Geophysical Research Abstracts
Vol. 19, EGU2017-8558, 2017
EGU General Assembly 2017

Global thunderstorm activity estimation based on number of transients in ELF-band

Adriena Ondraskova and Sebastian Sevcik

Department of Astronomy, Physics of the Earth and Meteorology, Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava, Slovakia (ondraskova@fmph.uniba.sk)

Schumann resonances (SR) are resonant electromagnetic oscillations in extremely low frequency band (ELF, 3 Hz – 3 kHz), which arise in the Earth-ionosphere cavity due to lightning activity in planetary range. The time records in the ELF-band consist of background signals and ELF transients/Q-bursts superimposed on the background exceeding it by a factor of 5 – 10. The former are produced by the common worldwide thunderstorm activity (100 – 150 events per second), the latter origin from individual intense distant lightning discharges (100 – 120 powerful strokes per hour). A Q-burst is produced by a combination of direct and antipodal pulses and the decisive factor for its shape follows from the source-to-observer distance.

Diurnal/seasonal variations of global thunderstorm activity can be deduced from spectral amplitudes of SR modes. Here we focus on diurnal/seasonal variations of the number of ELF-transients assuming that it is another way of lightning activity estimation. To search for transients, our own code was applied to the SR vertical electric component measured in October 2004 – October 2008 at the Astronomical and Geophysical Observatory of FMPI CU, Slovakia. Criteria for the identification of the burst are chosen on the basis of the transient amplitudes and their morphological features. Monthly mean daily variations in number of transients showed that African focus dominates at 14 – 16 h UT and it is more active in comparison with Asian source, which dominates at 5 – 8 h UT in dependence on winter or summer month. American source had surprisingly slight response. Meteorological observations in South America aiming to determine lightning hotspots on the Earth indicate that flash rate in this region is greatest during nocturnal 0 h – 3 h local standard time. This fact may be interpreted that Asian and South American sources contribute together in the same UT. Cumulative spectral amplitude of the first three SR modes compared with number of ELF-transients in monthly averaged diurnal variations quite successfully confirmed, that the number of transients could be a suitable criterion for the quantification of global lightning activity.