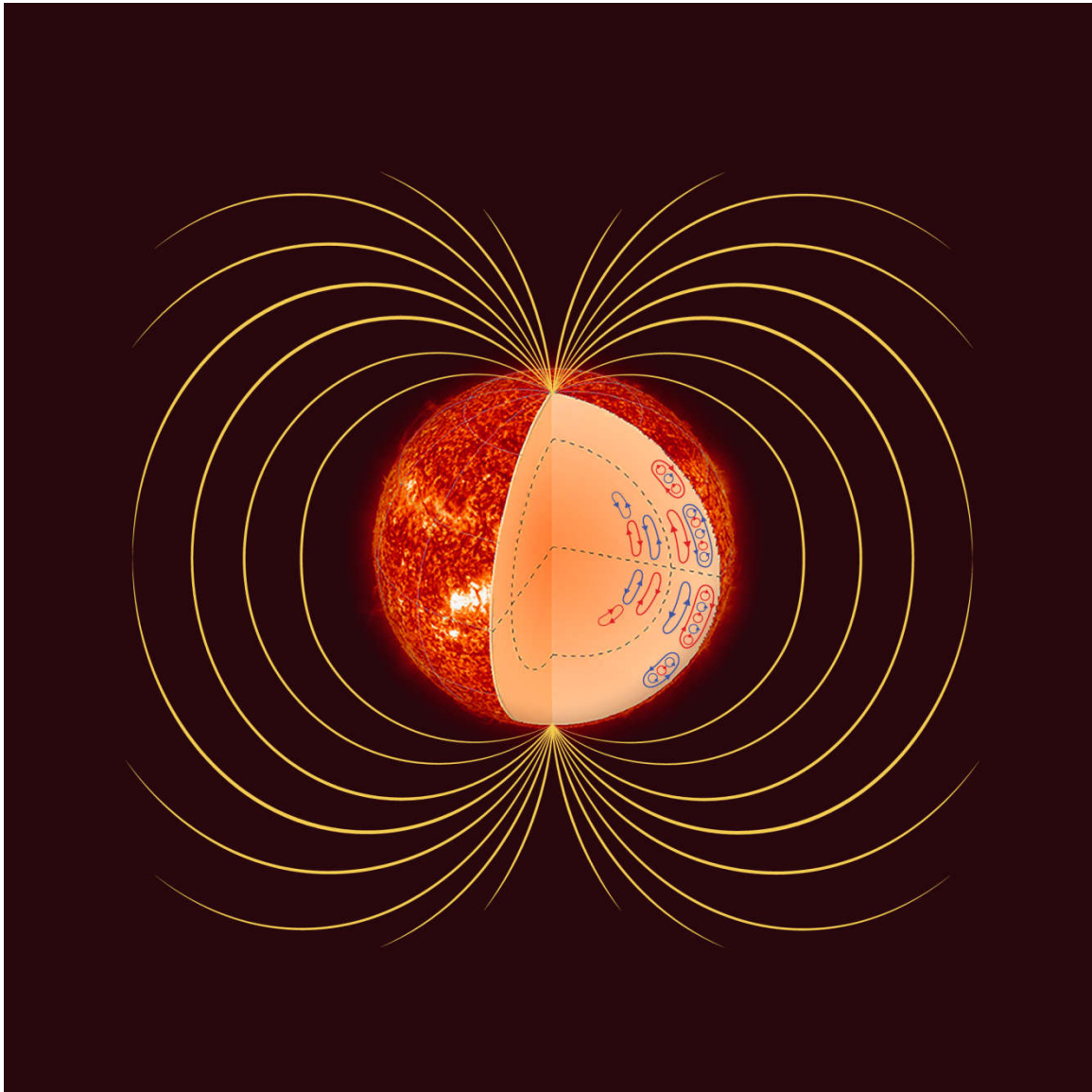


Fig. 1: The torus shaped nonlinear electromagnetic field (NEMF) of the Sun

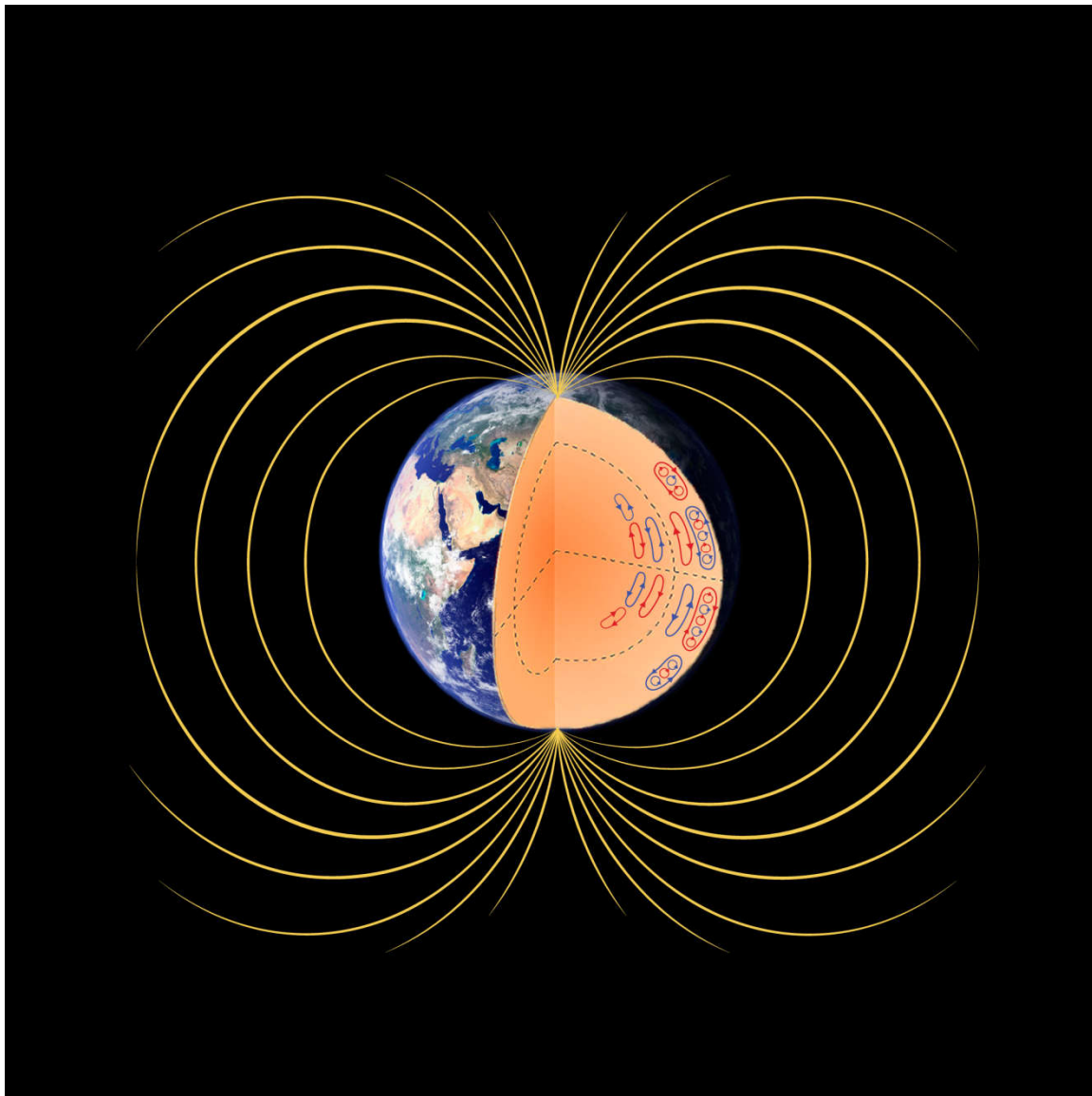


Fig. 2: The torus shaped nonlinear electromagnetic field (NEMF) of the Earth

IV. CONCLUSION

Thus, the gravitational field is a peculiar torus-shaped nonlinear electromagnetic field (NEMF). The torus shape results from stacking a vortex on top of anti-vortex with axes of spinning on one line. They are in dynamic equilibrium. Since this type of stacking annihilates most of the energy of the electromagnetic field, the gravitational field is much weaker than the electromagnetic.

But let us explain the dynamic equilibrium in more details. The vortex and the anti-vortex, which spin in opposite direction, create magnetic fields with opposite polarity. As a result the vortex and anti-vortex would attract each other stronger when the star spins faster clockwise and sucks energy in. This stronger attraction leads to a star more bulged at the equator with increased turbulent activity and pronounced torus (donut) shape NEMF.

When the bulging at the equator reaches the critical point, which the solar plasma can tolerate, the vortex and anti-vortex will start spinning in opposite (counterclockwise) direction and moving away from each other to release the pressure. They now throw energy out through the holes of the donut, which are at the ends of the axis of spinning of the donut.

This will elongate the shape of NEMF toward the poles and will shrink the NEMF at the equator.⁷ It will continue until the shrinking at the equator reaches the critical pressure, which the solar plasma can tolerate. To release the pressure the vortex and anti-vortex will start spinning in opposite (clockwise) direction, suck energy in, spin faster and attract each other stronger. And this goes on and on.

Thus, the gravitational field is a specific type of electromagnetic field; it is much weaker than the electromagnetic because the strong electromagnetic force is to a large degree compensated by the stacking

