Title: Forecasting radiation for the Lunar Gateway space station

Supervisor: Dr R. T. Desai (enquiries: ravindra.desai@warwick.ac.uk); Professor T. D. Arber
www.warwick.ac.uk/go/cfsa/people/desai
www.warwick.ac.uk/fac/sci/physics/staff/academic/arber

Research Centre: The Centre for Fusion, Space and Astrophysics (CFSA) focuses on plasma physics applied to the grand challenges of fusion power, space physics, solar physics, and astrophysics. Our work spans fundamental theory, observation, and the analysis of experimental data, combined with high performance computing. For more details of the CFSA see www.warwick.ac.uk/go/cfsa.

Project Description:

The magnetised plasma streaming outward from the Sun creates a cosmic plasma structure termed ‘the heliosphere’, extending out to 100 au. Galactic Cosmic Rays (GCRs) originating from supernovae and pulsars, and Solar Energetic Particles (SEPs) sourced from the Sun, present a major radiation risk for spacecraft and astronauts travelling out beyond the protective influence of the Earth’s magnetic field. Their propagation through the heliosphere to near-Earth space is essential to characterise to enable future exploration efforts to the Moon and beyond.

The project will simulate the propagation of GCRs and SEPs through the heliosphere using models of the solar wind and coronal mass ejections and compare to space-based measurements. A focus for this project will be the upcoming Lunar Gateway Space Station, due to launch in 2025, which will act as a base for future exploration of the lunar south-pole and Mars. Specific areas of focus include: modelling an increasingly representative heliosphere using the latest observations constraints; examining relativistic particle access to cis-lunar space and Lunar Gateway orbits; and modelling the interactions of energetic particles with coronal mass ejections.

This project benefits from involvement in the NASA/ESA/CAS/JAXA Gateway Heliophysics and Space Radiation Working Group associated with the Lunar Gateway and Artemis programme and associated travel may form a part of the project.