SEMINAR NOTICE

Department of Physics and Engineering Physics
University of Saskatchewan

SPEAKER: Kateryna Yakymenko, PhD Candidate
Department of Physics & Engineering Physics

TOPIC*:* ***Substorm Occurrence rates and Recurrence Times***

DATE: Tuesday, December 6th, 2016

TIME: 3:30-4:30 p.m.

PLACE: Physics 103

ABSTRACT:

Nature of magnetospheric substorms is one of the central and unsolved problems in space physics. Substorms and substorm occurrence rates are important to study. A substorm results in a morphological transition of the magnetosphere, changing the magnetic-field configuration of the near-Earth magnetotail and redistributing magnetotail plasma, part of which is got suddenly accelerated into the high-latitude ionosphere leading to extremely bright and dynamic aurora. A substorm produces a substantial energy transfer from the magnetotail to the ionosphere and to magnetospheric plasma populations. Despite decades of efforts, none of the existing substorm theories are comprehensive enough to explain various substorm signatures and none can predict the substorm onset. Moreover, identification of a substorm from various data sets is itself a challenging problem due to great ambiguity and variability of substorm signatures.

In this talk, I will first show how a substorm manifests itself in observations on the ground and in space. I will then discuss various algorithms for identification of the substorm onset and show that the substorm onset lists created by different algorithms and by using various data sets divert significantly. Understanding these differences, undoubtedly, will shed light on a mechanism of substorm triggering, an important component in developing a viable substorm theory and predictions. In the second part of my talk I will focus on two lists of substorms to analyze occurrence rates and recurrence times versus season, solar cycle, the structure of the interplanetary magnetic field, with respect to the so-called "Russel-McPherron effect" and, finally, versus the intensity of external drivers of the magnetospheric convection. Three distinct populations of the substorms will be distinguished: (1) quasi-periodic substorms with the recurrence time of 2-4 hr, (2) randomly occurring substorms with the recurrence time of 6-15, and (3) events with prolonged intervals of no substorms at all. The results are summarized into a working phenomenological model of the substorm occurrence wherein (1) the onset of periodic substorms is controlled by internal magnetospheric processes with the recurrence defined by the need to have a certain period of steady solar wind driving, (2) the random substorms are triggered by the mesoscale structures in the interplanetary magnetic field and (3) the extended periods without substorms correspond to development of quasi-homogeneous large-scale structures in the solar-wind plasma.

Coffee and Cookies will be served in Physics 103 at 3:00 p.m. for those attending the seminar.