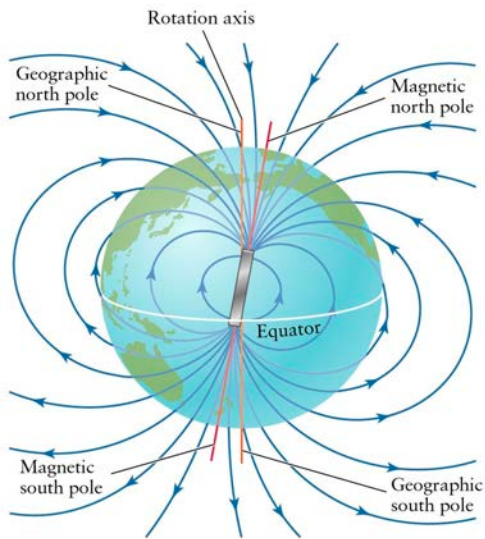


Statistical study of Open Closed Boundaries (OCB) using ULF wave observations from Antarctic AGOs, McMurdo Station, and South Pole Station

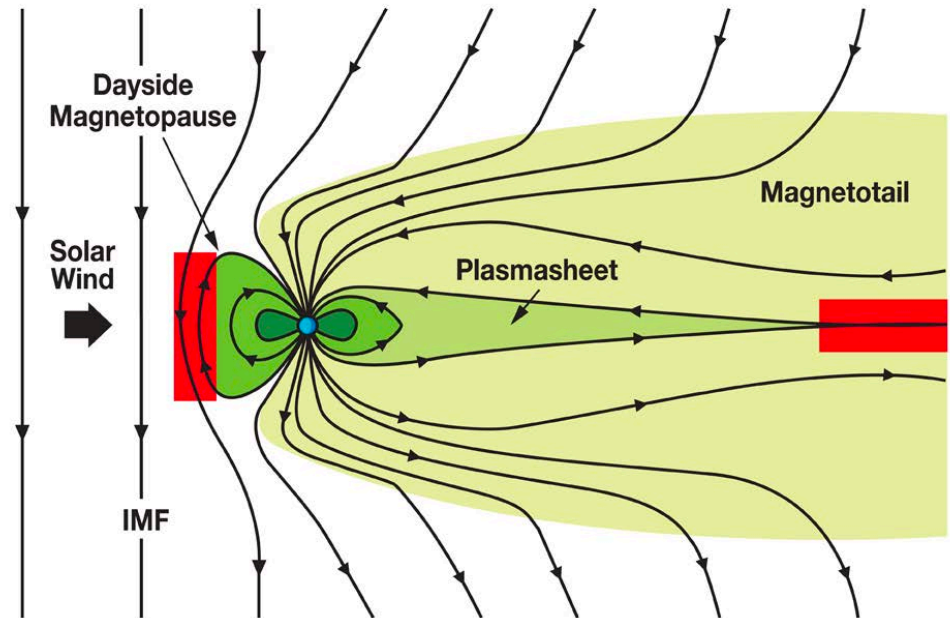
Rachel Frissell, Andrew Gerrard (gerrard@njit.edu), and
Hyomin Kim

Center for Solar-Terrestrial Research, New Jersey Institute of
Technology, Newark, NJ, USA.

