Investigation of the litosphere by using network magnetometer data

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Among other techniques, electromagnetic soundings provide a relevant contribution to the study of the deep interior of the Earth. They are based upon the determination of the impedance Z for frequencies down to 10-4 Hz and even less. Impedances are estimated from simultaneous variations of the horizontal magnetic and electric fields recorded at a station. We present here a new method for impedance derivation from a network of at least three 3-components magnetometers. Consider a network of three stations arranged in a triangular configuration with a separation distance allowing the description of magnetic variations associated to sources of regional or hemispheric extent. Assume further that the primary source field at the surface of Earth can be approximated as a superposition of independent plane waves. The magnetic data series will be analysed using the method proposed by Pinçon and Lefevre (1991, 1992), and by Pinçon et al (2000). In this approach the determination of horizontal gradients of the magnetic field components is achieved by wave-vector identification. The resulting frequency wave vector spectrum of the magnetic field over the 3 stations network will be used to estimate the variation of the Earth inductive response as a function of frequency. In order to assess the performances with field data of the method we propose, we use minute values from Earth geomagnetic observatories (INTERMAGNET data). Statistical postprocessing of the results obtained from data of three stations are also presented. We introduce results from studies done for Europe and North America.