Subject: Request to evaluate potential solar spectral and electromagnetic variability as a contributing factor in environmental EMF exposure and human health

I am submitting this comment in response to the Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure.

Public and scientific discussion has focused primarily on anthropogenic sources of EMF/RF. A complementary environmental factor that warrants systematic evaluation is possible long-term variability in the Sun's electromagnetic and particle output and its coupling into Earth's near-space and surface electromagnetic environment.

Solar Cycle 25 has shown elevated activity, including multiple M-class flares, associated coronal mass ejections, and periods of elevated solar-wind speed. These events modulate the magnetosphere, ionosphere, and ground-level geomagnetic and ELF/VLF fields. Independent of storm-level Kp indices, solar-wind streams and ionospheric disturbances can alter the natural electromagnetic background to which humans are continuously exposed.

A second, testable question is whether the Sun's photospheric continuum or key spectral-line ratios have shown measurable departures from historical baselines beyond those explained by improved atmospheric models or instrumental differences. Apparent changes in solar disk color or brightness have been widely reported by observers. While atmospheric scattering (Rayleigh) accounts for much of the yellow appearance of the Sun near the horizon, controlled comparisons of high-resolution spectra and calibrated continuum measurements (space-based or carefully corrected ground-based) against multi-decade archives could determine whether any residual shift exists in effective temperature, continuum slope, or relative line strengths (for example, hydrogen and helium features).

An additional, low-cost line of investigation concerns possible interactions between solar radiation exposure and telomere dynamics in human populations living at high elevation.

High-elevation regions receive greater doses of ultraviolet radiation and a modestly altered flux of higher-energy solar particles relative to sea-level sites, owing to reduced atmospheric attenuation. Populations that have long resided at elevations above approximately 2,500–3,500 m (Andean, Tibetan, and Ethiopian highland groups) therefore constitute a natural experiment for examining cumulative solar-related biological effects.

Telomere length and telomere-maintenance markers are measurable in peripheral blood or saliva and are known to respond to oxidative stress, ultraviolet exposure, and other environmental variables. Existing biobanks and published genomic datasets from highland populations already contain DNA that can be re-analyzed for average telomere length (qPCR, Flow-FISH, or Southern blot), TERT expression, or shelterin-complex components. These can be compared with matched lowland controls from the same ancestral backgrounds and further stratified by:

- local elevation,
- estimated personal ultraviolet dose,
- contemporaneous solar-wind speed, interplanetary magnetic-field parameters, and geomagnetic indices (publicly available from NOAA and similar sources),
- standard covariates (age, sex, smoking, hypoxia-related genotypes, diet, and socioeconomic factors).

A focused follow-up study could sample the same communities at two elevations and across periods of differing solar activity, testing whether any elevation-associated difference in telomere length or maintenance markers exceeds the effect predicted by hypoxia or ultraviolet dose alone and whether the difference covaries with recent solar-particle or geomagnetic conditions.

Such measurements would help determine whether natural solar radiation contributes measurably to genomic-maintenance outcomes in environmentally exposed populations and would supply quantitative data relevant to broader evaluations of environmental electromagnetic and radiation factors in human health.

Recommended investigations relevant to human health and environmental EMF:

- Long-term, calibrated monitoring of the solar continuum and selected Fraunhofer lines, with public release of differential analyses against historical spectra.
- Correlation studies linking solar-wind speed, density, interplanetary magnetic field, and ionospheric parameters with ground-level ELF/VLF field strength, Schumann resonance amplitude and bandwidth, and geomagnetically induced currents.
- Epidemiological or physiological time-series analyses examining whether periods of elevated solar-wind or ionospheric disturbance are associated with changes in sleep, heart-rate variability, blood pressure, or symptom reports in EMF-sensitive individuals, after controlling for weather, season, and anthropogenic RF.
- Inclusion of solar and geomagnetic indices as covariates in any ongoing or planned assessments of environmental EMF exposure and health outcomes, particularly for vulnerable populations.
- Re-analysis of existing highland genomic datasets and targeted follow-up sampling to assess telomere length and maintenance markers in relation to elevation, ultraviolet dose, and contemporaneous solar and geomagnetic indices.

These measurements are feasible with existing space-based and ground-based instruments and biobanks and would clarify whether natural solar variability contributes measurably to the overall electromagnetic environment and to genomic-maintenance outcomes relevant to human health. I request that HHS consider directing or supporting such targeted studies as part of its evaluation of environmental EMF factors.

Thank you for the opportunity to comment.