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Subionospheric VLF/LF radio waves propagation characteristics before, during and after the Sofia, Bulgaria Mw=5.6 earthquake occurred on 22 May 2012

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In 2009, INFREP, a network of VLF (20-60 kHz) and LF (150-300 kHz) radio receivers, was put into operation in Europe having as principal goal, the study of disturbances produced by the earthquakes on the propagation properties of these signals.
On May 22nd, 2012 an earthquake with Mw=567 occurred in Bulgaria, near Sofia, inside the "sensitive" area of the INFREP VLF/LF electromagnetic network. The data collected on different frequencies, during April-May 2012 were studied using different methods of analysis: daily correlation methods, spectral approaches and terminator time techniques, in order to find out possible connections between the seismic activity and the subionospheric propagation properties of radio waves.
The studies were performed with the help of a specially designed LabVIEW application, which accesses the VLF/LF receiver through internet. This program opens the receiver's web-page and automatically retrieves the list of data files to synchronize the user-side data with the receiver's data. Missing zipped files are also automatically downloaded. The application performs primary, statistical correlation and spectral analysis, appends daily files into monthly and annual files and performs 3D colour-coded maps with graphic representations of VLF and LF signals' intensities versus the minute-of-the-day and the day-of-the-month, facilitating a near real-time observation of VLF and LF electromagnetic waves' propagation.
Another feature of the software is the correlation of the daily recorded files for the studied frequencies by overlaying the 24 hours radio activity and taking into account the sunrise and sunset. Data are individually processed (spectral power, correlations, differentiation, filtered using bandpass, lowpass, highpass). JTFA spectrograms (Cone-Shaped Distribution CSD, Gabor, Wavelet, short-time Fourier transform STFT, Wigner-Ville Distribution WVD, Choi-Williams Distribution CWD) are used, too.