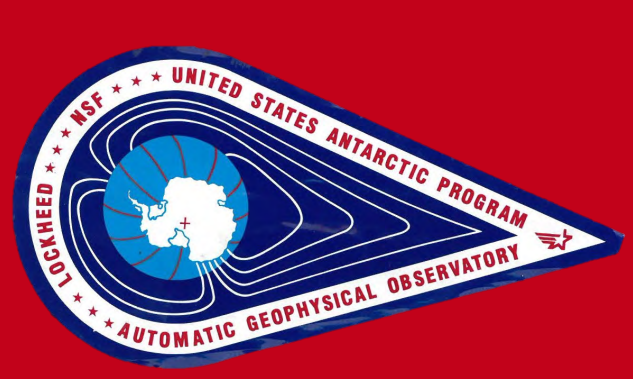




Statistical Study of the Magnetospheric Open-Closed Boundary (OCB) using ULF Wave Observations from the Northern and Southern Hemisphere.

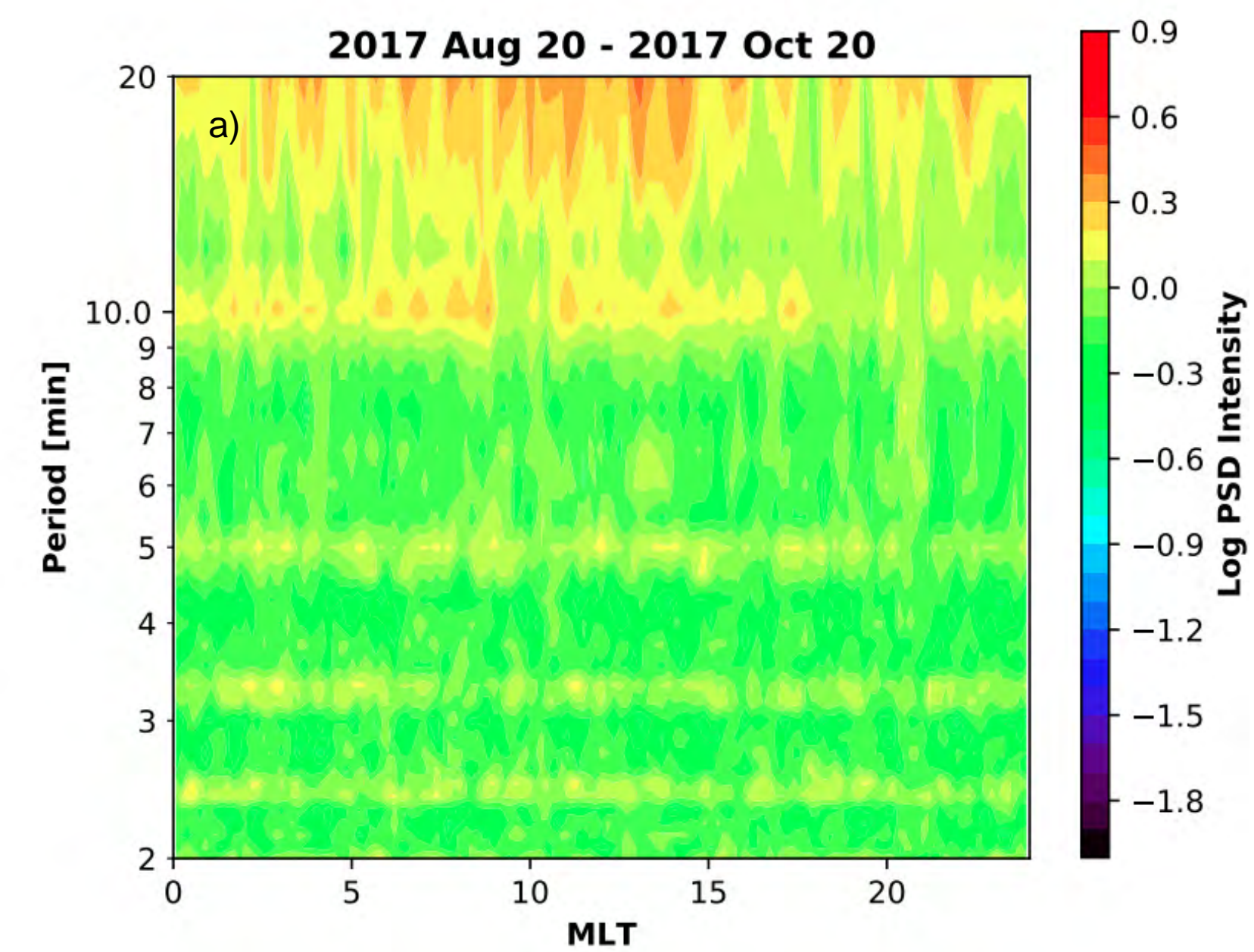


Abstract

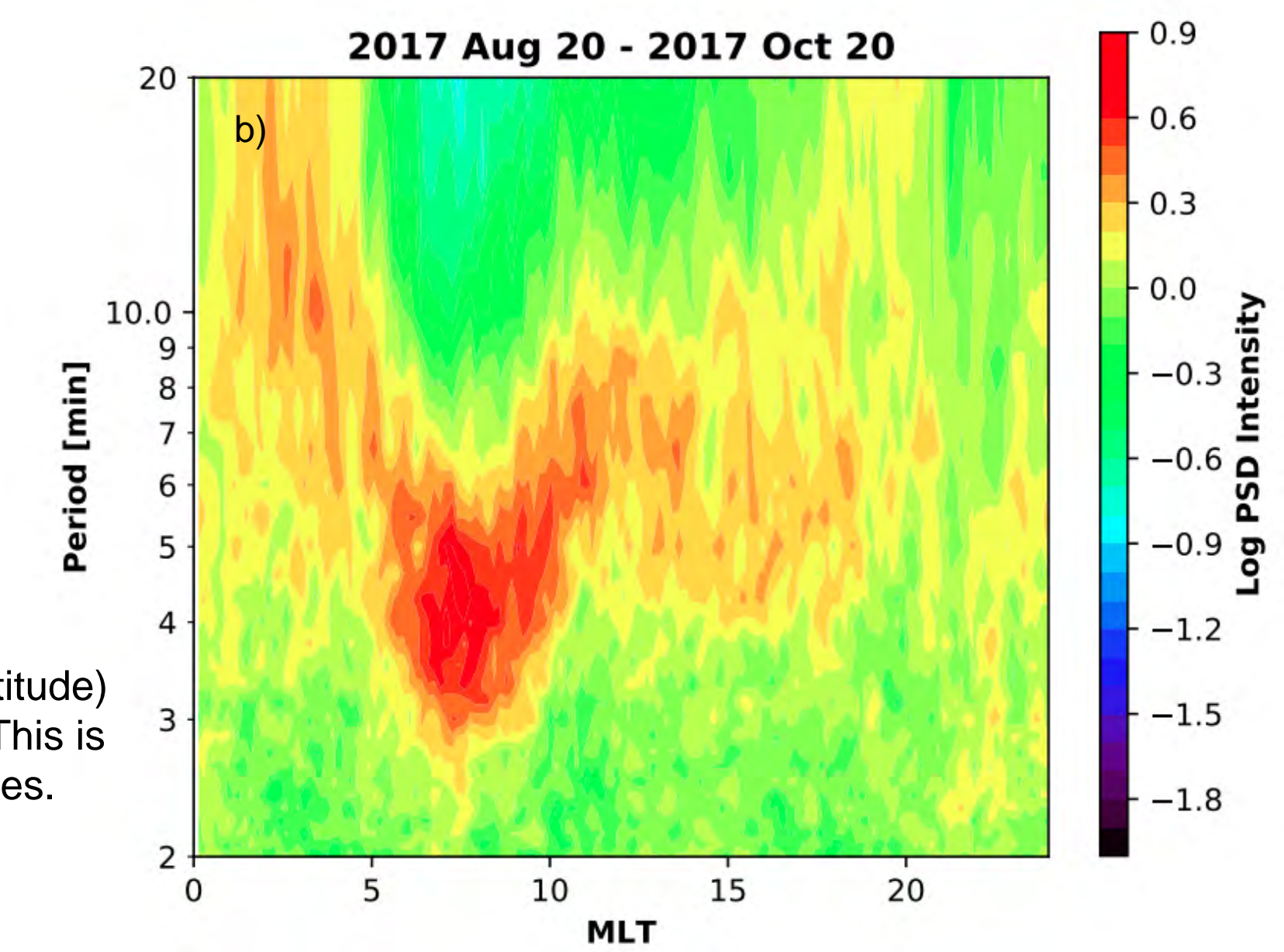
We present a statistical study using ground magnetometer data which are located over extensive latitudes from subauroral to the deep polar cap region. For this study, stations in both the northern hemisphere and southern hemisphere were chosen. The stations of interest in each hemisphere lie around the OCB. For the northern hemisphere, the following stations were chosen: Maniitsoq (SKT), Attu (ATU), Godhavn (GDH), Uummannaq (UMQ), and Upernivik (UPN). For the southern hemisphere, the following stations were chosen: PGO, PG1, PG2, PG3, and PG5. The stations included are to characterize open-closed boundary (OCB) behavior during geomagnetically quiet times. Knowledge of the location and dynamics of the magnetic field line OCB provides insight to space physics processes such as substorms, particle precipitation events, and magnetospheric configuration. Prior studies have shown that determination of the OCB location can be made by examining the ULF wave power in data from a latitudinal chain of ground-based magnetometers extending from the auroral zone into the deep polar cap.

