Revealing the physics of magnetic reconnection, a universal plasma process

PhD project
Space, Plasma, and Climate Community
October 2025 start, full-time.

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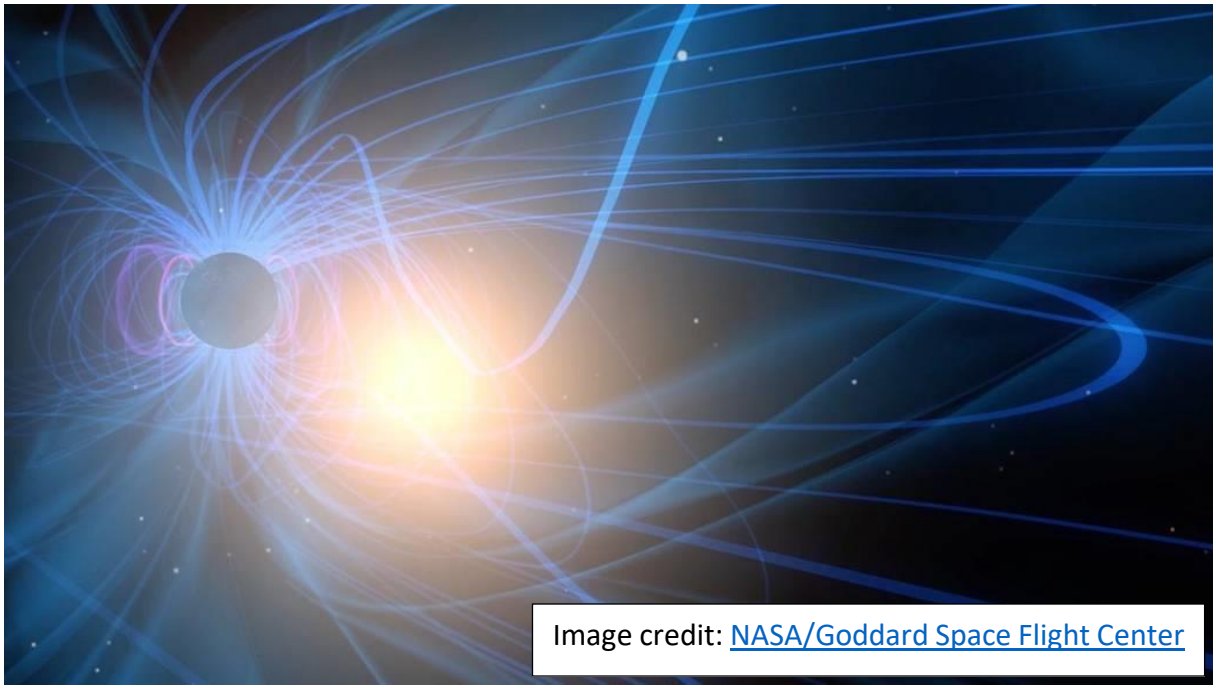

The goal of this PhD project is to develop new understanding about the physics of magnetic reconnection, a fundamental plasma process in space physics, solar physics, astrophysics, and laboratory plasma physics. Magnetic reconnection plays a key role in all these environments because it controls the magnetic topology of collisionless plasmas and it converts energy stored in the magnetic field into jets of hot plasma. In the solar system it is thought to control the onset and evolution of solar flares, the formation of the solar wind (a supersonic plasma flow emitted by the Sun), and the interaction of the solar wind with the Earth's magnetic field in space (the magnetosphere). It also lies at the heart of geomagnetic storms in the Earth's magnetosphere, and a better understanding of magnetic reconnection is crucial to improving our ability to withstand severe space weather.

You will use data from cutting edge space missions such as Magnetospheric Multiscale (MMS), Parker Solar Probe, and Solar Orbiter to study magnetic reconnection in situ in different space plasma environments. Measurements made *in situ* by satellites, both in the solar wind and in near-Earth space, are one of the best ways to understand how this plasma process works. MMS probes the solar wind – magnetosphere interaction, Parker is now orbiting the Sun at unprecedented proximity, and Solar Orbiter is exploring the 3D structure of the heliosphere. You will study how reconnection energises plasmas, how it creates magnetic field structures such as flux ropes, and how it controls the large scale structure of both planetary magnetospheres and the solar wind.

You will work in the context of international collaborations and the wider multi-national NASA/ESA project teams. This project involves a high degree of collaboration working with different instrument teams (including the Solar Orbiter magnetometer team at Imperial College), project collaborators, and the wider consortia.

This project is highly centred on data analysis, programming, and data visualisation. It will require knowledge and use of Python. For more information, please contact Prof. Jonathan Eastwood jonathan.eastwood@imperial.ac.uk.