

ASSESSING GLOBAL LIGHTNING ACTIVITY WITH ELF/VLF OBSERVATIONS, SCHUMANN RESONANCES AND IONOSPHERIC POTENTIAL

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Global lightning activity is estimated from globally spaced ELF/VLF receivers and used to investigate the dynamics of the global atmospheric electric circuit. ELF/VLF radiation generated by lightning is known to propagate long distances in the Earth ionosphere waveguide, but propagation effects resulting from diurnal ionospheric variations often dominate received amplitudes at a fixed station. Day/night propagation effects thus make meaningful comparison and summation of activity across multiple stations difficult. Exact inversion of the propagation channel is possible only with knowledge of the location of each lightning impulse, a feat unattainable even with current detection networks. In a novel approach, propagation effects are accounted for using established monthly averages of lightning location provided by the Lightning Image Sensor (LIS) and applying known frequency specific attenuation parameters for daytime/nighttime ELF/VLF propagation. The method allows for quantification of daily lightning activity on a global scale using a small number of receiver sites. Obtained curves of daily lightning activity are compared to measurements of atmospheric electric field at mid and polar latitudes and also to lightning activity estimates based on Schumann resonances. For Schumann resonances we utilize a method of field decomposition that separates propagating and standing modes. It is found that in most examined cases daily global lightning activity and the atmospheric electric field are poorly correlated.

Global Lightning Activity, Ionospheric Potential, Schumann Resonance

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