Source : www.thehindu.com Date : 2018-12-08

IISER KOLKATA TEAM DEVELOPS METHOD TO SIMULATE, PREDICT SOLAR ACTIVITY OVER TEN YEARS

Relevant for: World & Indian Geography | Topic: The Earth and the Solar System

Astronomers have observed sunspots on the surface of the sun for nearly 400 years. It is known that sunspots follow a cyclic pattern of growing in number and disappearing in approximately 11 years, known as the sunspot cycle or the sun's activity cycle. We are currently in the 24th sunspot cycle since the observation began in 1755.

According to a paper published in *Nature Communications,* a team of researchers from IISER Kolkata have developed a way of predicting the intensity of activity in the next solar cycle (approximately from 2020 to 2031) using data spread over the last 100 years.

Contrary to other calculations, they find that the sun's activity would not dip during the next cycle, but it would be similar to the current cycle, perhaps even stronger. They expect the cycle to peak around 2024. "This is a unique data driven simulation work," says Dipankar Banerjee, Solar physicist from Indian Institute of Astrophysics, Bengaluru, who was not involved in this research.

The researchers simulate the behaviour of the sun using magnetic field evolution models and observational data. They simulate solar activity, and using inputs from observed data from one cycle, predict the behaviour of the sun over the next cycle, about ten years in advance. Comparing their simulations with recorded data from 1913 to present, they show a remarkable agreement in most cases. Using the same method, they predict solar activity over the next cycle, about ten years into the future.

In an email to *The Hindu*, Dr. Dibyendu Nandi, who authored the paper, says "Our work has shown that we cannot make a prediction beyond the next sunspot cycle (i.e., beyond the next 10 years) because the dynamical 'memory' of the sun (i.e., the length of time over which past states affect future states of the sun) extends only over one sunspot cycle and not beyond," Dr. Nandi, who is with the Centre for Excellence in Space Sciences India and Department of Physical Sciences, IISER Kolkata co-authored the paper with PhD student Prantika Bhowmik.

"This kind of work will be very important for the understanding of the long-term variations of the sun and its impact on our climate which is one of the science objectives of Aditya mission. The forecast will be also useful for scientific operational planning of the Aditya mission," says Prof. Banerjee.

An important reason to understand sunspots is that they affect space weather. This refers to the effect of radiation, particle flux and magnetic flux in the region around the sun. During extreme events, space weather can affect electronics-driven satellite controls, communications systems, air traffic over polar routes and even power grids. The other reason sunspots are interesting is the belief that they are correlated with climate on earth. A lot of the research in this area focuses on predicting the way the next sunspot cycle will shape up – whether the sun will be extremely active and produce many sunspots or not.

There have been predictions that the next cycle (cycle 25) will show reduced sunspot activity. There have even been speculations that the sun may be heading towards a period of prolonged low activity - what solar physicists describe as a 'Maunder-like minimum'. The Maunder

minimum refers to a period from 1645 to 1715 where observers reported minimal Sunspot activity — the number of sunspots reduced by a factor of nearly 1,000, over a period of 28 years. During this and other such periods of low activity, some parts of Europe and North America experienced lower-than-average temperatures. While the connection between the Maunder minimum and the climate on earth is still debated, it gives another reason to watch the sunspots.

“Sunspot cycle 25 may reverse the substantial weakening trend in solar activity which has led to speculation of an imminent Maunder-like grand minimum and cooling global climate,” the researchers write.

Weighing about 5,854 kg, the GSAT-11 is the “heaviest” satellite built by ISRO.

Our existing notification subscribers need to choose this option to keep getting the alerts.

END