For each station, 30 quiet-time days pre and post the fall and spring equinox and summer and winter solstice were chosen. Any days with a planetary AP greater than 30 were discarded. Using the H- component fluxgate data from each station provided by SuperMAG, an average daily residual power spectra were calculated. The resultant spectrograms show signatures of whether a particular station is in an open or closed magnetic region. The data is split seasonally to determine if any seasonal effects are evident.

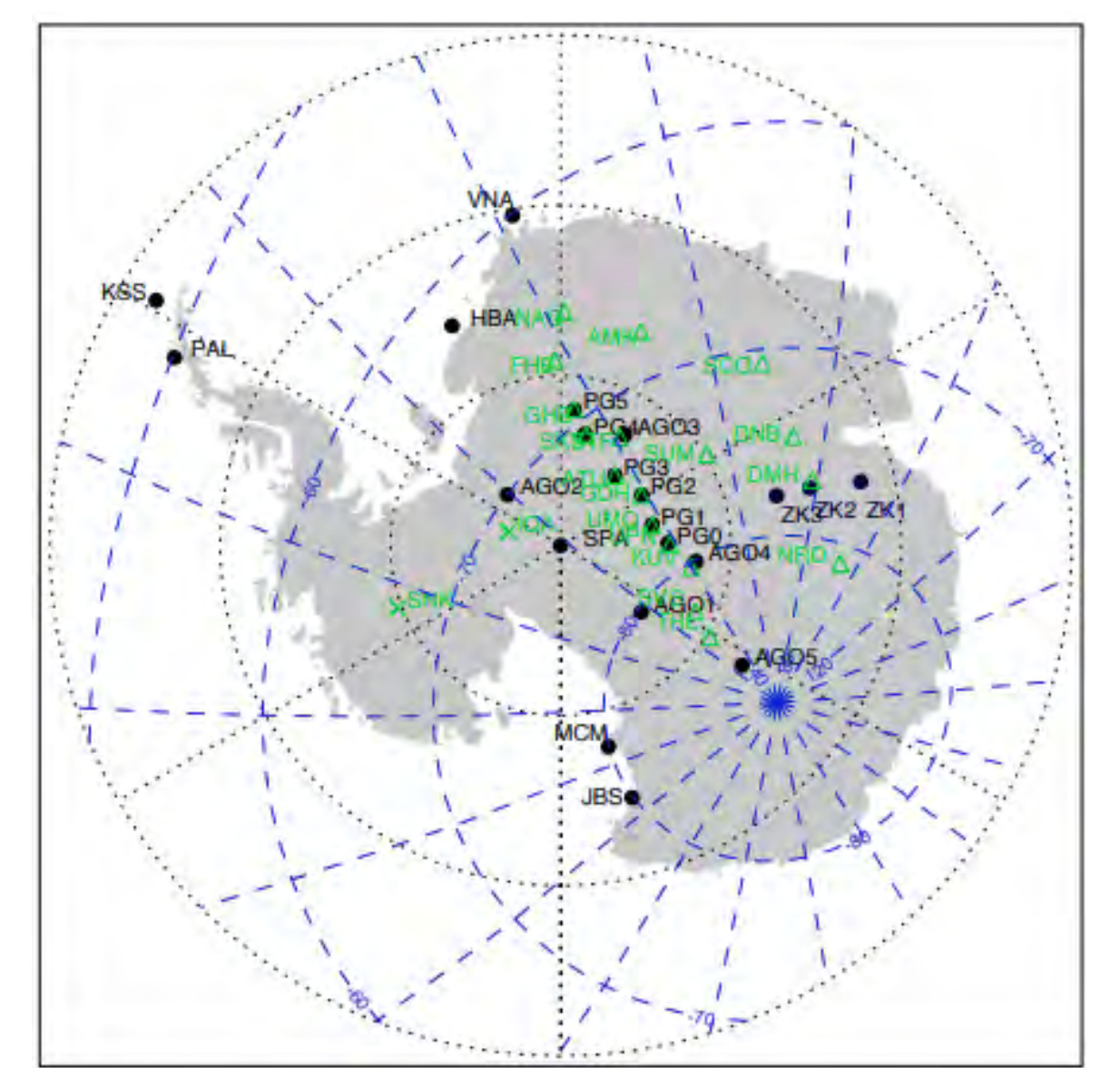
Open vs Closed Field Line Signature



(a) AGO 5 (Deep polar cap) during Fall 2017, quiet-time. This is signature of an open field lines.

