

Effect of Sq variations on the electromagnetic response functions in the period range between 3 hours and 1 day

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Electromagnetic (EM) responses, such as GDS, MT and HTF responses, at long periods are used to estimate the electrical conductivity in the deep mantle. However, it is known that the period dependence of EM responses shows discontinuous feature between shorter and longer periods at around 10,000 seconds. In the shorter period range, treatment of the regional/local induction is allowed so that the source field can be regarded as a plane wave. This suggests that the discontinuous feature may be due to the effect of a finite scale of the source field. This paper examined this problem by using a model of Sq (Solar Quiet daily variation), consisting of modes of spherical harmonic coefficients with a fundamental period of 1 day. It was shown that this model qualitatively explains the feature of the induction arrows only by considering an insulating Earth where induction does not occur. Forward modeling studies with land-ocean distribution at the surface and 1-D conductivity model have shown that most of anomalous features in the EM response functions in this period range are ascribed to the source field effect of the Sq variations.