

SCHUMANN RESONANCE: NEW ASPECTS FOR TOURISM DEVELOPMENT

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Abstract

The Schumann resonance is a global level important discovery that Earth produces natural electromagnetic waves in the extremely low frequency of 7.83[Hz]. It spreads a signal that positively or negatively affects all living beings, including humans in their natural environment. The research discusses some impacts that this resonance may have over tourists and visitors that visit or prospectively intend to visit different tourist destinations in Macedonia. Moreover, the paper puts a focus on some locations with tourism motives (like churches, monasteries, spas, mines, geo-tourist locations, etc.) that already have tourist activity, or those with potential to have one. From a scientific point of view, the paper offers the possibility to perceive some effects of the Schumann resonance on tourists and visitors from different approaches: psychological, neurological, physiological, etc. From a practical point of view, the findings may assist in identifying new strategic dimensions for promoting new aspects of tourist product in Macedonia.

Key Words: *natural frequency, tourism, positive effects*

JEL classification: *L83, I12*

Introduction

Being influenced by a large number of social, economic, political and environmental factors, tourism occurs to have an extremely diversified character. Particular attention is paid to tourist perception since it enables tourism policy-makers to create new insights and tailor new strategic approaches that may increase the number of visits and nights spent in a

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destination. When creating an image and perception while experiencing tourism services, tourists and visitors are drawn by various individual motives depending on their preferences. Yet, one may argue that the health issue seems to be of great importance to everyone, regardless of the individuality in specific needs when addressing tourism and leisure services. Hence, spa and wellness tourism emerged among top aspects for tourism development, urging the need to explore developing new aspects of added-value tourism products. Some potential is found in the possibility to create a state of synchronization between positive emotions, cardiovascular, respiratory, immune and nervous systems, which are influenced by the Schumann resonance (SR) (Schumann, 1952).

Namely, according to Schumann's research, the Earth produces natural electromagnetic waves at an extremely low-frequency level of 7.83[Hz], which spread a signal that affects everyone and everything on Earth in the natural environment. Such wave distribution of information is a global level important discovery, always pointing to new aspects of positive or negative influence on all living beings.

Though Schumann resonance literature is continuously growing, the issue of how it affects tourists and visitors that visit tourism recreational areas is barely discussed. This paper attempts to fill this gap by demonstrating the manner in which some tourist and recreational areas have the potential to reflect the therapeutic benefit of the Earth's magnetic field on tourists. Besides assessing the possibilities of the positive effects on visitors, the research emphasizes the importance to perceive new approaches in developing tourism product. In order to do so, the research is carried in a spa center as a sample location in Macedonia. Although this paper makes a contribution to the current research on electromagnetic field radiation, no academic study in Macedonia has yet, to our best knowledge, dealt with this topic in this manner. So, the study proposes an identification of new frontiers and strategic dimensions for developing a model for promoting new tourism product based on positive and harmonious energy vibrations in tourism locations in Macedonia.

The paper is divided into several sections. The first addresses the literature review on integral views on the Schumann resonance, along with a brief overview of the produced signal effects over the environment. This is followed by the research methodology. The next section discusses the results, being followed by the main conclusions of the study. The last

section presents the limitations and offers suggestions concerning future research.

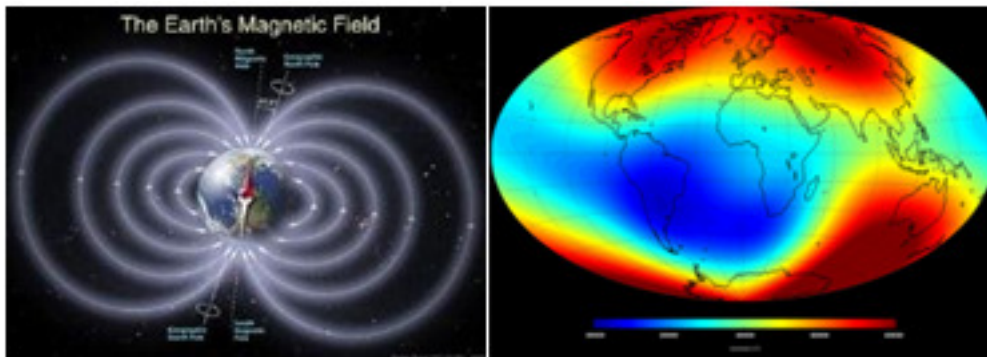
Literature review

This section is devoted mainly to studies investigating the Schumann resonance. However, the electromagnetic frequency has effects on global coherence of living things, so the literature review commences with a discussion of the concept of positive paradigm and potential dynamics over tourism and leisure activities.

