UNIVERSITY OF LEICESTER

Electrodynamics of the solar wind-magnetosphere-ionosphere-atmosphere coupled system

• What links the auroras and electric currents in space? • How does the solar wind impact the terrestrial environment? • Use multiple space- and ground-based systems to understand geomagnetic activity	**Level**	PhD
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	Second Supervisor	Dr Suzie Imber
	Application Closing Date	20th January 2023
	PhD Start date	September 2023

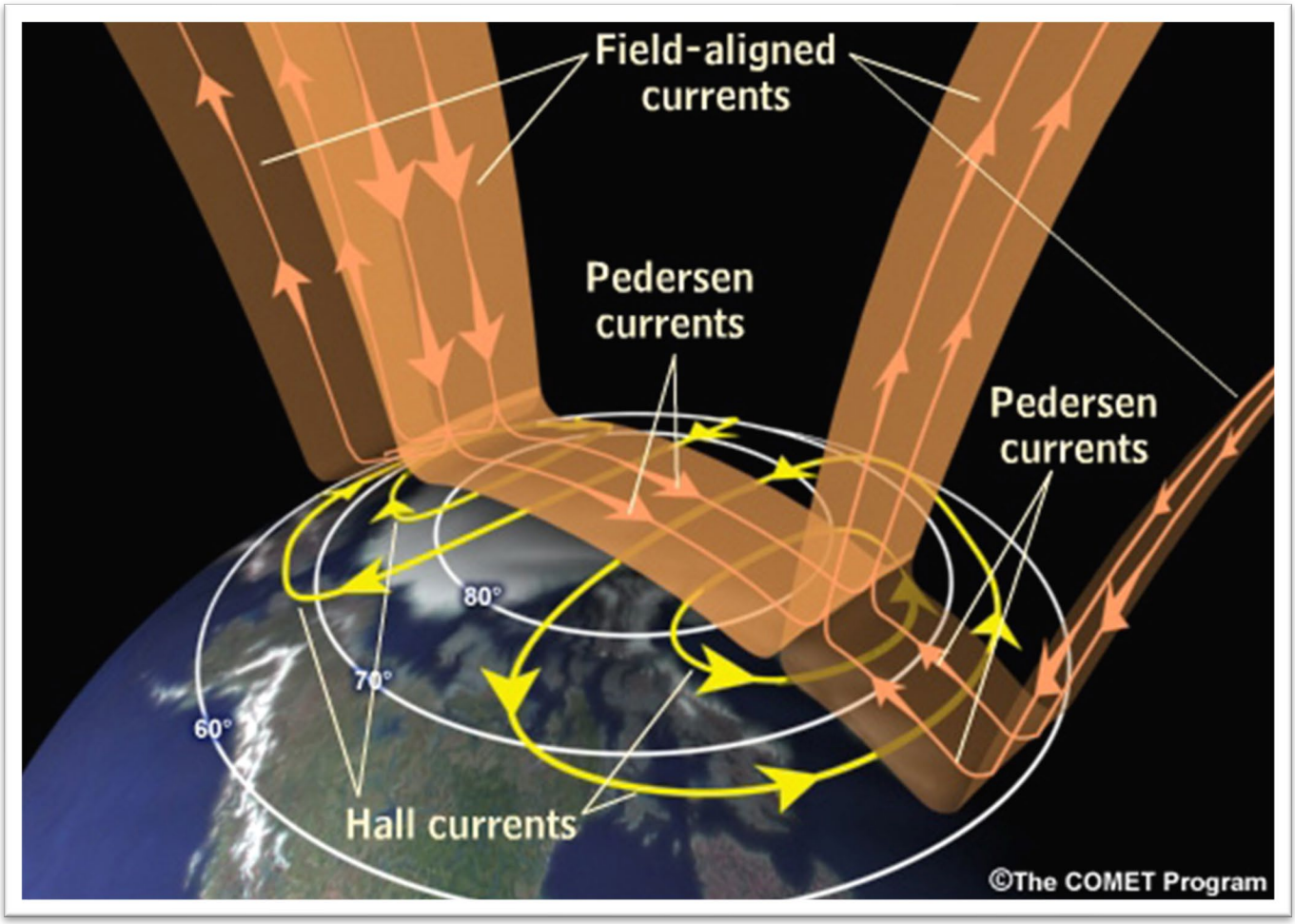
Project Details:

The interaction of the solar wind with the Earth's magnetic field leads to dynamic phenomena in near-Earth space, including the energization and circulation of plasma within the magnetosphere and ionosphere – the most visible manifestation of which is the polar auroras – which lead to a hostile environment for space- and ground-based technologies.

There are currently two theoretical frameworks in which the interaction and dynamics are understood. The "open magnetosphere" model proposed by Jim Dungey in the 1960s - which invokes magnetic reconnection as the process by which terrestrial magnetic field lines become connected and disconnected from the interplanetary magnetic field embedded within the solar wind - has been highly successful in explaining many aspects of magnetospheric dynamics. Alternatively, the dynamics can be thought of as driven by electric currents generated at the magnetopause and diverted into the ionosphere and inner magnetosphere, forming current loops that transmit stress from the solar wind to the magnetospheric plasma. These two paradigms are clearly different aspects of the same phenomenon, but as yet there is only a poor understanding of how the two pictures fit together.

Until recently, progress has been hampered by an inability to measure the spatial and temporal variations of the current systems of the magnetosphere. However, a new measurement technique that exploits magnetometry from the Iridium satellite constellation of nearly 70 spacecraft – the Active Magnetosphere and Planetary Electrodynamics Response Experiment (AMPERE) – provides an unparalleled opportunity to study the electric currents systems linking the magnetosphere and ionosphere, and to understand their role in the larger solar wind-magnetosphere-ionosphere-atmosphere system. This project will exploit data from AMPERE, space-borne auroral cameras, and many other space- and ground-based observatories, together with theoretical modelling, to gain a fuller understanding of the electrodynamics of our near-Earth environment and its response to solar wind disturbances.

Key aims of the research include: study the variability of the auroras, how they are generated, and what this tells us about the structure and dynamics of the magnetosphere; understand how electric currents link different parts of the magnetosphere and ionosphere, including the poorly understood inner magnetosphere; gain insights into the excitation of auroral substorms, recurrent episodes of explosive energy release in the magnetotail.



An artist's impression of a portion of the electric current system that transmits stress from the solar wind to the ionosphere and inner magnetosphere. (Image credit: The Comet Program, UCAR.)

References:

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How to apply:

Include with your application:-

- CV
- Degree Certificates and Transcripts
- Details of any study currently being undertaken
- Personal statement
- Enter the supervisor's name and project title in the Proposal Section (no proposal required)
- Enter contact details of two academic referees in the boxes provided or upload reference letters if already obtained.
- Evidence of English language if applicable.
- In the funding section include: Ref: Milan - UKRI (STFC)

The University of Leicester School of Physics and Astronomy has advertised a number of PhD opportunities. If you are applying for more than one University of Leicester project, please indicate if this is your first, second or third choice, in your application.

Further information on how to apply and funding can be found here