# Investigation of Pc5 ULF oscillations during quiet geomagnetic conditions

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## Project description

SuperDARN radars are coherent HF radars and so they receive reflections from field aligned irregularities in the ionosphere. Due to the fact that the ionosphere has finite conductivity, the motion of the field line can be seen in the back and forth movement of the plasma (seen as alternating blue (positive) and yellow (negative) velocity bands) in the Doppler velocity data of the radar. SuperDARN HF radar observations are of central importance here as they provide good spatial resolution of the resonances in very large field of view.The Pc5 pulsation events can be monitored in the high-latitude ionosphere by SuperDARN and ground-based magnetometer array in ground-based magnetometer stations that are in the same range of magnetic latitude, when the interplanetary magnetic field (IMF) of the solar wind is northward. These two instrument types complement each other. The line-of-sight Doppler velocities from the radar can be used to measure ULF oscillations in the F-region plasma flow associated with Pc5 field line resonance. Ultra low frequency (ULF) pulsations have been observed for many years in magnetometer data and are endemic within the magnetosphere. Spectral analysis of the Pc5 pulsations from SuperDARN and magnetometers has been performed.

This project will involve the candidate to investigate intervals where the interplanetary magnetic field (IMF) Bz component is northward for a prolong time. Those chosen intervals should meet the criteria of geomagnetic quiet periods where ($k_p \leq 2+$). The candidate will use the Automated Pulsation Finder (APF) to identify as many intervals as possible for which pulsation signatures are present in the Sanae and Goose Bay SuperDARN HF radars and ground-based magnetometer data. The candidate will have to perform Fourier analysis of them to determine the presence, or lack of, Pc5 pulsations. This will help in determining the characteristic features of pulsations during northward interplanetary magnetic field intervals. This will involve some basic programing and plotting using either Python or IDL.