

Distribution of source effects in the high latitude magnetotelluric data

The magnetotelluric (MT) and related passive electromagnetic induction methods work on the condition that the far-field assumption is fulfilled by the source signals. Whereas possible violations of this condition due to anthropogenic signals have been understood well, it becomes more and more evident that part of the natural electromagnetic signals is not homogeneous either, and unlike told in textbooks these near-field effects are not limited to polar and equatorial electrojet regions or the Sq variations with their harmonics. Such evidence comes mainly from long-term (monitoring) data, which result in transfer functions and induction arrows. The latter ones are most affected by source effects which expresses itself in the fact that they are not constant in time in a way that cannot be explained by changes in subsurface conductivity.

To assess this problem, we have considered four years long time-series data of 15 stations from the IMAGE (International Monitor for Auroral Geomagnetic Effects) network. We have processed these data with Egbert's processing and also applied the Remote Reference Technique, which is necessary to eliminate cultural noise. Preliminary results clearly show temporal changes. In the induction arrows, the non-stationarity behaviour is prominently seen in the high but also in mid-latitude regions. The spatial and temporal pattern these source effects are exhibiting are partly familiar, in particular for seasonal changes in mid-latitude, and partly not understood well yet. We will further investigate them with the aim to identify their generation mechanism and to recommend ways to avoid MT results being influenced by them.