Electromagnetic induction in the Earth and/or other planetary bodies

PhD project:

Space, Plasma, and Climate Community

October 2025 start (or earlier), full-time.

Supervisor:

Fiona Simpson (f.simpson@imperial.ac.uk)

Electromagnetic induction techniques are used to characterise the interiors of planetary bodies including the Earth. On Earth, this is often achieved using the magnetotelluric (MT) technique, a passive geophysical technique complementary to seismology that uses electromagnetic induction to quantify Earth's 3D electrical conductivity structure and, through numerical modelling and inference, constrain physicochemical properties, whereas in planetary science, magnetic transfer functions derived from orbiting magnetometers are used. As MT involves measuring natural electric and magnetic fields induced in the Earth by interactions between the solar wind (a stream of high-energy charged particles from the Sun) and Earth's magnetosphere (a protective shield around the Earth maintained by Earth's magnetic field), the technique can also be used to investigate Earth-ionosphere-magnetosphere-solar-wind interactions (i.e., space weather) and their impacts on ground-based technological infrastructure.

Current foci of Fiona Simpson's research group are mantle plumes (particularly the hypothesised Iceland plume), space weather and icy moons. However, applications are invited from candidates interested in pursuing a PhD in any aspect of electromagnetic induction in the Earth and/or other planetary bodies involving geophysical fieldwork, numerical modelling, machine learning and/or instrumentation. The student will receive training in electromagnetic induction techniques, have opportunities to participate in geophysical fieldwork in Iceland and/or Greenland and be expected to present their research at national and international conferences. A clean driving licence is essential.

Please contact Dr Fiona Simpson (f.simpson@imperial.ac.uk) to discuss possible projects.