Astronomers observe nova V659 Sct during outburst

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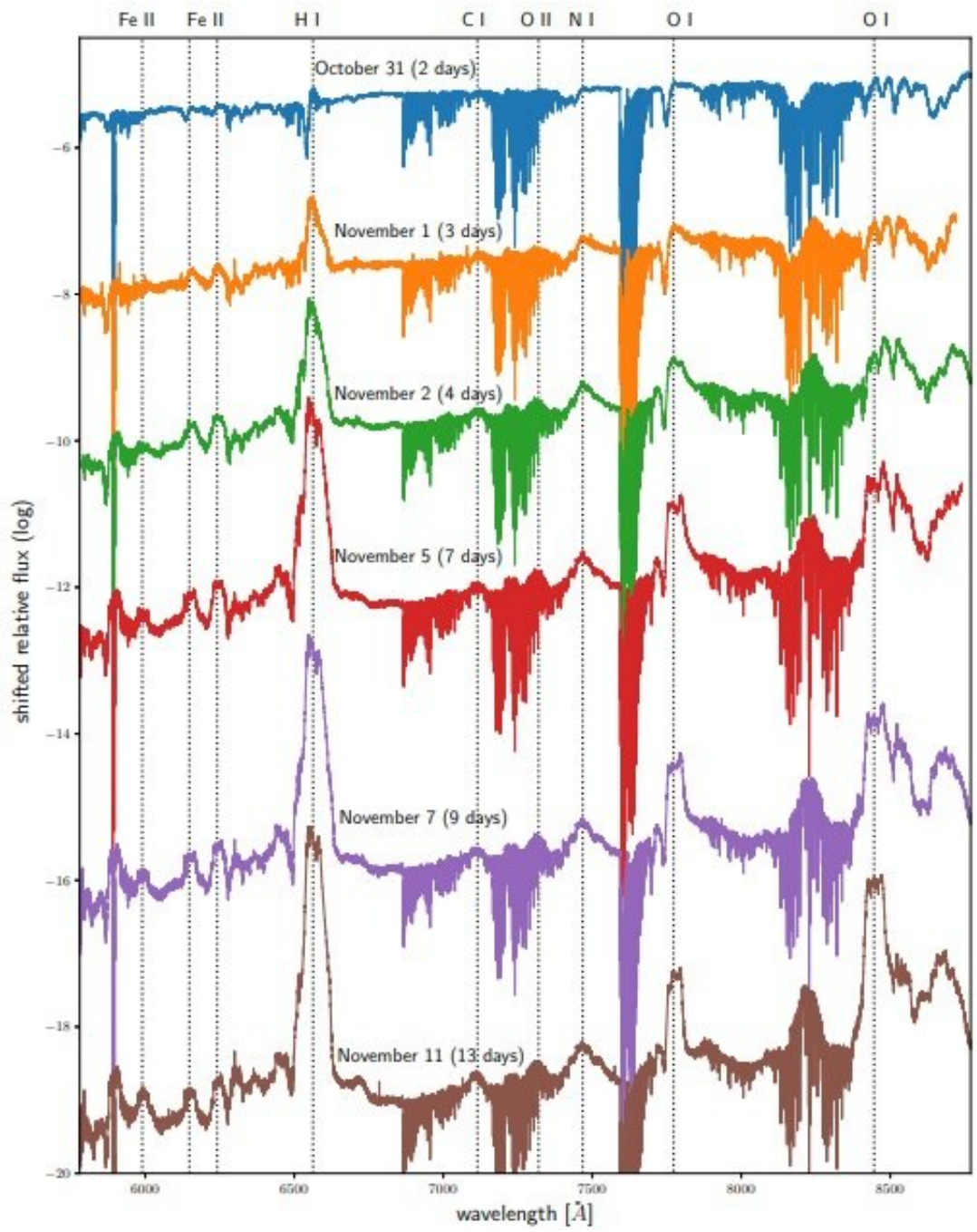

Six spectra of Nova V659 Sct observed in the red channel of the HEROS spectrograph. Dates are of 2019 and the corresponding days after discovery are given in brackets. Broad bands of telluric lines are present in this wavelength range. Credit: Jack et al., 2020.

Using the TIGRE telescope, astronomers have conducted spectroscopic observations of recently discovered nova known as V659 Sct during multiple phases of its outburst. Results of this observational campaign, presented in a paper published June 24 on the arXiv pre-print server, shed more light on the properties of this event.

A nova is a star experiencing a sudden increase in brightness and slowly returning to its original state, a process that could last many months. Such an outburst is the result of the accretion process in a close binary system containing a white dwarf and its companion.

V659 Sct (also known as Nova Scuti 2019 or ASASSN-19aad) is a galactic nova in the constellation Scutum discovered on October 29, 2019, by the All Sky Automated Survey for SuperNovae (ASAS-SN). It had a V band brightness of 8.4 mag during its maximum optical light emission, but its position close to the sun in the sky made observations very challenging.

A team of astronomers led by Dennis Jack of the University of Guanajuato in Mexico, investigated V659 Sct despite these observational difficulties. They used the Heidelberg Extended Range Optical Spectrograph (HEROS) installed on the 1.2 m TIGRE telescope in Mexico in order to obtain optical spectra with intermediate resolution of the nova.

"We obtained a series of eight optical spectra (3,800 to 8,800 Å) of the Nova V659 Sct during the different phases of its outburst with our robotic 1.2 m TIGRE telescope and its intermediate resolution (R ≈ 20,000) HEROS spectrograph," the astronomers wrote in the paper.

Based on the data from TIGRE it was estimated that V659 Sct is some 24,500 light years away from the Earth. The observations found emission lines of atomic hydrogen, iron, oxygen, sodium and calcium,

among others, in the spectra of the studied nova.

The results show that V659 Sct went from optically thick absorption line spectrum into optically thin nebular phase very quickly, what indicates a small envelope mass. The researchers noted that this is assumed to be typical for more evolved systems with a relatively large mass of the white dwarf. When compared to other similar novae, the absorption features of the spectral lines in V659 Sct show generally higher expansion velocities.

According to the paper, the analysis of interstellar medium (ISM) absorption features present in the spectra of V659 Sct indicates that both sodium D lines show a substructure with three main components. ISM absorption features of atomic calcium and potassium were also identified.

Furthermore, it was found that the spectra of Nova V659 Sct contain several features of diffuse interstellar bands (DIB) and the astronomers managed to determine their velocities and equivalent widths. The results suggest that the DIBs are relatively strong due to high galactic reddening.

More information: Time series of optical spectra of Nova V659 Sct, arXiv:2006.14052 [astro-ph.SR] arxiv.org/abs/2006.14052