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Poster
We performed a leave-one-out analysis in order to study the impact of the operational network of magnetometers on the SWPC geoelectric field model. The geoelectric field model has two main components: 1) the magnetic interpolator (MI), which uses geomagnetic data from the magnetometer network and the Spherical Elementary Currents (SECS) method to evaluate the magnetic field disturbance everywhere, and 2) the geoelectric field calculator, which combines the SECS model output with information about the ground conductivity. In this study we create an ensemble of SECS and geoelectric field model runs: one reference run in which all magnetometers are included, and many test runs in which one magnetometer is excluded from the SECs interpolation. The main goal of this study is to compare geomagnetic and geoelectric response time series at the test location and characterize the differences between the reference run and the test runs. This methodology only accounts for the uncertainties introduced by the SECS model due to the geographical configuration of the magnetometer network. Our results indicate that both geomagnetic and geoelectric field vector correlations are higher when the distance to the closest station is smaller. In particular, SWPC geomagnetic and geoelectric Fields appear to produce vector fields with high reliability (i.e., correlation values > 0.8) for grid points located within ~200-300-km radius from a magnetometer. However, these results display some dependence with the test site's geographical location – the correlation-distance relation decreases faster for stations located northern than 50 degrees in latitude. Furthermore, taking into account the locations of all magnetic stations (not just the closest to the test site) shows that beyond this ~200-300 km radius, the angular distribution of stations (relative to the test site) might play an important role. This implies that locations inside the network (e.g., surrounded by stations) might have more accurate fields than points in the periphery. The magnetometer network currently used in the nowcasting (operational) SWPC geoelectric field model – a combination of US Geological Survey (USGS) and Natural Resources Canada (NRCan) stations – is in a configuration such that any given model grid point over north america (up to 60 degree north) is, on average, 484 km to the nearest magnetometer. Our results suggest the addition of magnetic observatories to the operational network is needed.

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