

VLF RADIO PROPAGATION CONDITIONS: COMPUTATIONAL ANALYSIS TECHNIQUES

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Very low frequency (VLF) radio waves propagate within the Earth-ionosphere waveguide with very little attenuation. Modifications of the waveguide geometry effect the propagation conditions, and hence, the attenuation. Changes in the ionosphere, such as the presence of the D-region during the day, or the precipitation of energetic particles, are the main causes of this modification. Using narrowband receivers monitoring VLF transmitters, the amplitude and phase of these signals are recorded. Multivariate data analysis techniques, namely Principal Component Analysis (PCA) and Singular Spectrum Analysis (SSA), are applied to the data in order to determine parameters, such as seasonal and diurnal changes, affecting the variation of these signals. Transient effects may then be easier to detect.

Radio propagation, Ionosphere

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