

ELECTROMAGNETIC ULF-ELF RESPONSE OF NEAR-EARTH SPACE TO MAN-MADE, ATMOSPHERIC, AND MAGNETOSPHERIC ACTIVITY

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Plasma environment of the Earth plays the role of a “tuning fork” responsive to natural and technogenic disturbances. Here we present a brief review on research cycle aimed at studying the electromagnetic interaction between the atmosphere and upper ionosphere in the ULF-ELF range under both “below” and “above” impacts. The experimental part of this study is based on the analysis of synchronous satellite and ground observations using data from the world network of high-sensitive magnetometers and low-Earth-orbit (LEO) satellites SWARM, Chibis-M, and CSES. The plasma and electromagnetic noise at LEO over typhoons are revealed. We have obtained evidences of penetration into the upper ionosphere of electromagnetic ULF-ELF emissions from lightning discharges, typhoons, ground ELF transmitter, and power transmission lines. To interpret the observational results, new numerical models of the electromagnetic interaction of the atmosphere and ionosphere are developed. We estimate the electromagnetic “pollution” of near-Earth space by industrial 50/60 Hz radiation. These observations revealed the entire complex of phenomena of interaction between geophysical shells. The impact of atmospheric processes and man-made activity on near-Earth space is still an underestimated factor of near-Earth space physics.