GALACTIC SCHUMANN RESONANCE TYPE WAVES

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ABSTRACT-One of the enigmas in astronomy is the cause for stars having varying brightness, and that includes our Sun. The current theory for stars energy does not support fast variations nor the proliferation of different types of variable stars. Variations of the energy output of our Sun have been noted for many centuries and current instruments can record the periodic magnetic field reversal. There is an energy source that can account for many of the variable star actions, but the wavelengths of this energy are not easily measured directly. Sir Arthur Eddington mentioned a suggestion, but dismissed it.

I. Introduction

In referring to variable stars, Sir Arthur Eddington mentioned, but dismissed the suggestion, "that there is some subtle radiation traversing space that the star picks up."[l] Eddington's dismissal was based upon *incomplete information*, that is, the science known in the 1920s. The existence of electromagnetic (EM) waves coming from the cosmos, other than light, was not known to scientists until 1940.[2] Decades before WWII, it was known that radio waves could be propagated long distances over the horizon through a mechanism that was described as skip. To have skip, it was concluded there was an unseen metallic-like layer, an ionosphere, well above the atmosphere that acted like a conductor which reflected radio waves having certain frequencies. The ionosphere produces radio wave reflections when the angle of incidence is optimum for specific wave lengths.

The discovery that EM oscillations can be created and sustained within a metallic enclosure was not known to Eddington in the 1920s; this was discovered in the 1930s.[3] The EM waves within a cavity are referred to as standing waves.

The development of radio astronomy was inhibited during WWII. The accelerated development of nuclear related theory during that war identified the various EM spectra that could be produced by atomic structures. In the early 1950s, Harvard researchers built a radio telescope that was intended to detect a specific radio frequency produced by an atomic structure, that of the 21 cm emission coming from neutral hydrogen. In 1951, the detection of the 21cm emission of the neutral hydrogen atom coming from space changed physics and radio astronomy dramatically.[4]

As compared to today, the antennas and detection instruments available in 1940 that could detect the presence of EM waves coming from space were extremely limited in their sensitivity and frequency range. Today, using parabolic antennas, terrestrial based radio astronomers have instruments that can readily detect EM emissions in the higher frequencies of the radio spectrum that penetrate the radio window.[5] At the lower frequencies in the radio window, very large antenna arrays are required to obtain the sensitivity and directional resolution comparable to that of a parabolic antenna. To current radio astronomers, low frequency is essentially between 10 MHz to 240 MHz. The Low Frequency Array for Radio Astronomy (LOFAR) is intended to monitor 10 to 240 MHz.[6] The Murchison Widefield Array (MWA) is designed to monitor frequencies from 80 to 300MHz.[7] The subtle radiation from space that can alter a star's output will have frequencies that are best described using periods of years or centuries, sub-microHz frequencies.

Our Sun is a variable star. The periodic fluctuations in our Sun's output have oscillation cycles that fall into the sub-microHz. These periodic fluctuations have been given names by their discoverers, but they can be described as solar minimums and maximums that encompass within their periods the regular sunspot cycles. The Sunspot cycle periods are reasonably well defined but the other solar minimums and maximums could encompass multiple centuries for one cycle, but not enough observation time has passed to define their periods with certainty.

II. Electromagnetic Cavities in Space

In 1952, physicist Dr. Otto Schumann mathematically predicted that there could be a global EM resonance.[8-9] Ref(9) is included for historical clarity. SR were detected in 1960.[10] More EM barriers have been discovered about the Earth.[11-13] The Earth itself is within the cavity created by the Sun's heliosphere. What is known about the shape of the Sun's heliosphere has changed dramatically. We know the Sun's heliosphere is a sheath of high energy particles. The recent imaging from the Casinni spacecraft has radically changed the long accepted comet type shape of the heliosphere. "'These images have revolutionized what we thought we knew for the past fifty years: the sun travels through the galaxy not like a comet but more like a big, round bubble' said Stamatios Krimigis, principal investigator for MIM1, which is orbiting Saturn. It's amazing how a single new observation can change an entire concept that most scientists had taken as true for nearly fifty years."[14] It is quite possible that Schumann type resonances are being produced inside this large heliosphere bubble, but they will have frequencies in the sub-microHz. It is possible that the Cassini data will allow a better measure of the size of the Sun's heliosphere bubble to facilitate the calculation of SR type frequencies. [15] As noted in ref.(13), there are density ducts formed along the Earth's magnetic field lines, thus it is reasonable to suspect similar density duct structures could exist along the Sun's magnetic field lines.