Schumann resonance: Integral views

The Schumann resonance (Schumann, 1952) is vastly explored and the literature is continuously growing. It was detected by Balser and Wagner (1960) as a spectrum of resonant electromagnetic waves in the extremely low-frequency range in the Earth-ionosphere cavity (Figure 1).

Figure 1: *Earth magnetic field*



Source: <http://planet-earth-2017.com>

The interest in exploring the SR differs. Yet, from the very beginning the studies were focused on evaluating the characteristics of global lightning and thunderstorm activity (Nickolaenko et al., 2003; Nickolaenko, 1997; Nickolaenko & Hayakawa, 2002), monitoring the global upper-tropospheric water vapor changes (Price, 2000), and monitoring planetary temperature (Williams, 1992). Furthermore, Nickolaenko and Rabinowicz (1982) used the SR in the exploration of the electrical activity and lower ionosphere parameters on celestial bodies.

Schumann resonance effects

The literature contains a large body of work exploring the effects of the Earth magnetic field on all living beings, including humans in their natural environment. Figure 2 clearly shows the presence of the SR by forming distinct peaks starting around the fundamental frequency of 7.8[Hz] with higher harmonic components at 14, 20, 26, 33, 39 and 45[Hz].

As noted by McCraty et al., (2012), and McCraty and Deyhle (2015) this directly overlaps with the central nervous system alpha wave bandwidth which is associated with the psychophysiological coherence of 0.1[Hz], the approximate 10-second cycle of ocean waves and the hypothetical resonant frequency of the Earth.

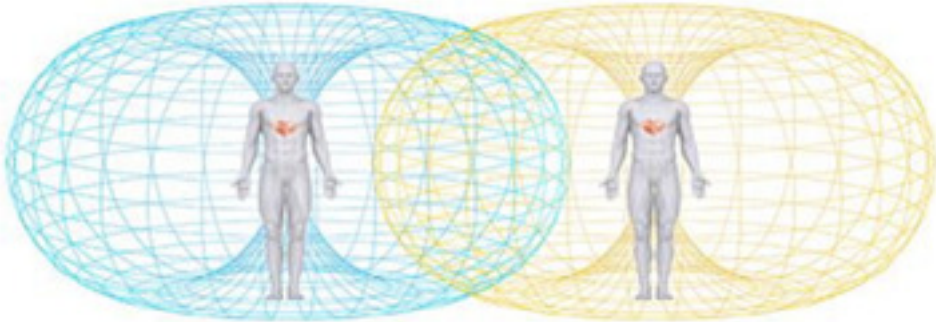
Figure 2: *Schumann resonance*



Source: *Edwards (2015)*

Furthermore, Brizhik et al., 2009 discuss the postulation of feedback loops between all living systems and the Earth's magnetic field, enabling encoded information to be communicated non-locally between people at a subconscious level. In the same line, Lynch (2014), McCraty (2003) and Rosch (2014) argue that the presence of electromagnetic interactions within and between people (Figure 3) have vast implications for interpersonal communication, psychotherapy, healing, and future related research and praxis, which have hardly been tapped.

Figure 3: *Intra-personal and interpersonal bio-electromagnetic interactions*



Source: *Edwards (2015)*

McCraty et al., (2012) also note that changes in the Earth's magnetic field affect human heart rhythms, brain, and nervous system activity; athletic performance, memory and other tasks; synthesis of nutrients in plants and algae; the number of reported traffic violations and accidents; mortality from heart attacks and strokes; and incidence of depression and suicide.

Research methodology

Case study - Kežovica Spa, Štip (Macedonia)

Štip is the largest urban city situated in the eastern part of Macedonia and generally serves as an industrial and educational center for the region. Despite tourist potential, it is not developed in tourism manner and incorporates only 0.68% of total tourist arrivals (7,645 tourists) and 0.64% of total overnights (20,452 overnights) registered in 2018.

