國立中央大學太空科學與工程學系

Department of Space Science and Engineering, National Central University

專題演講

Magnetic Explosions in Space

Speaker： Prof. Yi-Hsin Liu

(Department of Physics and Astronomy, Dartmouth College, USA)

Time： 112 年 7 月 27 日 星期四 14:00-15:00

Place： 健雄館(科四館) S4-811 教室

摘 要/Abstract：

In space, charged particles follow magnetic field lines, which can become twisted and distorted due to the motion of the plasma. When the magnetic field lines become tightly twisted, they can break and rejoin in a different configuration. This process is called magnetic reconnection, and it can rapidly release a tremendous amount of energy. During such a "magnetic explosion", the magnetic energy is converted into kinetic energy of the plasma particles, which are accelerated to high speeds, and thermal energy, which heats up the plasma. This process can occur in various astrophysical environments, leading to solar flares, coronal mass ejections, geomagnetic substorms in Earth's magnetosphere, and potentially the bright, short-duration radiations from magnetospheres of neutron stars.

Understanding the rate at which reconnection processes magnetic flux is critical to estimating the energy conversion rate in these natural phenomena. In this talk, I will discuss the milestones in modeling the reconnection rate, which has finally led us to a significant breakthrough with the help of first-principles computer simulations and in-situ spacecraft observations. I will explain the essence of the up-to-date theory, and show how we can extend it to relativistic reconnection in extremely magnetized astrophysical plasmas.

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