Physical Research Laboratory
Ahmedabad

Space & Atmospheric Sciences Division

Division Seminar

Title:**"On the Prediction of Magnetic Field Vectors of Interplanetary Coronal Mass Ejections"**

Speaker: **Ranadeep Sarkar, SRF**
Udaipur Solar Observatory, Physical Research Laboratory

Date: **01 January 2020**

Venue: **Ground Floor Lecture Hall**

Time: **16:00 hrs**

Highlight of the talk:

Coronal mass ejections (CMEs) are powerful expulsions of gigantic clouds containing magnetized plasma that routinely erupt from the Sun and propagate out through the solar system. When such an eruption is directed toward the Earth with high speed and has a southward component of the magnetic field (Bz), an intense magnetic storm occurs upon the impact of the CME on Earth's magnetosphere. The storm can occur when the CME's interplanetary flux rope (FR) and/or the sheath between the FR and the associated shock has southward Bz. Therefore, a prior knowledge of the strength and orientation of the magnetic field embedded in the FR is required in order to forecast the severity of geomagnetic storms caused by CMEs.

We have developed an observationally constrained analytical model, the INterplanetary Flux Rope Simulator (INFROS), for predicting the magnetic-field vectors of interplanetary coronal mass ejections (ICMEs). The main architecture of INFROS involves using the near-Sun flux rope properties obtained from the observational parameters that are evolved through the model in order to estimate the magnetic field vectors of ICMEs at any heliocentric distance. As a proof of concept, we validate INFROS for an Earth-impacting CME which occurred on 2013 April 11. The predicted magnetic field profiles of the associated ICME show good agreement with those observed by the in-situ spacecraft, namely, WIND. In the talk, I will present these results obtained from INFROS model and its implication towards the space-weather forecasting. In addition, the INFROS model validation for an ICME event which was sequentially observed by the in-situ spacecraft, namely, MESSENGER at ≈ 0.45 AU and the STEREO-B at 1 AU will also be discussed. INFROS shows promising results in near real time which could prove to be an useful space-weather forecasting tool compared to the time-consuming and computationally expensive MHD models.

All interested are welcome.