As per the national context, although being noted as one of the national strategic priorities of the country (The Government of the Republic of Macedonia, 2016), tourism contribution is still modest. Some improvements are expected for the forthcoming period according to the latest National Tourism Strategy (2016-2021), where the focus is on urban, cultural and lake tourism. According to Petrevska and Collins-Kreiner (2017), Macedonia is in the "development" stage of its life cycle and has reached a state of tourism maturity.

Macedonia has seven main geothermal fields with 18 thermal water localities, including more than 50 occurrences as springs and wells, generally being identified in the eastern and northeastern parts of the country. Yet, probably due to the low temperature of Macedonia's

geothermal water, the geothermal energy is barely used as a renewable source of energy in the country. According to the Energy Balance for 2015-2019, the geothermal energy participated with 2.36% in the national energy balance of renewable energy sources (Popovska-Vasilevska & Armenski, 2016).

Kežovica Spa is located 2 km southeast from the center of Štip. With the water radioactivity of 43.7 Mach, it is known as one of the most radioactive thermal mineral waters not only in Macedonia but also in the Balkans (Figure 4). The thermal mineral water temperature is between 54-70°C with a flow rate of 5.4 l/sec (Gorgieva & Popovski, 2001). Due to high radioactivity, the water in Kežovica Spa has such complex favorable chemical content full with lots of minerals that positively affect people's health. It is recommended and used as curative of rheumatism, knuckles conditions, nervous system, diabetes, infertility, arteriosclerosis, skin diseases and inflammations, high blood pressure, etc. Local residents use the water from the springs for drinking, inhalation and treating some lung problems.

Figure 4: Location of spas in Macedonia, with Kežovica Spa



Source: Gorgieva & Popovski (2001)

Today, Kežovica spa (Figure 5) has renovated bath with pools and a center for rehabilitation. The complex has a unit for physic-therapy, which uses the most modern devices and treatment methods. This spa has

a capacity of 105 beds and encompasses almost 7% of all beds registered within Macedonia's spas (1,579 beds). Additionally, there is a possibility to be accommodated in modern private facilities in the center of Štip.

Figure 5: *Kežovica Spa*



Source: *Google images (Kežovica Spa)*

Although the water of Kežovica Spa is thermal and offers the possibility to be used as a geothermal resource, so far it has not been used. Besides balneology being the main applicative form, some further utilization may include greenhouse heating, plastic houses heating, drying of agricultural products, district heating, preparation of sanitary warm water, etc. Yet, power generation is not applicable since the temperature is far below the limit of technical feasibility. Despite the high awareness of Kežovica Spa potential for the local economic development, the local authorities have not still initiated any serious project for spa tourism development.

Research aims and questions

The study has a primary aim to investigate and evaluate the potential impact of the Schumann resonance over tourists and visitors that visitor may visit Kežovica Spa. Moreover, the research utilizes the data measurements and underlines the possibilities to use the spa as a relaxing ambient full with positive and harmonious energy vibrations.

In order to fulfill the aim, the main objective of the paper is to ascertain how the Earth's wave distributes information, the intensity, and possible affection. During the analysis, the focus was on the following particular questions:

- RQ₁: How to manage the signal of the Earth magnetic field for tourism purposes?

- RQ₂: How to perceive the effects on tourists and visitors from different approaches (psychological, physiological, neurological, etc.)?
- RQ₃: Which measures to recommend for promoting new tourist product that may result in the ultimate satisfaction of tourists?

Study method

The study is based on a mixed research method incorporating qualitative and quantitative information obtained by primary and secondary sources. In this manner, the authors have reviewed and made an in-depth analysis of relevant literature with a focus on the measurements of the Earth magnetic field and investigating its positive effects on the biosphere. To deepen the information collected through the desk research, the data were gathered from primary sources by using 16 Bit AD converter. Furthermore, a self-made induction Schumann antennas 16 [Hz] were designed at the laboratory of the Faculty of Natural Sciences.

The data were collected from two locations (Plačkovica and Kežovica Spa) and further processed with the software package T-Soft. Besides the presentation of the original signals on both locations, the low band pass Butterworth filter 1-35 [Hz] was applied, and the Fast Fourier Transform spectrum was done.

