Radio flares observed on a nearby M dwarf star
20 April 2022, by Tomasz Nowakowski

Using the MeerKAT radio telescope, an international team of astronomers have detected radio flares on a nearby M dwarf star known as SCR 1746?3214. The finding, reported in a paper published April 7 on the pre-print server arXiv.org, could advance our understanding of flaring behavior of M dwarfs.

To date, astronomers have observed numerous large flares originating from cool dwarfs. This is due to the fact that M-type and ultracool stars can exhibit high levels of magnetic activity. In general, studying flare events could offer important hints on the properties of magnetic dynamos and interiors of stars; thus, researchers are interested in detecting new flaring activity.

Now, a recent study by astronomers led by Alex Andersson of the University of Oxford, UK, reveals that such activity has been detected on the M dwarf star SCR 1746?3214, which is located just 39 light years away from the Earth. By analyzing MeerKAT radio images centered on the black hole X-ray binary H1743?322, Andersson's team serendipitously detected a new radio transient event that received designation MKT J174641.0?321404. The transient turned out to be associated with SCR 1746?3214 and subsequent multi-wavelength investigation of this M dwarf identified further radio flaring activity.

"Commensal analysis of MeerKAT images of the sky surrounding H1743?322 identified a new radio transient, MKT J174641.0?321404, coincident with the high proper motion star SCR 1746?3214. The radio flaring seen in late 2018 was detected three times over 11 epochs of data from MeerKAT," the researchers wrote in the paper.

The observations found that SCR 1746?3214 showcases clear stellar flares, confirming it as an active star. The flaring activity of this M dwarf across the electromagnetic spectrum is consistent with emission expected from the dMe stars. The so-called dMe stars are late-type dwarfs displaying hydrogen emission lines, indicative of chromospheric heating.

Furthermore, the observational campaign confirmed that SCR 1746?3214 is a mid-late spectral M dwarf with clear magnetic activity indicated by strong hydrogen-alpha emission. It was found that the star has a rotational period of approximately 0.23 days, suggesting that this M dwarf is a rapid rotator, comparable to other low-mass systems.

When it comes to the fundamental properties of SCR 1746?3214, the researchers noted that the M dwarf has a radius of about 0.146 solar radii and its mass is 0.12 solar masses. The effective temperature of this star is estimated to be around 2,900 K.

Summing up the results, the researchers noted that their study marks the second time that MeerKAT has been fortunate enough to discover a Galactic radio transient by chance. This shows the unique capabilities of the current generation of radio telescopes.
telescopes for commensal science.

"This transient's serendipitous discovery by MeerKAT, along with multiwavelength characterization, make it a prime demonstration of both the capabilities of the current generation of radio interferometers and the value of simultaneous observations by optical facilities such as MeerLICHT," the authors of the paper concluded.

They added that further multiwavelength studies of SCR 1746?3214 could be helpful in advancing our knowledge about space weather around M dwarfs. This is crucial in order to determine the habitability of potential exoplanets.


arxiv.org/abs/2204.03481

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