

Data Constrained Models for Solar Activity Predictions.

Solar variability governs the electromagnetic, radiative, and particulate environment in the heliosphere creating hazardous weather in space through eruptive events such as solar flares, coronal mass ejections. Moreover, modulation in solar output in terms of solar irradiance defines space climate. Both the short and long-term solar variabilities are closely associated with and mostly dominated by the Sun's magnetic cycle. Thus, in the context of space weather studies, understanding and predicting the Sun's magnetic field evolution has gained significant impetus in recent times - the same has been the focus of the research performed in this thesis work. Through utilising a newly developed observational data-driven computational model along with two other existing models, we present predictions of the space weather and space climate in the next decade. Moreover, our work successfully reproduces the past solar activity during the last century and provides a physical explanation of the distinct characteristics observed in the Sun. Altogether the work done in this thesis imparts a deeper understanding of the complex processes within the Sun and in other stars.