Computation of the electromagnetic waves excited by a dipole source in the layered medium

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We have developed such a new computation code of electromagnetic waves in a layered semi-conductive dielectric medium that is demanded specifically by the sounding system called EM-ACROSS(=Accurately Controlled Routinely Operated Signal System) for the underground structure analysis and state monitoring by means of the active dipole transmission. An essential point in this code is the introduction of more accurate approximation in the numerical integration of Hankel function. Comparison with numerical calculations and the analytic solutions was satisfactory. Further comparison was made with the observed transfer functions in frequency domain (1-100 Hz & source-receiver distances are less than 3.5km) at Tono area. Agreement is noted particularly for magnetic field, despite of the significant heterogeneity of electric conductivity at the shallow part of this area, indicating that the surface heterogeneity effect is eliminated in magnetic field as an integrated quantity of complicated distribution of electric current in the heterogeneous shallow parts. This code will be useful in designing the observation system and also the data analysis of the transfer functions acquired by ACROSS without any constraint of far field or near field. Forthcoming development of the code is the extension to account for experimental results in finite length of dipole source.