It takes an EM wave approximately 8 minutes to travel 1 AU. If the same Earth SR theory held for the Sun, the basic standing wave would be related to a wavelength that is associated with the circumference of the Sun, which is about 4,366,800 km. A wavelength for this distance would give a frequency of $1.31004(10^{-12})$ Hz. However, the Sun has a complicated atmospheric structure which consists of a photosphere, a chromosphere and a corona. The top of the Sun's corona is probably the lower conducting layer and an inside layer of the Sun's heliosphere is the other conducting layer that would define an EM cavity that can produce a SR type wave. Additionally, the Sun's heliosphere bubble is much further away from the Sun's surface in comparison to the conducting ionosphere layer above the Earth's surface. [16] It is reasonable to suspect that the Sun's heliosphere is more complex than that of the Earth. There could be many unseen layers yet to be identified in the heliosphere bubble and the magnetosphere surrounding the Sun.

III. Galactic Schumann Resonance Type Waves

Nothing is known about the unseen structures within and about our galaxy to definitively say this or that structure can create or support SR types waves. We can surmise that the galactic core is the source for all the energy and matter that comprise the structures outside the core. Based upon our current knowledge about the unseen structures surrounding the Earth and Sun, it is reasonable to suspect that there could be many such unseen structures within and surrounding our galaxy that can support SR type waves. The arms of our galaxy can be considered density ducts and they could be supporting the propagation of many subtle radiations within them.

The dominant literature about variable stars seems to conclude that their variability, other than eclipsing stars, is based upon their internal energy pulsations. The current theory as to what generates a stars energy does not support rapid changes in output.[17] If one considers that there is a subtle radiation traversing space that the star picks up, then the wave(s) periodicity, magnitude and orientation relative to the stars magnetic axis will have to be considered when estimating the energy that could be transferred to the star. The energy content of this radiation would have a tremendous magnitude to influence a stars energy output. When the energy in the wave can flip the stars magnetic axis, the power level required to do the flip would depend upon the wave's orientation to the star's magnetic axis.

Our Sun's sunspot and magnetic field flip cycle has a slightly varying period.[18] Also, it is notable that the peak Sunspot output has a slowly varying cyclic. This suggests that the short term cyclic is being modified by a longer cyclic by an EM wave superposition process. The superposition process is typically described by using waves that are all spatially aligned in the same plane. It is expected that galactic SR type waves will have a variety of orientations, and depending upon their orientation, they will cause an additive, subtractive or null resultant.

It is known that the Earth's magnetic field has flipped its poles, but the last measurable flip was some million years ago. It is not known what the Sun did at the same time. However, the Earth's magnetic field is always wandering, which suggests some subtle radiation from space could be the cause for this action.[19]

IV. Conclusion

The primary problem in detecting subtle very low frequency radiation from space is having a sufficient monitoring period to identify the presence directly or indirectly as both processes require long observation times, which could be centuries.

Knowing that unseen metallic-like structures in space can support standing waves, the suggestion that there are subtle radiations traversing space has merit. These unseen barriers have flexibility, thus the waves within them can have variations.

The interesting issue concerning the discovery noted in ref.(13) is that the MWA was detecting emissions from the energetic particles that are within *density ducts* some 1,000,000 km (about 600 mi) above the Earth. A researcher detecting these emissions using a single or close cluster of parabolic radio telescopes might make the assumption that they were coming from some far off point in space. Until satellite radio telescopes are sent well beyond the Sun's heliosphere and magnetosphere, there can be instances where astronomers, using an earth orbiting radio telescope or terrestrial based radio telescope, will not know if they are picking up Earth or Sun related emissions rather than something that is truly coming from some region of space far beyond the unseen barriers within and surrounding our solar system.

The density ducts introduce refraction errors that cause position offsets of radio telescopes pointing at distant radio sources.

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