Appendix A

Table 1 Summary of epidemiological and experimental studies on the effects of geomagnetic and solar activity on human health parameters

Author (Year)	Field Researched	Field Intensity	Population	Target tissue/organ	Results
McCraty (2017)[35]	Geomagnetic field (Total M agnetic Field Variation - TM FV, Kp, Ap, Schumann Resonance - SRP)	Natural intensity variation (0.01-300 Hz) *Measures such as TMFV (standard deviation of the time-varying field) and Kp/Ap indices reflect global geomagnetic activity, without a fixed intensity of application*	Adults and the elderly (n=10), males (n=2) and females (n=8); Average age: 53 years (range 34-65 years	Autonomic Nervous System (ANS) / Cardiovascular System	The daily activity of the ANS not only responds to changes in solar and geomagnetic activity, but also synchronizes with the time-varying magnetic fields associated with geomagnetic field resonances and Schumann Resonances.
Wang (2019)[32]	Static and rotated geomagnetic field (inclination and declination variation)	~35 μT (ambient equivalent)	Adults (n=36); Age (18 to 68 years)	Brain (Central Nervous System)	Measurable alpha-ERD brain response to specific and ecologically relevant rotations of the magnetic field. The response was selective for field polarity in the Northern Hemisphere (downward tilt) and counterclockwise rotations. The sensitivity to field polarity rules out induction and quantum compass mechanisms, supporting a ferromagnetic transduction hypothesis (biogenic magnetite).
Mattoni (2020)[36]	Natural Variation of Geomagnetic Activity (Ap, K, Kp Indices) and Solar Activity (Index F10.7) over 30 days	Not Applied (Environmental Field)	Healthy adults (n=20), Age (>18 years)	Cardiovascular System	The effects of geomagnetic and solar activity on HRV are, at best, very small. Strong correlations reported previously are probably statistical artifacts of autocorrelation in time series.
Anand (2022)[42]	Interplanetary M agnetic Field (IM F) - *in situ*	Average: 5.8 nT (range: ~3.2 to 9.0 nT)	Elderly (n=726), male, (~60+ years)	Lungs	An increase in FM I (and other indices of solar activity) was associated with a significant reduction in FEV1 and FVC. This effect was amplified by the presence of particulate

					pollution (PM 2.5 and BC).
Zilli Vieira (2022)[37]	Interplanetary M agnetic Field (IM F) - *in situ*	Average values/hours not provided; percentile analysis (>50º)	Adults (n=176), patients with an Implantable Cardioverter Defibrillator (IAD); mean age not provided	Heart (Atrium)	Periods of higher geomagnetic activity (M FI, Kp, Solar Wind > 50th percentile) significantly amplified the risk of Atrial Fibrillation (AF) triggered by air pollution (PM 2.5, BC, PN) up to 24h before the event.
Schiff (2022)[41]	M FI (Geomagnetic)	Average: 5.9 nT	Elderly (n=742), male; Average age 73.3 years	Vascular endothelium	Increase in markers of endothelial activation (sICAM -1, sVCAM -1) and inflammation (CRP).
Tracy (2022)[38]	Geomagnetic field (Kp Index)	Kp Index (0-9, no direct unit) Average: 19.1 ± 12.2 IQR: 16.2 *Higher values indicate greater geomagnetic disturbance*.	Elderly (n=728), male; M ean age 75.8 ± 6.9 years	Hematopoietic System / Bone M arrow (inferred)	Significant inverse association between increased geomagnetic activity (Kp) and total leukocyte, neutrophil and basophil counts. Conclusion: Periods of high geomagnetic activity are associated with mild immune suppression, possibly through effects on the bone marrow or regulation of the autonomic nervous system.
Wang (2023)[40]	Geomagnetic field (Kp Index)	Kp Index (0-9, dimensionless) Cumulative M edian: 1.61 IQR: 0.49 *Higher values indicate greater geomagnetic disturbance*.	Pregnant women (n=9,573), single births; 74.9% were under 35 years old.	Fetus / Growth Parameters Fetal (BPD, HC, FL, AC)	Negative association between increased geomagnetic activity (cumulative Kp index) and growth parameters fetal (especially cranial and abdominal circumference) measured late in gestation (24 weeks). Positive association with cranial parameters measured early (<24 weeks). Conclusion: Geomagnetic activity is associated with changes in intrauterine fetal growth patterns, with effects varying according to gestational age.

Table 1 Summary of epidemiological and experimental studies on the effects of geomagnetic and solar activity on human health parameters. The table presents a synthesis of study designs, populations, exposures, and main results related to the effects of environmental and geomagnetic magnetic fields on various physiological systems. Field intensities are reported as described in each study, ranging from controlled experimental applications (~35 μT) to measures of natural variation (Kp, Ap, IMF, TMFV, SRP indices). The study populations include adults, the elderly, pregnant women, and patients with pre-existing cardiac conditions. The results indicate significant associations between geomagnetic activity and changes in the autonomic nervous

system; however, questions remain regarding the methodologies employed. Furthermore, changes have been documented in the cardiovascular, endothelial, hematopoietic, and pulmonary systems. Also in fetal growth, with variations in the direction and magnitude of the effects depending on the physiological context and the exposure window. AC: Abdominal Circumference (fetal); AF (AF): Atrial Fibrillation; ANS (ANS): Autonomic Nervous System; Ap index: Planetary amplitude index (measure of geomagnetic activity); BC: Black Carbon; BPD: Biparietal Diameter (fetal); CR: Cosmic Rays; CRP: C-Reactive Protein; FVC: Forced Vital Capacity; DAI: Implantable Cardioverter-Defibrillator; ERD: Event-Related Desynchronization; F10.7: Solar Radio Flux at 10.7 cm (2800 MHz); FEV1: Forced Expiratory Volume in 1 second; FL: Femur Length (fetal); HC: Head Circumference (fetal); HF: High Frequency (HRV frequency band); IBI: Inter-Beat Interval; ICAM- 1: Intercellular Adhesion Molecule 1; IMF: Interplanetary Magnetic Field; IQR: Interquartile Range; Kp index: Planetary K index (measure of global geomagnetic activity); LF: Low Frequency (HRV frequency band); $PM_{2.5}$: Particulate Matter with aerodynamic diameter ≤ 2.5 μm; PN: Particle Number; SDNNi: Standard Deviation of NN intervals index (HRV measurement); sICAM-1: Soluble Intercellular Adhesion Molecule 1; sVCAM-1: Soluble Vascular Adhesion Molecule 1; SRP: Schumann Resonance Power; SWS: Solar Wind Speed; TMFV: Total Magnetic Field Variance; TP: Total Power (HRV measurement); VCAM-1: Vascular Adhesion Molecule 1; VLF: Very Low Frequency (HRV frequency band); HRV: Heart Rate Variability.

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