Defining the Open Closed Boundaries

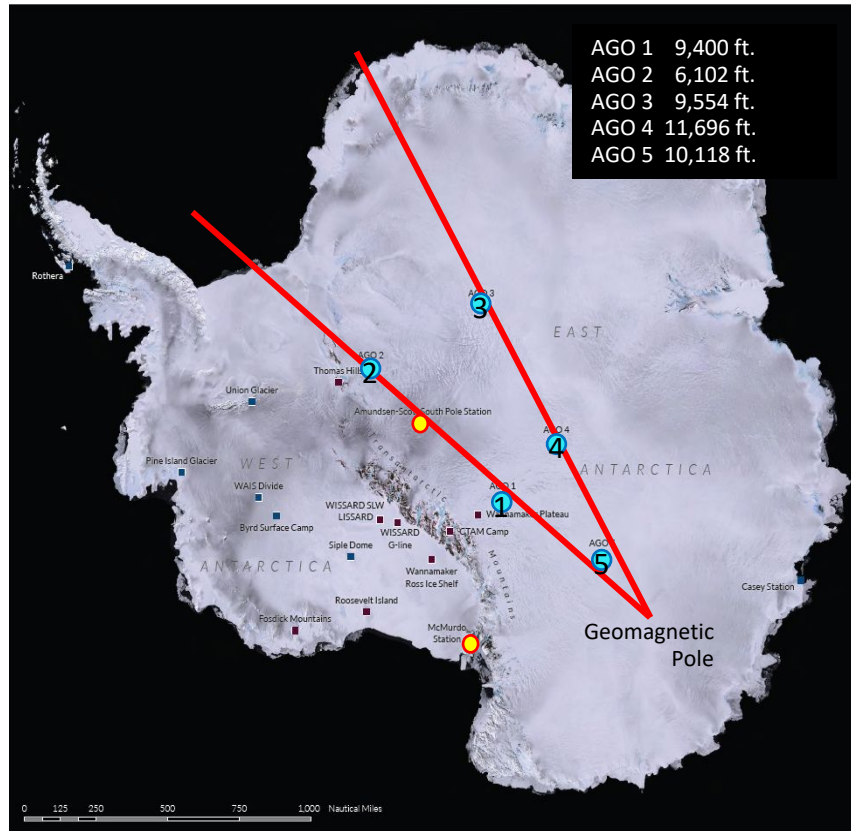


<https://pin.it/ln3ozh7gtfunsd>



<https://www.livescience.com/earth-magnetic-north-passes-prime-meridian.html>

Magnetometers: Uses and location

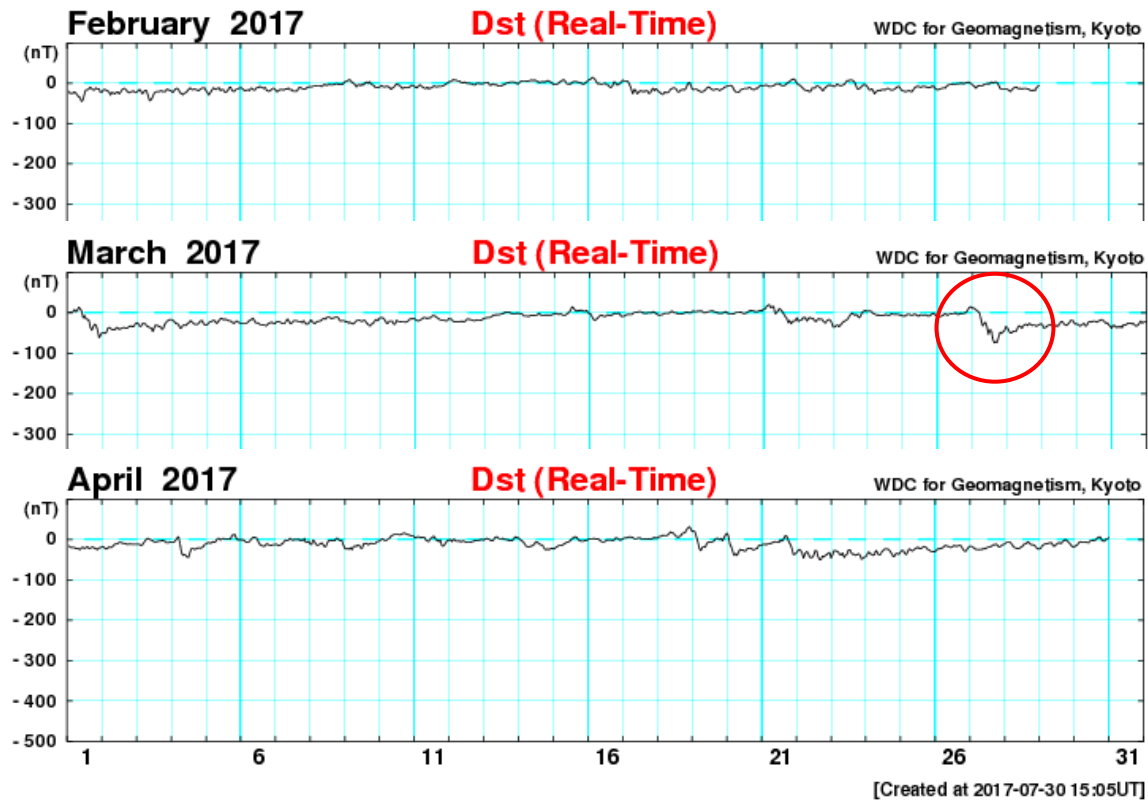


These sites are unique in that they:

