

New Observations of the Inner Heliosphere: from Fundamental Physics to Space Weather

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Research at 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 <http://www.warwick.ac.uk/go/cfsa/>

We are now transitioning to a 'data rich' era in our exploration of the heliosphere and how the sun's expanding plasma atmosphere, the solar wind, affects space weather at earth. The combination of long-standing solar and solar wind observations with recently launched Parker Solar Probe and Solar Orbiter missions that will visit within the orbit of Mercury provide unprecedented opportunities both for the study of fundamental physical processes such as turbulence and reconnection, and for improved quantitative insights into space weather at earth. The high Reynolds number solar wind is a large-scale natural laboratory for the study of turbulence in-situ, and Parker Solar Probe and Solar Orbiter will scan the solar wind as it evolves from the vicinity of the solar corona to earth orbit. The project will involve understanding, modelling and adapting current data analytics methods to apply them to the rich and varied classes of in-situ and ground based space plasma observations. It requires combining nonlinear plasma physics with a careful understanding of the varied nature of the observations and their uncertainties.