In order to provide relevant accuracy and significance of the interpreted results, two types of data were compared:

- First, the authors used the data already gathered from the field research undertaken in September 2015 at the mountain Plačkovica. All started in 2013 when prof. Lazo Pekevski forms the Seismological Observatory in Skopje as the lead expert of the team of university professors who set up a fixed antenna to receive and register the extreme-low frequencies from 1,400m heights, thus covering a large territory. Moreover, this antenna serves as a referent measurement point enabling purifying, correcting and comparing data obtained from other locations in its nearby vicinity. After performing several pilot measurements, as of 2015, prof. Pekevski with collaborators recorded and utilized data for scientific purposes (Popovski et al, 2017; Panov et al., 2016);
- Second, the authors undertook new measurements in February 2019 directly at the near vicinity of Kežovica Spa, as a case study for this research.

Figure 6: *Preparation phase and measurement instruments*

a – Preparations, Plačkovica (2015) b - Induction antennas used in 2015



c – Preparations, Kežovica Spa (2019) d – Induction antenna used in 2019



Source: *Authors*

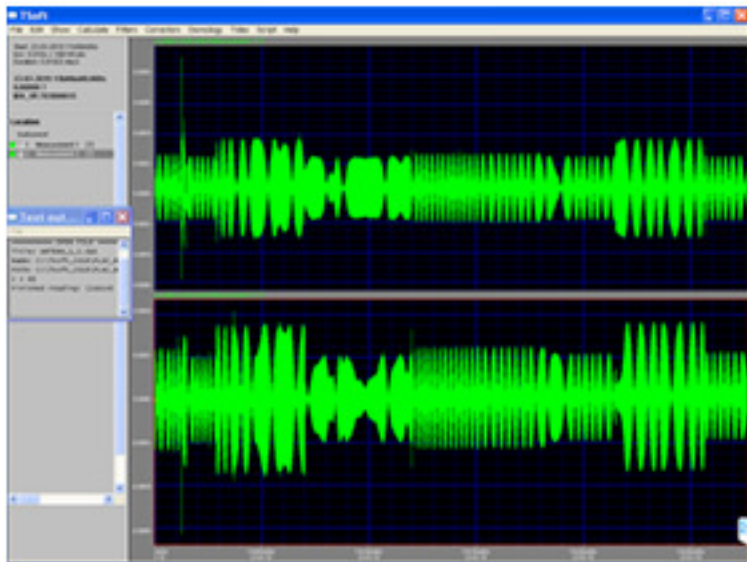
Figure 6 visually presents the preparation phase applied in 2015 (Figure 6a) and 2019 (Figure 6c), along with the applied measurement instruments on both locations Plačkovica (Figure 6b) and Kežovica Spa (Figure 6d), respectively. On both locations, the measurements were repeated in many various intervals during the day for one month period. This was done due to fact that the effects of the solar wind and magnetization differ during the day (and during the night) and vary on a range of timescales from minutes to hours. Through extensive research, for the purpose of the study, the authors extracted and interpreted data from a one month sample period, as a reference time period (September 2015 at Plačkovica location, and February 2019 at Kežovica Spa location).

Generally, the measurements upon which data are analyzed and the conclusions are made, spread over one month period, with constant recorded intervals of 2-3 hours. The time sample was randomly chosen, though the main focus was on the following momentums:

- Early mornings (7:00 – 9:00 o'clock), as the usual time when elderly local residents visit the spa for the regular daily bath;
- Noon periods (11:00 – 13:00 o'clock), as preferred time for medical treatments; and
- Early afternoons (15:00 – 17:00 o'clock), as the period when non-working residents often visit the spa for recreational purpose.

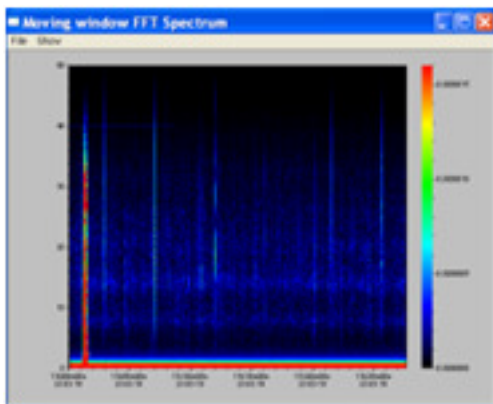
Results and discussion

Figure 7: Basic signal (top: Plačkovica, bottom: Kežovica Spa)