- Are located over an expansive region
- Are conjugate w/Northern Hemisphere
- Are the only sites on Earth with coverage into the deep polar cap

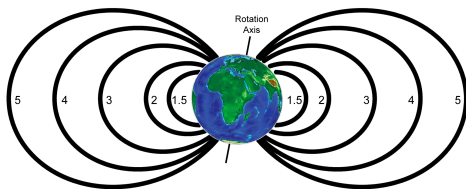
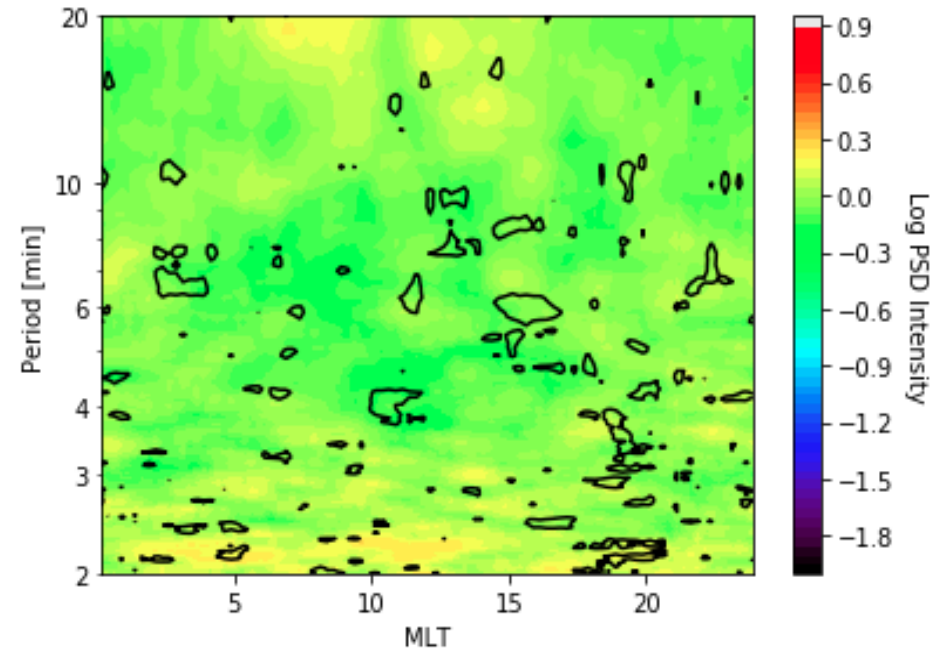
https://www.google.com/search?q=automatic+geophysical+observatories&sxsrf=ACYBGnQ-ir0YaqXkZwAztL-qTZVUFzvEQ:1577997737258&source=lnms&tbn=isch&sa=X&ved=2ahUKEwjHpNfU4-XmAhWhdd8KHd3XAISQ_AUoAXoECAsQAw&biw=924&bih=733#imgsrc=LDR_1QZcyY-dMM:

