Swift observations of the dwarf nova ASASSN-18fs

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The All Sky Automated Survey for SuperNovae (ASAS-SN; Shappee et al. 2014) reported a possible Galactic dwarf nova ASASSN-18fs on 2018 March 19 at \( \sim 13.2 \) mag in the V band, with a quiescent magnitude of \( V \gtrsim 17.6 \) (Stanek et al. 2018). Dwarf novae are accreting white dwarfs that occasionally show outbursts due to thermal instabilities in the accretion disk (see Lasota 2001, for a review). Here we report on the follow-up photometry using the Neil Gehrels Swift Observatory.

ASASSN-18fs was observed using the Ultraviolet and Optical Telescope (UVOT) and the X-ray Telescope (XRT) aboard Swift. The data were downloaded from the HEASARC archive1. The source was observed 11 times since then, up to \( \sim 46 \) days after the initial detection of the transient.

The UVOT products were analysed using uvotsource which extracted the source magnitude and flux. We used a circular source region of 5'' centred on the source location and a background region consisting of three 10'' circles placed near the source. The UVOT light curves are shown in Figure 1 (left). The outburst lasted for \( \sim 35 \) days, with the magnitude decaying from \( \sim 13.7 \) to \( \sim 15.8 \) mag during the initial \( \sim 29 \) days. The source magnitude then decayed more rapidly over the next \( \sim 6 \) days before reaching quiescence.

Several dwarf novae exhibit rebrightenings after their main outburst (e.g., Kato et al. 2009). Due to the large gap in our Swift observations around MJD 58240, we were unable to constrain with these data whether or not the source exhibited rebrightenings. The ASAS-SN light curve2 around this time (not shown in the figure) was also non-constraining, providing only upper limits. Therefore, we examined archival data from the American Association of Variable Star Observers (AAVSO3; Figure 1, left, grey points; Kafka 2018) which shows that ASASSN-18fs exhibited at least one post-outburst rebrightening.

We also examined the Spectral Energy Distribution (SED; Figure 1, right) constructed using the Swift/UVOT data. The days for which these SEDs were constructed are shown by the vertical dashed lines in Figure 1 (left). The SED evolution is consistent with that of a dwarf nova in outburst whose emission is dominated by a disk decaying with time.

The XRT data were processed using xrtpipeline. The light curve and spectra were extracted using XSpec (v12.9) using a circular source extraction region having a radius of 30'', centred on the source location. An annular background region having an inner and outer radius of 100'' and 200'', respectively, was used. The 0.5–10 keV light curve is shown in Figure 1 (left bottom). The first XRT pointing detected the source at a count rate of \( 2.3 \times 10^{-2} \) counts s\(^{-1}\). By the next observation (\( \sim 5 \) days later) the count rate had dropped by a factor of \( \sim 3.5 \). It stayed at this count rate

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1 https://heasarc.gsfc.nasa.gov/cgi-bin/W3Browse/swift.pl
2 https://asas-sn.osu.edu/
3 Using the CV band for which the unfiltered data are reduced to the V band
Figure 1. The optical, UV, and X-ray light curves of ASASSN-18fs are shown in the upper, middle, and lower panels of the left figure, respectively. The vertical dashed lines indicate the times for which we constructed the SEDs (shown in the right figure).

for the rest of the outburst and the subsequent decay. However, once the source transitioned to quiescence (after the rebrightening) the count rate was seen to rise, once again. It reached a similar level as was seen during the first XRT pointing. This behaviour, of the suppression of the X-ray emission during the outburst, is seen in several dwarf nova systems (e.g., SS Cygni; McGowan et al. 2004).

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