Source : www.thehindu.com Date : 2023-06-26

SCIENTISTS NOW ONE STEP CLOSER TO IDENTIFYING THE SOURCE OF SOLAR MEAN MAGNETIC FIELD: INDIAN INSTITUTE OF ASTROPHYSICS STUDY

Relevant for: Science & Technology | Topic: Science and Technology- developments and their applications and effects in everyday life

June 25, 2023 08:06 pm | Updated June 26, 2023 02:27 am IST - Bengaluru

The sun contains the corona (the outer shell of the sun's atmosphere), the photosphere (the visible surface), and the chromosphere (near-transparent layer, just above the photosphere) with magnetic field generated by electrical currents acting as a magnetic dynamo inside the sun. Photo: nasa.gov

Scientists from the Indian Institute of Astrophysics (IIA) through their latest study have given a clearer picture of how the sun's magnetic field influences the interplanetary magnetic space which is the primary driver of space weather.

According to the Department of Science and Technology, scientists now are one step closer to identifying the source of the Solar Mean Magnetic Field (SMMF), which is the mean value of the line-of-sight (LOS) component of the solar vector magnetic field averaged over the visible hemisphere as well as its relationship with Interplanetary Magnetic Field (IMF).

The sun contains the corona (the outer shell of the sun's atmosphere), the photosphere (the visible surface), and the chromosphere (near-transparent layer, just above the photosphere) with magnetic field generated by electrical currents acting as a magnetic dynamo inside the sun. These electrical currents are generated by the flow of hot, ionised gases in the sun's convection zone.

"The SMMF is the mean value of the line-of-sight component of the solar vector magnetic field averaged over the visible hemisphere of the sun. The effect of the SMMF on the IMF is an object of interest to scientists, for a better understanding of the IMF paves the way for responding to space weather in a better fashion. However, so far, the studies on the SMMF have mostly been confined to the magnetic field measurements at the photosphere," states the Department of Science and Technology.

IIA scientists in their quest to understand if and how the SMMF at chromospheric heights is related to the SMMF at photospheric heights, have found a very good similarity between the two, with the value of chromospheric SMMF being lower than the photospheric SMMF, thereby suggesting that the primordial magnetic field inside the sun could be a source of the SMMF.

They calculated and analysed the SMMF using magnetic field measurements at the chromosphere, in conjunction with that of photospheric measurements. For this, they utilised data from Synoptic Optical Long-term Investigations of the Sun (SOLIS)/Vector Spectromagnetograph (VSM) instrument during 2010–2017 and cross-checked this with data from the Wilcox Solar Observatory.

Understanding the source of the SMMF and its driving parameters could help us understand how the SMMF affects the IMF.

END