DST Measurements: A Quiet Time Factor



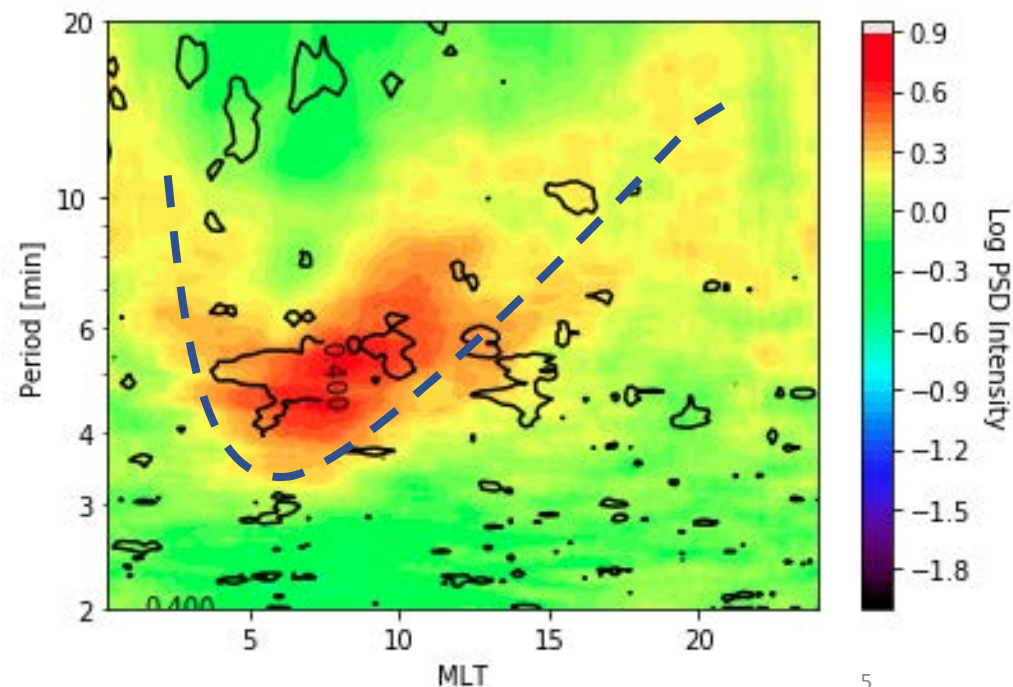
Determination of Open/Closed Signatures

March 2017: AGO5, $L > 300$



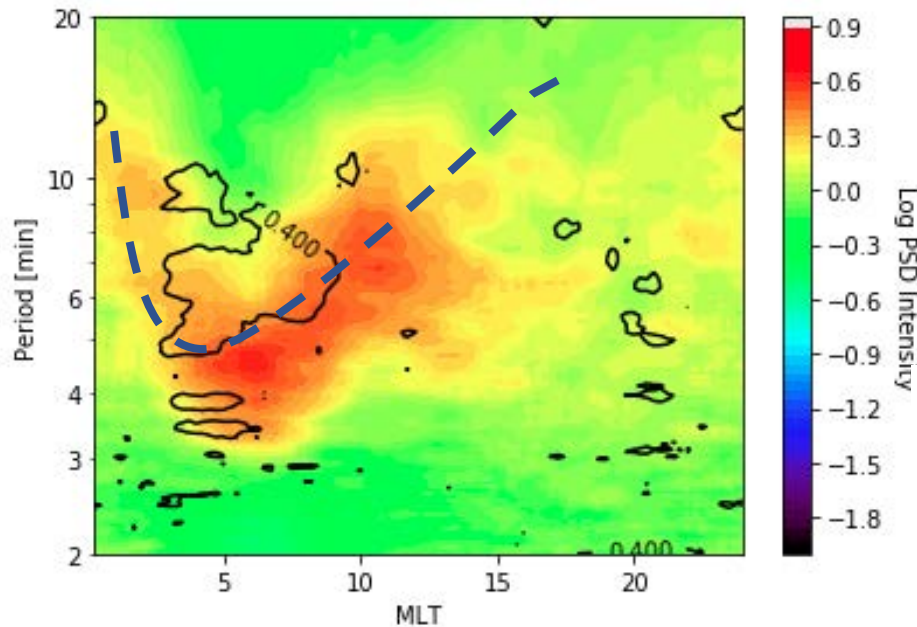
