



Zoom Seminar Presentation by:

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# ***The role of ULF waves in the dynamics of the inner-magnetosphere and Space Weather***

Ultra-Low Frequency (ULF) waves are a classification of geomagnetic pulsation observed by both in-situ spacecraft and ground-based instrumentation. These waves are manifested in the Earth's ionosphere and magnetosphere as perturbations of the local plasma, and electric and magnetic fields with periods of  $\sim 0.1$ - $1000$ s (frequencies  $\sim 1$ - $10000$  mHz). ULF waves are recognized as playing an important role in the overall dynamics of both the ionosphere and the magnetosphere, from the modulation of electron precipitation into the ionosphere, to the acceleration, transport, and loss of energetic particles within the inner-magnetosphere. These dynamics are referred to as Space Weather and can have catastrophic affects on ground-based and satellite infrastructure.

In this talk I will investigate the role of ULF waves in the dynamics of energetic particles in the Earth's inner-magnetosphere and in particular, the ring current and outer radiation belt. Using a database of ULF wave power, calculated from ground-based magnetometer observations of ULF waves over multiple solar cycles, I will demonstrate a clear relation between ULF waves and the strength of the Earth's ring current. Utilizing the same observations, I will further demonstrate that ULF wave acceleration and transport of energetic electrons is a key process in radiation belt dynamics during geomagnetic storms (periods of extreme geomagnetic activity driven by Coronal Mass Ejections and Co-rotating Interaction Regions) as characterized by in-situ spacecraft. Overall, this work demonstrates the importance of ULF waves in Space Weather dynamics and the utility of ground-based observations in the study of the Earth's magnetosphere and Space Weather.

Bio: Dr. Murphy obtained his PhD in 2013 from the University of Alberta studying the dynamics of magnetospheric substorms and the aurora. In 2014 he started as an NSERC Postdoctoral Fellow at the NASA Goddard Space Flight Center (GSFC) and continued to study the aurora while expanding to study the dynamics of the outer radiation belt. Following the completion of the NSERC fellowship Dr. Murphy transitioned to a research position at the Universities Space Research Association (USRA) focussing on radiation belt research. In 2017 Dr. Murphy started at the University of Maryland as research faculty focussing on space weather.

**TUESDAY, APRIL 27<sup>th</sup>, 2021**

**9:30 AM Zoom Event**