of vortex on top of anti-vortex. However, this stacking is what makes objects to be attracted to the surface of this sandwich of vortex and anti-vortex.

Since the earth's NEMF is a vortex in the northern hemisphere on top of anti-vortex in the southern hemisphere, it influences differently the atmosphere circulation in the northern and southern hemisphere. The tornadoes in the northern hemisphere spin clockwise like the vortex NEMF of the northern hemisphere and the tornadoes in the southern hemisphere spin counterclockwise like the anti-vortex NEMF of the southern hemisphere.

Also, in the earth's northern hemisphere all thrown objects deflect to the right or clockwise like the spinning clockwise vortex of the earth's NEMF. In the southern hemisphere, all thrown objects deflect to the left or counterclockwise like the spinning counterclockwise anti-vortex of the earth's NEMF. Thus, the so-called Coriolis forces (formulated in 1835) reflect the fact that the earth's NEMF is a vortex in the northern hemisphere on top of anti-vortex in the southern hemisphere.⁷

Each object (as everything material) has its NEMF⁴ and this NEMF reacts with the NEMF of the earth. Since the vortex of the northern hemisphere spins clockwise, the earth's NEMF defects the thrown object clockwise (to the right). Since the anti-vortex of the southern hemisphere spins counterclockwise, the earth's NEMF deflects the thrown object counterclockwise (to the left).⁷

Recently, the classical general relativity theory was successfully used to describe holographic quantum matter,³ which is an additional proof of the common roots of the gravitational and electromagnetic fields. The opposite is also true - gravitational field can be modeled as quantum matter, which means that the gravitational field is quantum field.⁸

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