<https://en.wikipedia.org/wiki/L-shell>

March 2017: AGO3, $L \sim 10$

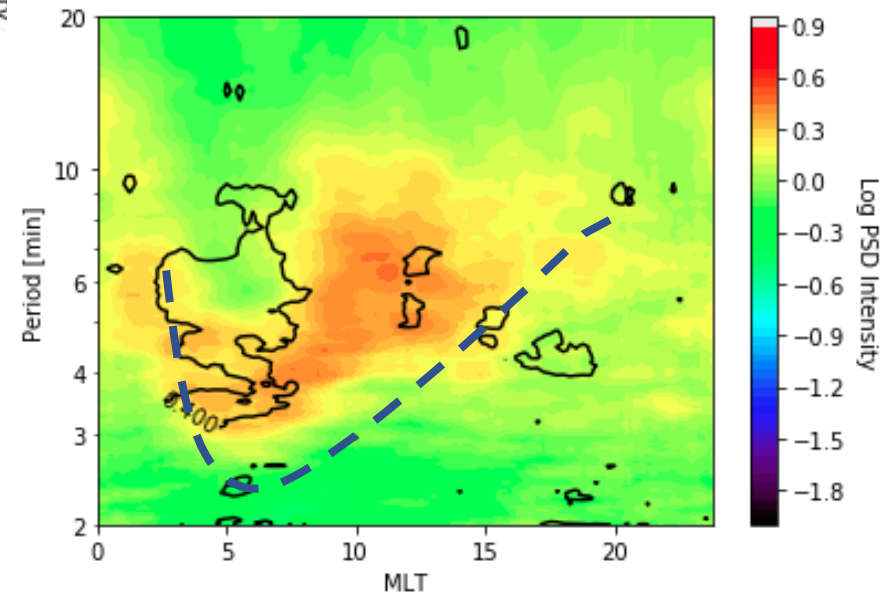


ULF Variability along the Swooping-U Pattern

AGO3: Sept. 2017

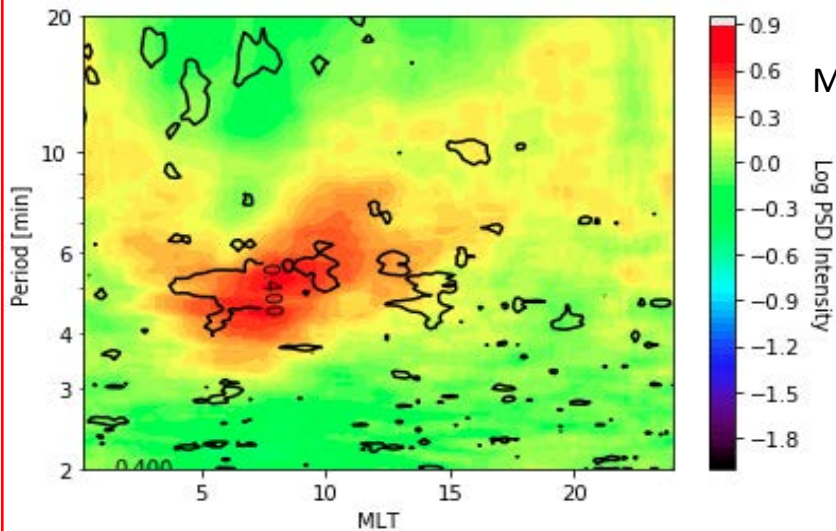


