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Photometry and spectroscopy of the 2021 outburst of the symbiotic star YY Her

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The symbiotic star YY Her has just been announced in outburst (ATel #[14458](#)), based on unfiltered telephoto lens images taken on March 15.006 UT during the New Milky Way survey for transients.

As part of our continuous monitoring of symbiotic stars, we have been following the event with ANS Collaboration telescopes in UBVRi bands with their observations transformed to the Landolt system of equatorial standards. Some representative results on YY Her from our monitoring are:

2021 UT	U	B	V	R	I	status
Feb 16.155		14.159	13.081	12.030	10.722	quiescence
Feb 25.134		13.882	12.956	11.878	10.692	on the rise
Mar 13.081		13.135	12.379	11.424	10.447	current
Mar 16.157	12.421	13.146	12.328	11.468	10.465	current

showing the star still at quiescence on Feb 16, and already on the rise by Feb 25. For comparison, the average values of the YY Her epoch photometry listed by Henden and Munari (2008, BaltA 17, 293) in their photometric atlas of symbiotic stars are: U=14.322, B=14.300, V=12.925, R=11.842, and I=10.574.

We have obtained on March 16.08 UT a deep low-resolution spectrum of YY Her with the Asiago 1.22m telescope (3300-8000 Ang, 2.3 Ang/pix). The major difference with similar spectra for the preceding quiescence are a Balmer continuum in much stronger emission, a more pronounced veiling of the M giant spectrum by a blue continuum, and a significant increase in the integrated flux of emission lines. In the following table we compare the integrated fluxes of some representative emission lines measured on the March 16.08 UT spectrum and on a similar spectrum taken on Aug 11, 2019 at exactly the same orbital phase, so to avoid introducing spurious differences due to varying orbital aspect. The two spectra have been taken 583 days apart, the orbital period of YY Her being 590 days, with the last transit of the M giant at inferior conjunction occurring in May 2020.

line	lambda	flux (10^{-13} erg $\text{cm}^{-2}\text{s}^{-1}$)	
		2019/08/11	2021/03/16
OIII	3341	3.3	1.8
[NeIII]	3869	0.2	1.6
Hgamma	4340	5.8	11.0
[OIII]	4363	0.6	2.1
HeII	4686	3.6	12.4
Hbeta	4861	14.8	26.8
[OIII]	5007	0.2	2.3

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HeII	5412		1.0
Halpha	6563	70.2	110.0
HeI	6678	5.2	6.5
HeI	7065	3.1	4.1

The current outburst seems to be of the "hot type" with the larger increase in flux affecting the higher ionization emission lines, as opposed to outbursts of the "cool type" characterized by the near disappearance of higher ionization lines. The latter is the most frequent type of outburst among symbiotic stars, with some objects showing both types, most notably AG Dra.

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