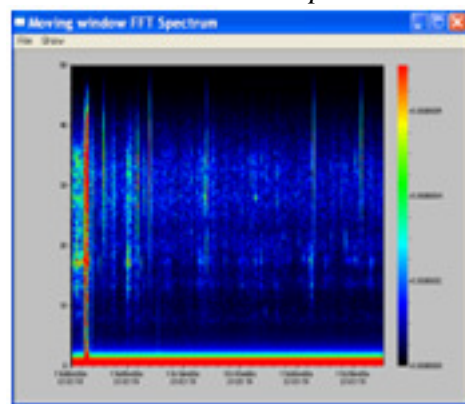


Source: Authors

Figure 8: Spectrogram
a - Plačkovica



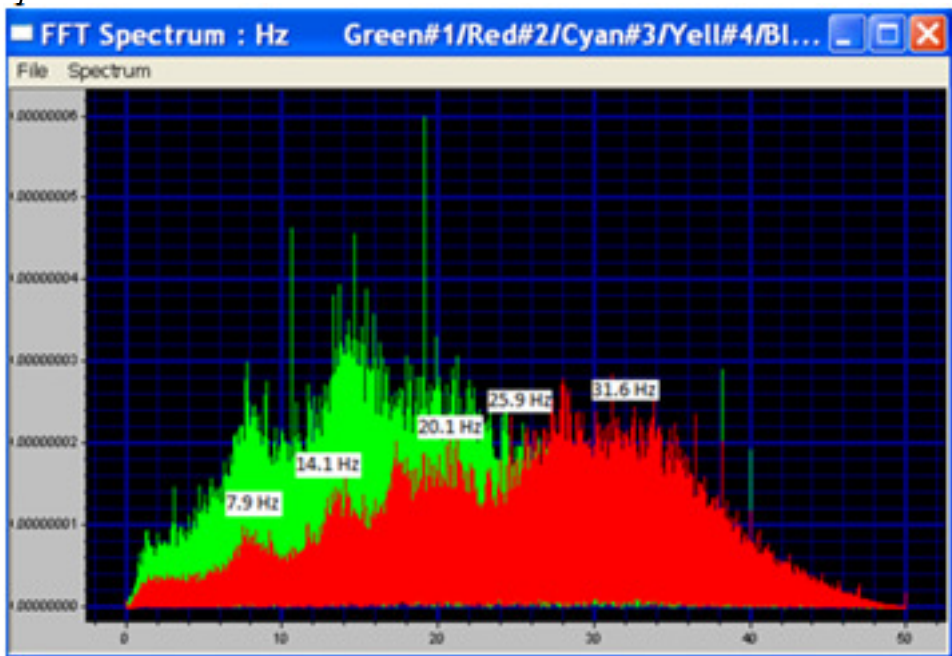
b – Kežovica Spa



Source: Authors

Figures 7 and 8 present just a small extract from numerous data obtained from the measurements in Plačkovica and Kežovica Spa. Figure 7 presents the basic signal from both locations, and figure 8 presents their spectrograms.

Figure 9: *Comparing Plačkovica (green) and Kežovica Spa (red) spectrums*



Source: *Authors*

A more close comparison is presented in Figure 9. The research revealed that Kežovica Spa has a significant presence of the basic pulsation of the Schumann resonance of 7.9[Hz] along with other harmonics at 14.1[Hz], 20.1[Hz], 25.9[Hz] and 31.6[Hz]. It is known that such impulses have positive therapeutic effects on humans, whereas the frequencies around 7-8[Hz] support the bone growth, frequencies around 10[Hz] support the ligament healing, while the frequencies around 15[Hz] are in favor for capillary formation, fibroblast proliferation and decrease skin necrosis (Human frequency blog b, 2019). Another positive impact of Schumman resonance on the human body is already vastly discussed (Babayev & Allahverdiyeva, 2005; Gubbins & Herrero-Bervera, 2007; Persinger & Saroka, 2015).

Having in mind that usually, local residents who visit Kežovica Spa have problems with heart rhythms, brain, and nervous system activity, such registered magnetic field may stream with high positive signals. This is expected to affect in a most positive manner to visitors' heart rate, blood pressure and overall health condition and calming, as already discussed by HeartMath Institute (2019), Mitsutake et al., (2005), McCraty et al., (2012), and Ward and Henshaw (2016).