AGO2: Sept. 2017

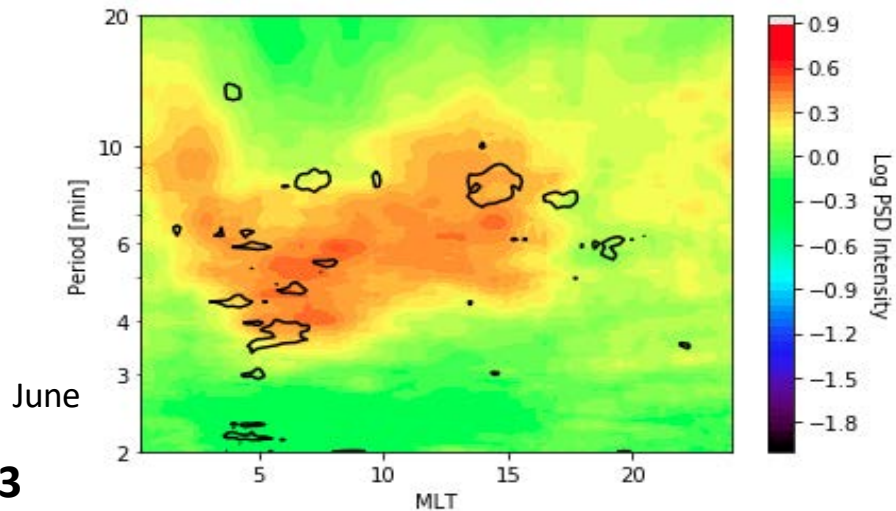


Solstice vs Equinoctial Seasons: Quiet Time

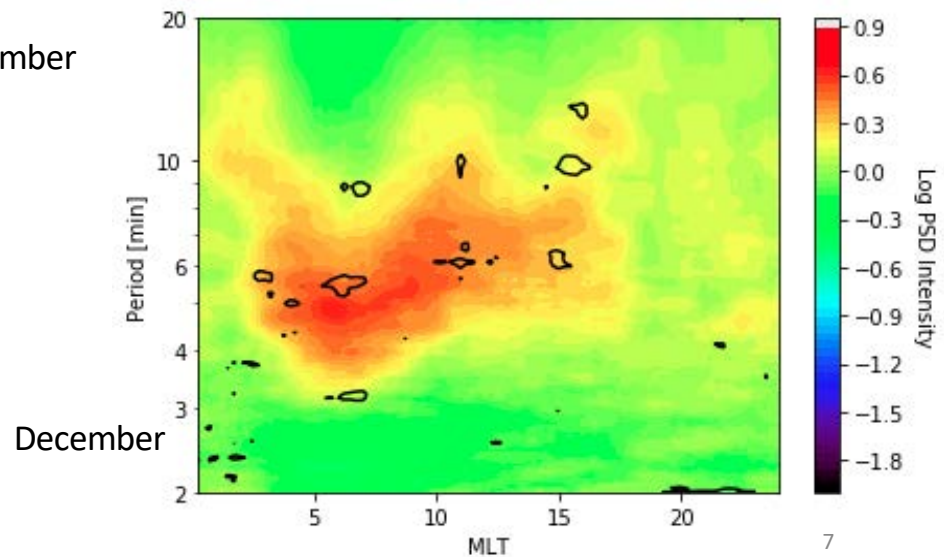
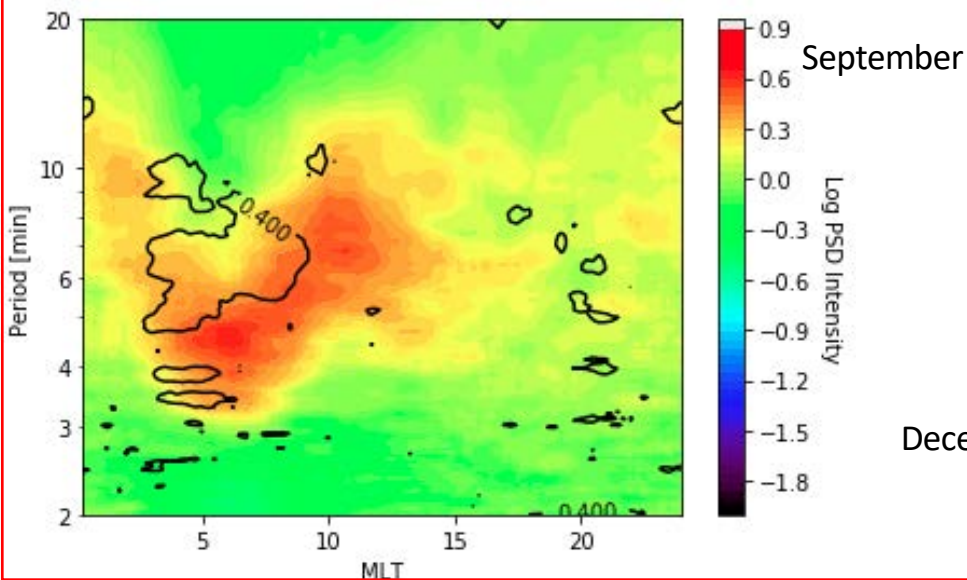
Equinox: Higher Variability



