



Using ground-based instruments to estimate magnetospheric plasma distributions

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The eigenfrequencies of a magnetic field line are determined by its length, magnetic field strength, and the plasma mass density distribution along it. The Cross-phase technique utilises two ground-based magnetometers to estimate these eigenfrequencies, and together with a magnetic field model, this allows us to estimate the plasma distribution. Using ground-based technology is advantageous over spacecraft as it provides continuous coverage.

We have developed a strategy to automate Cross-Phase searches in magnetometer data to look at longer term variability in plasma mass density distributions. This algorithm can detect multiple harmonics, allowing greater information to be gained about the plasma distribution than would be possible with just the fundamental. Early results suggest a clear presence of preferred frequency bands in daylight hours, and we show our attempts to fit a plasma model to the data.

However, the use of ground-based magnetometers is limited at high latitudes due to coverage. To resolve this, we discuss our plans to apply the Cross-Phase technique to SuperDARN data so that the magnetospheric plasma distribution can be estimated on a much greater scale.