The results point that Kežovica Spa may easily be promoted as a tourist and recreational area that offer ultimate satisfaction in an ambient with positive and harmonious energy vibrations, thus attracting visitors, one-day trippers, excursionists and nature-lovers who appreciate and support local environmental quality.

Conclusion

The paper makes an attempt to draw attention to how to manage and utilize the Earth's magnetic field for tourism purposes. In order to do so, the study supports the thesis with results obtained by measuring the Schumann resonance in Kežovica Spa in Štip, Macedonia. Generally, by combining the insights from primary and secondary sources, it was found that Kežovica Spa, along with the surrounding vicinity of Štip (with particular reference to Plačkovica Mountain) receives natural electromagnetic waves with extremely low frequency, known as the Schumann resonance.

Furthermore, the study reveals that such effects may be perceived by tourists and visitors from different approaches, like psychological, physiological, neurological, etc. Hence, it may provoke to feel more relaxed, full of energy, revitalized and reenergized. That means that Kežovica Spa may attract much more visitors than the current number if being promoted as a recreational and leisure area that offers more than just an ordinary spa treatment.

Having in mind that the therapeutic benefit of the electromagnetic field radiation on human's health from a medical perspective has been scientifically proven, Kežovica Spa may gain an added value. Besides the ordinary balneology treatment, a new dimension may be added by putting a focus on a new product that may result in a comprehensive satisfaction in an ambient full of harmonious energy vibrations.

We strongly believe that a model for comparing the consumption of the "basic tourist product" with the consumption of a "new tourist product" may contribute to an adequate understanding of the findings. Hence, Kežovica Spa, along with Štip, needs to undergo the process of developing a new product for tourism consumption. This process goes in tandem with different tourism promotion strategies became popular in many cities around the world (Ben-Dahlia et al., 2013; Law, 1996; Selby, 2004). This may be a good opportunity for developing spa tourism based on positive impulses from nature, and creating and generating no negative impacts on the environment caused by tourism. Moreover, such innovative approach may lead to sustainable development, thus promoting and offering specific tourism product with zero seasonality.

When visitors of Kežovica Spa are going to be told that the Earth's magnetic field positively encode and interact with their consciousness, emotions, and thoughts, it is believed that they will be willing to extend the duration of the stay (being 2.7 days for 2018) and to visit the location again. The local economic development may be boosted, tourism private initiative may arise and Štip may be transformed from the largest urban industrial and educational center in the eastern part of Macedonia to the leading spa tourism city in the country. This, by all means, posts a necessity of creating tourism-friendly settings conditions from the environment and applies them pragmatically in the fast-growing tourism industry thus making stable and equitable local and regional economic prospects.

On the other hand, Macedonia lacks tourism planning which imposes the need of creating clearly defined and recognizable offer by designing niche tourist products (Petrevska et al., 2018). Consequently, key tourism players on a local, regional and national level need to identify such solution approaches that can proactively aim at increasing the visibility of Kežovica Spa as a destination that besides traditional way of consuming balneology spa services possesses additional positive aspects for rejuvenation and overall wellbeing, regardless of age and gender.

Limitation and future work

The research was limited by several factors that can serve as productive starting points for future work.

First, the measurements at Kežovica Spa were done in a short time period, so additional time extension spanning over a calendar year and numerous repetitions of measurements during the day-time period may be involved. This is to better assess signal impulses in the sampled location, but also to purify the data from magnetic storms and sub-storms, electric discharges and thunderstorms that occasionally appear.

Second, instead of measurements with only one mobile instrument, performing measurements with several more mobile induction antennas could be beneficial and advisable. This will enable comparison of data, particularly in the line of their consistency and accuracy.

Finally, when doing a case study research, there is a risk for generalization of the findings and the danger of overrating details and specifics. This is often criticized as the biggest disadvantage when applying a case study method for research purposes (Muno, 2009; Sartori, 1994; Yin, 1984).

The limitations, however, do not diminish the significance of the findings, but they rather suggest some broad directions for further research. Notwithstanding the difficulties, this article assists in a better understanding of the distribution of the magnetic field signals, their dispersion and effects on current, but also on potential tourists and visitors. Overall, the research generates useful findings and points to valuable directions for further work.

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