Indian scientists make the deepest radio image of the Sun – a big step towards predicting Space Weather

The Sun is the brightest object in the sky and has been studied by scientists for hundreds of years. However, it still hosts several mysteries even today, for example when and how powerful explosions take place in the Sun which can potentially affect communication satellites, power supply, GPS navigation, etc. In their research to understand the connection between activities of the Sun and the space weather, a team of scientists led by Dr. Divya Oberoi at NCRA along with Atul Mohan and Surajit Mondal have made significant advances by making the deepest ever images of the Sun at radio wavelengths.

The radio data was acquired through the radio telescope “Murchison Widefield Array” (MWA) in Australia, where Dr. Oberoi was involved since its inception. Over the last several years, Dr. Oberoi and his Ph. D students Rohit Sharma, Atul Mohan, Surajit Mondal, along with several international collaborators were building tools and techniques to uncover the mysteries of the Sun using the MWA data. They developed an indegenious software package called 'Automated Imaging Routine for Compact Arrays for the Radio Sun' or AIRCARS. The lead author of the AIRCARS project, Surajit Mondal says, “previously people could look at only the bright flares which is the tip of the iceberg. For understanding the space weather what is needed is the details which are hidden in the faint end”. AIRCARS can do exactly this which can help in understanding and predicting the space weather better and faster than previously possible.

In an independent project using AIRCARS, for the first time, the team generated much higher contrast images of the Sun at hundreds of closely spaced frequencies at every half-a-second, totaling about a million images per hour. These high contrast images led to the discovery of rapidly oscillating (expanding and contracting) large regions at the source of a weak burst which challenges the conventional wisdom about their origin. Atul Mohan, the lead author of the paper says “these finding dismisses the surface origin of the oscillations, instead points to new phenomenon operating deep down the solar atmosphere”.

Both these studies will appear in the April issue of the prestigious Astrophysical Journal of the American Astronomical Society.

The other members who contributed to this work are Colin Lonsdale and Leonid Benkevitch, both from the Massachusetts Institute of Technology, USA; John Morgan from Curtin University, Australia; Iver Cairns from University of Sydney, Australia; and Meagan Crowley from University of Massachusetts, USA.

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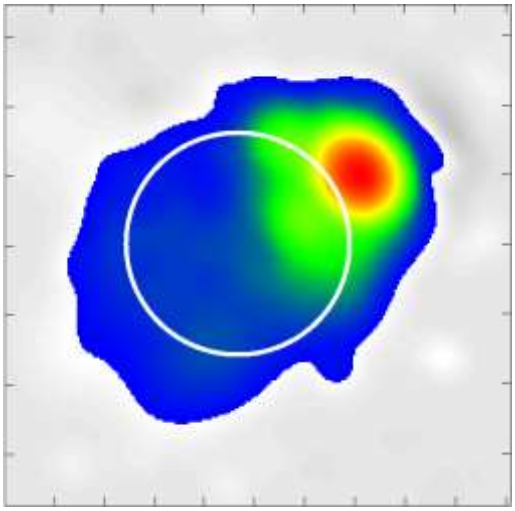

Images: (Left) This is the image of the sun during one of the powerful explosion on the sun. The bright red area is the base of the explosion. The material ejected out from the explosion can often reach the Earth which can potentially affect communication and transmission systems. The white circle is the visible sun.

Right: Surjit Mondal, Divya Oberoi and Atul Mohan

References:

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