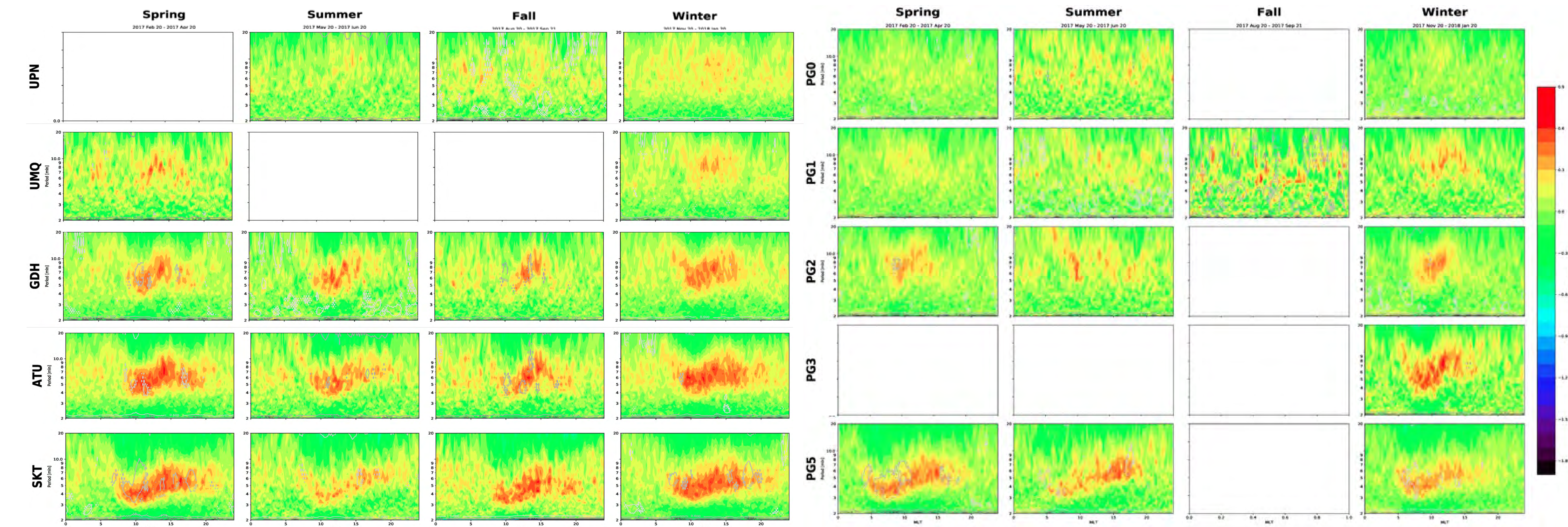


(b) AGO 3 (lower magnetic latitude) during Fall 2017, quiet-time. This is signature of closed field lines.

