Abstract:
Solar storms, which can have a significant impact on Earth satellites and power grids, have their origin in the dynamic evolution of magnetic field in the solar atmosphere. We cannot observe magnetic field in the solar atmosphere directly but we can measure an important topological quantity known as “magnetic helicity flux”. Magnetic helicity is a topological invariant of ideal magnetohydrodynamics (MHD), a theory that describes the large-scale structure of the solar plasma, and provides a measure of the twist and linkage/connectivity of magnetic field lines. In short, the more complex the field line topology, the more complex the dynamical activity in the solar atmosphere.

In this talk, I will discuss the meaning of helicity as a topological invariant of MHD. I will then discuss how it can be calculated in applications related to solar storms. Finally, I will present some recent results from a study of helicity flux in MHD simulations and suggest some other topological quantities that could be useful in the forecasting of solar storms.

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