Temporal variations in ionospheric currents create an electric field that is further modified by the induced telluric current flowing in the conducting ground. Knowledge of the resulting induced electric field at the Earth's surface is needed e.g. in modeling Geomagnetically Induced Currents (GIC) that flow in man-made conductor systems, such as gas and oil pipelines or high-voltage power grids. GIC calculation is usually done in two steps: 1) Calculate the horizontal electric field at the Earth's surface and 2) calculate the current driven by the electric field in a specific conductor system. In this presentation we concentrate on the first step, in which the appropriate horizontal length scale is about 100 km.

Direct measurements of the ground electric field are very sensitive to the local conductivity, so usually the induced electric field is calculated from magnetic measurements. Several methods have been developed for this task, but they all require some knowledge of the Earth’s electric conductivity as input. In this presentation we discuss the possibility of integrating the induced electric field directly, using Faraday’s law and the measured time derivative of the vertical component of the ground magnetic field. Numerical integration is carried out by fitting Spherical Elementary Current Systems (SECS, Amm and Viljanen, 1999) to the input data. Tests with simulated data sets indicate that this approach works well in principle, but practical applications may be limited as the method seems to require measurements from a very dense magnetometer network.