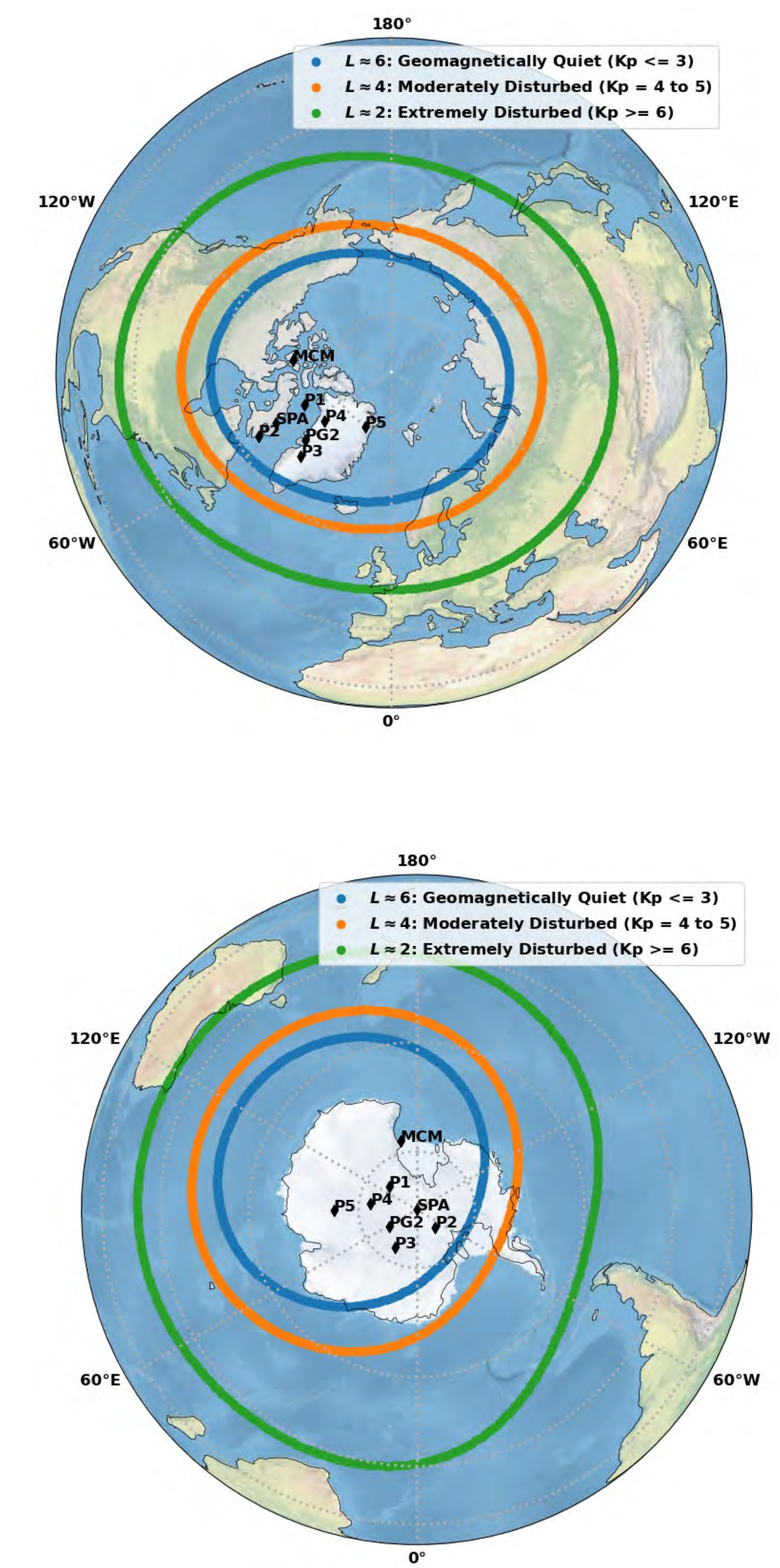


c) A map of the magnetometers located in Antarctica.

Conjugate Pairs: Quiet-time



A comparison of the residual power spectral densities for stations in the Northern Hemisphere (left) vs stations in the Southern Hemisphere (right). All spectrograms are based on quiet-time averages of 30 days pre and post the spring and fall equinox and the summer and winter solstice.



Plots for both the Northern (top) and Southern Hemispheres (bottom) with rings showing L = 6, 4, and 2 to show approximately where the aurora will be for geomagnetically quiet, moderately disturbed, and extremely disturbed. The northern hemisphere represents the overlay of conjugate stations from the southern hemisphere. The L shell is calculated from using magnetic latitude from AACGMv2 from Shepherd [2014].

References

References:
 Shepherd, S. G. (2014), Altitude-adjusted corrected geomagnetic coordinates: Definition and functional approximations, *J. Geophys. Res. Space Physics*, 119, 7501–7521, doi:10.1002/2014JA020264.
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 Urban, K. D., Gerrard, A. J., Bhattacharya, Y., Ridley, A. J., Lanzerotti, L. J., and Weatherwax, A. T. (2011), Quiet time observations of the open-closed boundary prior to the CIR-induced storm of 9 August 2008, *Space Weather*, 9, S11001, doi:10.1029/2011SW000688.

Spectrograms for quiet-time 2017 from SuperMAG data. **Pc5 bands**: ~2 to 10 minutes in period. Note, the **absence** of Pc5 waves at higher magnetic latitude

Conclusion

We presented a climatology study of quiet-time ULF wave activity from 2017. Both the northern and southern hemisphere is included in the results and the data is arranged by season. The next step is to address missing data concerns and compare the results to what storm time would look like.