Solstice: Lower Variability



**AGO3
2017**



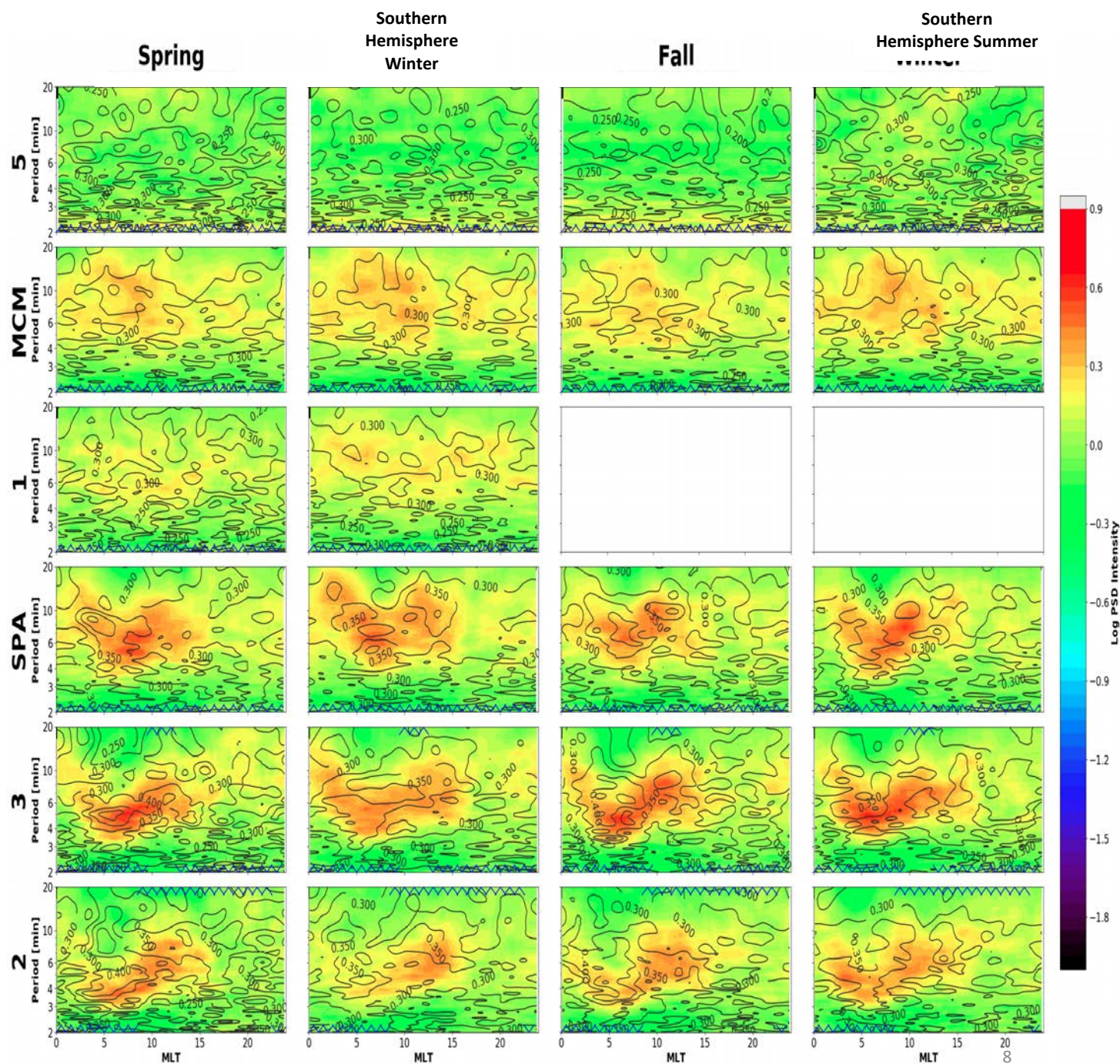
Higher magnetic latitude

Solar Minimum 2017

“Quiet time” ULF
climatologies during the
“cardinal months”

There is seen to be greater
variability in ULF data on
the dusk-midnight section.

