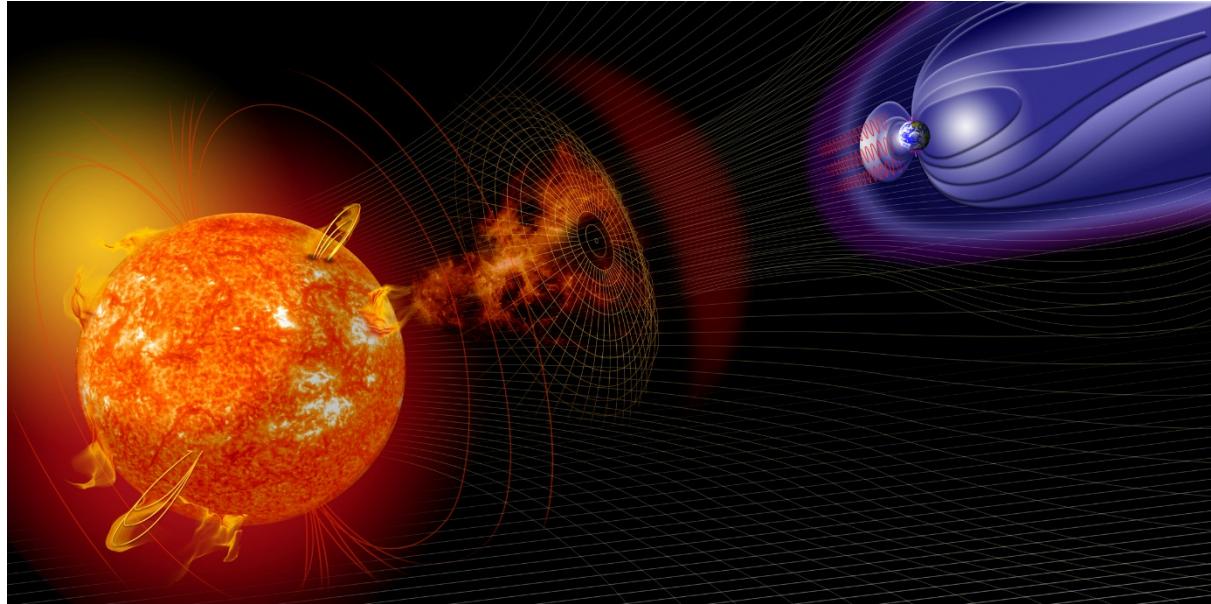


Predicting, modelling and mitigating extreme space weather

PhD project (start Oct 2026) in the Space, Plasma and Climate community, Dept. of Physics, Imperial College London. Supervisor: Prof. Jonathan Eastwood jonathan.eastwood@imperial.ac.uk



The goal of this PhD project is to uncover the physics of space weather, a significant threat to infrastructure resilience and included on the UK National Risk Register. For example, geomagnetic storms can cause geomagnetically induced currents that can impact the operation of grounded infrastructure such as power distribution networks. Geomagnetic storms also disrupt the operation of global navigation satellite systems, through signal scintillation in the ionosphere. Finally, enhanced particle fluxes in the radiation belts can be harmful to satellites. A large space weather event has the potential to cause considerable socio-economic impact [Eastwood et al., Risk Analysis, 37, 2016, 2017]. However, these risks are still not well understood. At Imperial we have developed a physics-based model of the solar wind – magnetosphere interaction, GorgonOps. This model runs on high-performance computing services at Imperial and the Met Office, and is capable of running faster than real time to provide forecast and nowcast capabilities.

You will use the GorgonOps simulation code to study the physics of space weather. This will include simulation of historic severe space weather events and comparison with observations, development of new space weather capabilities in post-processing of the data, and also exploration of how machine learning can be used in conjunction with the GorgonOps model to improve our ability to forecast space weather. Finally, you will also explore developing new capabilities to enable the delivery of regional space weather forecasting, recognising that during an interval of severe space weather, different effects are experienced in different locations at the same time.

You will work in the context of our national and international collaborations, particularly with the UK Met Office and the European Space Agency. This project involves a high degree of collaboration also working with the wider space weather community: a vibrant mix of scientists, engineers, and end users in a variety of industrial sectors, as well as policymakers and Government.

This project is highly centred on programming and data visualisation. It will require extensive knowledge and use of Python, and you will learn familiarity with HPC computing environments and workflow.

For more information, please contact Prof. Jonathan Eastwood jonathan.eastwood@imperial.ac.uk.

Image credit: NASA