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Comparison of lightning parameters deduced from ELF transients at two separate observatories

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Lightning produces electromagnetic radiation also in the ELF (Extremely Low Frequency, 3Hz – 3kHz) band. Transverse electromagnetic mode waves can propagate in the Earth-ionosphere waveguide to global distances before decaying to background levels and they can initiate global electromagnetic resonances (Schumann resonances, SR). ELF waves originating from common lightning sources were observed at two recording stations – Nagycenk (NCK; 47.6N, 16.7E), Hungary and Mitzpe Ramon (MR; 30.6N, 34.8E), Israel – on 31^{st} March, 2003. They appeared as coherent transient signals in the time series of the monitored components of the atmospheric electromagnetic field (vertical electric and horizontal magnetic components). Direction and source-observer distance (SOD) as well as current moment spectrum were deduced for each transient at both stations by comparing the measured spectra of the field components to theoretical SR model spectra. Wait and Jones' model was used which assumes vertical dipole type source, perfectly conductive ground and an ionosphere the conductivity profile of which is deduced from more measured and theoretical conductivity profiles. Locations estimated from single station data were compared to results from triangulation and verified by satellite IR images. The comparison suggests that local ionospheric irregularities between the source and the observer may alter the field spectra and then the deduced value for SOD can be inaccurate. Special attention was paid to the position of the day-night terminator line relative to the source and the observers when deduced current moment spectra for the same lightning source were compared. This comparison suggests that spectral amplitudes are about 20% higher on the day side of the terminator line than on the night side.