Lower magnetic latitude

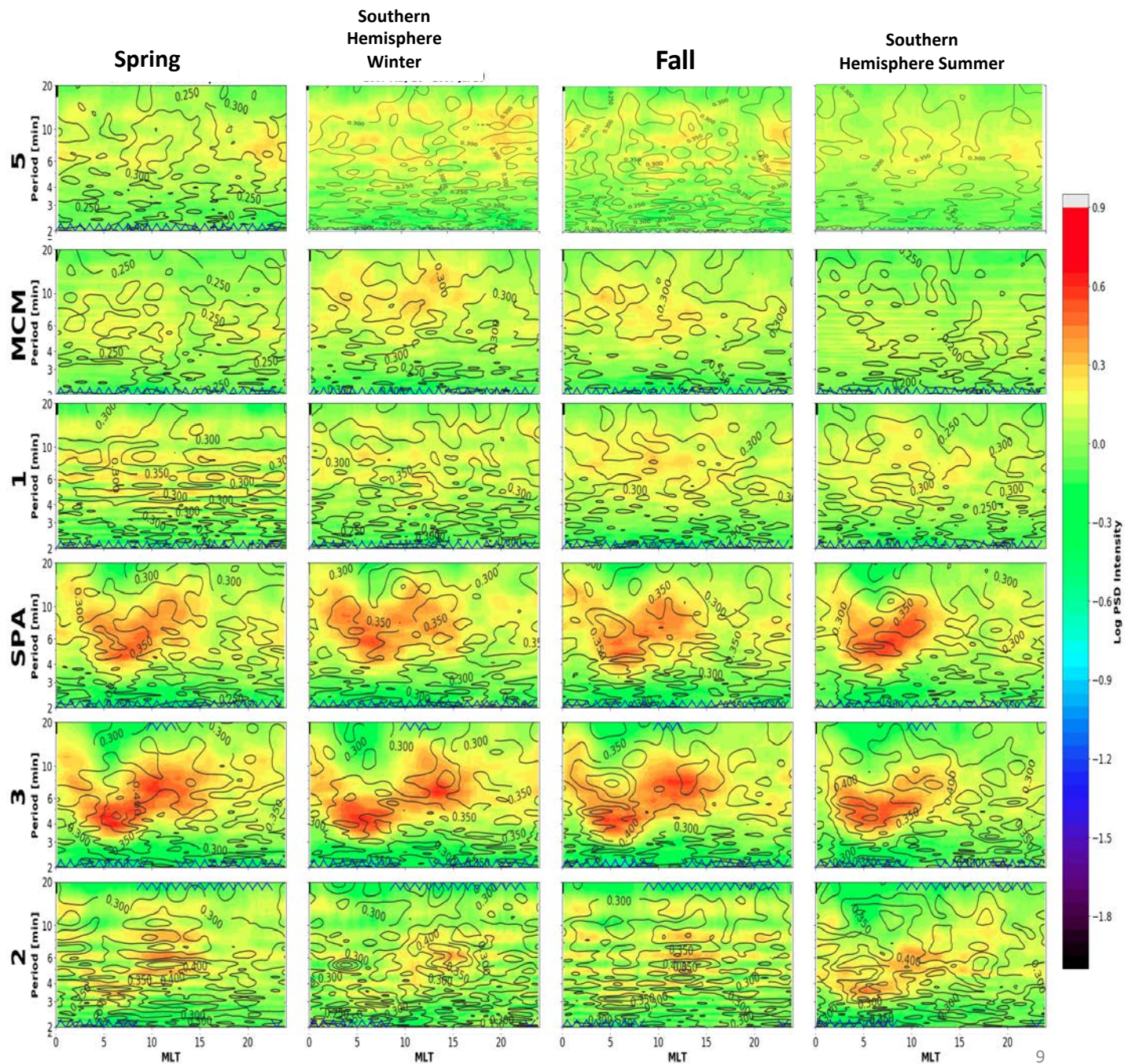


Higher magnetic latitude

Solar Minimum 2006-2009

Greater ULF energy is
observed at lower
magnetic latitude
sites during equinox
conditions. Due to
dipole tilt.

Lower magnetic latitude



Conclusion

- Use Spectrograms to determine OCBs from magnetometer data.
 - Barring Iridium transmission issues and AGO power system concerns, this technique shows great potential for locating the OCB all year long with an array of relatively simple instruments
- Greater ULF energy is observed at lower magnetic latitude sites during equinox conditions.
- See more variability at the dusk-midnight section likely due to ULFs as seen in M. Cooper et al. [2019]