UNIFICATION OF LORENTZIAN SPECTRAL METHODS APPLIED IN DIFFERENT SCHUMANN RESONANCE STATIONS TO PREPARE GLOBAL INVERSION FOR SPECIFYING GLOBAL LIGHTNING SOURCES

TAMÁS NAGY 1, Gabriella Sátori 1, Robert Boldi 2, Vadim Mushtak 3, Earle Williams 3, Mariusz Neska 4

1. Geodetic and Geophysical Research Institute, HAS, Csatkai u. 6-8. H-9400 Sopron, Hungary, e-mail: nattomi@ggki.hu
2. Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, MA 02420, USA.
3. Parsons Laboratory, Massachusetts Institute of Technology, Cambridge, MA 02139, USA
4. Institute of Geophysics, PAS, ul. Ks. Janusza 64, 01-452 Warsaw, Poland

The aim of so-called inversion problem in Schumann resonances is to specify the lightning sources globally, given station measurements of SR intensities, peak frequencies, Q factors, for multiple SR modes and possibly at multiple stations. In this respect, having a unified method used by all stations for calculating SR intensities, peak frequencies and Q factors plays a crucial role.The Lorentzian function is a singly peaked function giving the shape of certain types of spectral lines which, in the context of SR are usually described by three independent parameters. It represents the theoretical spectral response of the damped simple harmonic oscillator. The term Lorentzian fitting is applied to the procedure of approximating a finite sequence of 2-dimensional data points - in this case a set of experimental frequencies and the corresponding spectral values - in the least-squares sense by a superposition of a given number of Lorentzian functions. The peaks which are present in the SR spectrum resembles the bell-like shape of the Lorentzian function extremely well, which makes it an excellent choice for approximation in the mathematical sense. This leads to a nonlinear least-squares fitting problem with *3m* parameters, with *m* being the number of resonant modes one intends to consider. The purpose of this preparatory study is to unify the different algorithms of the Lorentzian spectral method applied in different Schumann resonance stations (Nagycenk, Hungary; Rhode Island, USA; Belsk, Spitsbergen, Poland) and to eliminate or minimize the differences of methodological origins. Spectral parameters of common time series determined by Lorentzian fits are compared for the stations participating in the inversion procedure.

Lorentzian fitting, nonlinear least-squares, Schumann resonances

Nagy Tamás, József Bór, Geodetic and Geophysical Research Institute of the HAS, Sopron, Hungary, H-9401, PoB. 5. e-mail: nattomi@ggki.hu, tel.: +36 30 689 4953, fax: +36 99 508 355