

Astronomers investigate peculiar outburst activity of AG Draconis



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The light curve of AG Dra during the recent active stage in the B band together with the curves of studied emission line EWs. The thin curves show spline fits to the data points. The dashed vertical lines indicate the times of individual brightness maxima of AG Dra during the ongoing active stage. Image credit: Gális et al., 2019.



Using a set of various ground-based telescopes, European astronomers have conducted photometric and spectroscopic observations of a symbiotic binary known as AG Draconis. Results of this observational campaign, presented in a paper published May 10 on arXiv.org, unveil the system's peculiar outburst activity in recent years.

Located some 16,000 light years away from the Earth, AG Draconis (AG Dra for short) is a strongly interacting binary system in the constellation of Draco. It consists of a metal-poor cool giant of spectral type K3 and a hot component, most likely a white dwarf. The giant star is about 35 times larger than the sun and has a mass of around 1.5 solar masses, while the smaller component is approximately 0.4 times as massive as our sun and has a relatively high temperature between 10,000 and 15,000 K.

AG Dra is one of the best studied symbiotic systems as it has been observed since 1890. Observations of this binary performed within the last two decades confirmed two periods in the system. The longer one, lasting about 551 days, is assumed to be related to the <u>orbital motion</u> and the shorter one, with duration of approximately 355 days, could be due to pulsation of the cool component.

Moreover, AG Dra exhibits characteristic symbiotic activity with alternating quiescent and active stages. Studies show that the active stages in this system occur in intervals of nine to 15 years, and consist of several outbursts repeating at about one-year intervals.

Now, a team of astronomers led by Rudolf Gális of P. J. Šafárik University in Košice, Slovakia, reports that a new active stage of AG Dra started in the late spring of 2015 when the source became brighter and showcased a minor outburst. This event was followed by three outbursts that took place in April 2016, May 2017 and April 2018.



However, the results of new observations show that the latest outbursts differ from these typically observed in the system at the beginning of active phases.

"The photometric and spectroscopic observations suggest that all these outbursts are of the hot type. Such behavior is considerably peculiar in almost 130-year history of observing of this object, because the major outbursts at the beginning of active stages are typically cool ones," the astronomers wrote in the paper.

The hot and cool types of outbursts are distinguished by researchers based on the spectroscopic behavior of AG Dra observed in the far ultraviolet and on the behavior of the emission lines in its optical spectrum. As reported in the paper, the astronomers emphasized that the last three outbursts as well as the preceding minor one were all of the hot type.

In concluding remarks, the authors of the study also discuss the possible paths of future evolution of AG Dra, taking into the account the newly observed outbursts. They note that it still remains uncertain whether the next outburst in the system, expected most likely in May 2019, will be of a hot or cool type. Furthermore, there is also a possibility that AG Dra will return to quiescence as such behavior was observed in mid-1960s, after a weak activity period of this binary ended.

All in all, the astronomers say that the peculiar <u>outburst</u> activity in AG Dra highlights the importance of long-term monitoring of symbiotic stars in general. Such studies could disclose essential information about the nature and mechanisms of active stages and outbursts of these objects.

More information: Rudolf Gális, et al. The peculiar outburst activity of the symbiotic binary AG Draconis, *Open European Journal on*



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