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# Global lightning dynamics deduced from Schumann resonance frequency variations at two sites $\sim$ 550 km apart

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Schumann resonance (SR) peak frequencies depend on the lightning source-observer angular distance. The modal phase shift interaction at nodal distances manifests itself as sharp frequency variations: increases or decreases depend on the direction of the source motion with respect to the observer and the mode number. Nagycenk Observatory (47.6° N, 16.7° E), Hungary and Belsk (51.8 ° N, 20.8 ° E), Poland, are relatively close to each other ( $\sim$550 km apart) compared with SR wavelengths. Both stations can approach the nodal position with respect to the African source region for the third Ez mode and to the Asian/American "chimney" regions for the first Ez mode as lightning activity migrates as the seasons change. These two observation sites can be on the different sides of the nodal line region for some weeks twice during a year, indicating the fine seasonal motion of the source regions which causes relatively large frequency variations (some tenth Hz) and different frequency values at the two stations, especially for the third Ez mode. Source-observer distance dependent frequency variations are presented throughout a year by using simultaneous SR observations at Nagycenk (NCK) and Belsk (BLK). The observed frequency changes are supported by the simulation of the distance-dependent frequency variation based on the computed spectra of the vertical electric field components using the Two-Dimensional Telegraph Equation (TDTE) technique (Kirillov, 2002). For the tropical "chimney" regions the diurnal phase of greatest activity has well established spatial-temporal dynamics. Modal peak frequencies are obtained, along with modal intensities and quality factors, by means of the least-squares fitting of "experimental" spectra by the "classic" Lorentzian function (Williams et al., 2006).