

LETTER TO THE EDITOR

Early emission characterization of TDE 2025aarm

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Received 2 March 2026; accepted 2 June 2026

ABSTRACT

In this work, we present early emission data analysis of the tidal disruption event TDE 2025aarm, including optical, UV, and X-ray data. At a redshift of $z = 0.01368$, TDE 2025aarm is the second closest TDE ever discovered, offering a valuable opportunity to study such phenomena in great detail. We observed TDE 2025aarm in the optical with the Liverpool Telescope for a total of three epochs. We complemented our dataset with ancillary spectroscopic and photometric data. The early optical spectra are characterized by a blue-continuum and helium, hydrogen, and possibly Bowen lines typical of H+He events. The optical light curves peak at $M_g \sim -18.68$ mag and are well described by fallback of a $M_\star \sim 0.16 M_\odot$ star onto a $M_{\text{BH}} \sim 2 \times 10^7 M_\odot$ black hole. We report *Swift*-XRT detection in the 0.3 – 10 keV range, with a total flux of $F_X \sim 1.42 \times 10^{-14} \text{ erg cm}^{-2} \text{ s}^{-1}$, fit by a blackbody with $k_B T \sim 0.39 \text{ keV}$. This makes TDE 2025aarm a new event among optical/UV bright TDEs detected in soft X-rays. Our analysis suggests that the early emission from TDE 2025aarm is powered by circularization shocks and that the delayed accretion scenario best describes the observed features.

Key words. Black hole physics – Galaxy: nucleus

1. Introduction

Tidal disruption events (TDEs) are transient phenomena that occur when stars wander sufficiently close to a supermassive black hole (BH) to be torn apart by tidal forces. A luminous flare of radiation, with typical luminosities of $10^{42} - 10^{44} \text{ erg s}^{-1}$, is expected from the fraction of stellar debris that, being gravitationally bound after disruption, fall back onto the BH and form an accretion disk (Hills 1975; Rees 1988). Over the past decade, wide-field optical and X-ray surveys have discovered more than 100 TDEs, establishing them as a distinct class of luminous nuclear transients (e.g., Hammerstein et al. 2023). These events typically exhibit blue optical/UV (OUV) continua and light curves that rise over days to weeks and decline over weeks to months, which are often approximated by a power-law decay consistent with the fallback rate of stellar debris onto the accretion disk (e.g., Nicholl et al. 2022). Spectroscopically, TDEs are divided into four main classes, He, H+He, H, and featureless (e.g., Charalampopoulos et al. 2022; Hammerstein et al. 2023), with one additional less-emerging class discovered in recent years: TDE coronal (Yao et al. 2023). The TDEs in the H+He class tend to prefer more OUV luminous flares with more compact radii than TDE H (Van Velzen et al. 2021). The TDEs in the He class emerge for sufficiently high luminosities and compact radii to ionize He II, while featureless spectra are expected for the highest luminosities (Aspegren & Kasen 2026).

Though TDEs are expected to be mainly powered by accretion, almost 50% of the discovered TDEs exhibit faint X-ray ra-

diation or none at all. There are two main models that attempt to explain this diversity. In the first scenario, the accretion disk formation is delayed, while the OUV emission is powered by shocks from debris stream–stream collisions near apocenter during the circularization process. The dissipated kinetic energy is thermalized and diffuses through the infalling debris, producing bright OUV emission that is largely decoupled from the X-ray emission from the inner accretion flow (Piran et al. 2015). In the second scenario, the circularizing debris form a viscous accretion disk around the supermassive BH (SMBH), which can effectively obscure the X-ray emission and reprocess it into OUV wavelengths (Rees 1988), with viewing angle effects potentially intervening (Dai et al. 2018).

The paper is structured as follows: we present the discovery of TDE 2025aarm and the status of multi-wavelength observations in Sect. 2. In Sect. 3 we present the optical, UV, and X-rays data used in this analysis. In Sect. 4 we focus on analyzing the spectral features, reconstructing the photospheric parameters, and modeling the light curves of the event. Finally, in Sect. 5 we discuss our results and draw the final conclusions.

2. Discovery

TDE 2025aarm (AT 2025aarm) was discovered by GOTO on MJD 60949.17 with a L-filter magnitude of 18.96 at the coordinates RA, DEC (J2000) = 68.05, -5.38° (O’Neill et al. 2025). It is located 0.186'' from the center of its host galaxy (LEDA 3681212; Fabricius et al. 2021), indicating that the event is coincident with the galaxy center within subarcsecond precision.

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It was classified as a TDE H+He at a redshift of $z = 0.01368$ (Newsome et al. 2025). Assuming a flat Λ CDM Universe with $H_0 = 67.4 \text{ km s}^{-1} \text{ Mpc}^{-1}$, $\Omega_m = 0.315$, and $\Omega_\Lambda = 0.685$ (Planck Collaboration 2020), we obtained a luminosity distance of $D_L = 61.48 \pm 6.15 \text{ Mpc}$, making TDE 2025aarm the second closest TDE ever discovered, with only AT 2023clx (Charalampopoulos et al. 2024) being closer. The distance modulus is $\mu = 33.94 \pm 0.22 \text{ mag}$.

Owing to its vicinity, TDE 2025aarm was and still is monitored across the entire electromagnetic spectrum. A first non-detection in the 1 – 8 GHz radio bands was reported by Sfaradi et al. (2025) with the Allen Telescope. It followed a significant detection with the Very Large Array at 15.1 GHz with a flux density of $36 \mu\text{Jy}$, corresponding to a luminosity of $L_{15 \text{ GHz}} = 1.6 \times 10^{26} \text{ erg s}^{-1} \text{ Hz}^{-1}$ and a positive spectral index (Christy et al. 2025). The source was significantly detected in the 0.5 – 7.0 keV X-ray band with the Chandra Telescope, with an unabsorbed flux of $5.9 \times 10^{-15} \text{ erg cm}^{-2} \text{ s}^{-1}$, a spectral index of 2.2, and a luminosity of $L_{0.5-7 \text{ keV}} = 2.5 \times 10^{39} \text{ erg s}^{-1}$ (Somalwar et al. 2025). Observations were also performed in the GeV–TeV gamma-ray bands, though without achieving any significant detection (Mohrmann 2025; Paneque et al. 2025).

3. Observations and data

3.1. Optical

We observed the position of TDE 2025aarm for three epochs (MJD 61016.93, 61030.04, 61084.90) with the SPectrograph for the Rapid Acquisition of Transients (SPRAT; Piascik et al. 2014) at the Liverpool Telescope (LT) via Director’s Discretionary Time (IDs CQ25B01 – CQ26A01; PI: A. López-Oramas). Observations were performed with a blue-optimized setup, and we used the standard LT automatic pipeline for data reduction. See Table E.2 for details. We collected one additional public spectrum from WISerEP (Yaron et al. 2017). This spectrum was observed on MJD 60977.43 with the FLOYDS-N at the Las Cumbres Observatory (LCO; PI: M. Newsome).

We collected ancillary photometric data from public brokers, including g and r filter forced-photometry from the Zwicky Transient Facility (Graham et al. 2019) and o and c filter photometry from ATLAS (Tonry et al. 2018). The light curves cover a total range between MJD 60939.42 and 61086.78. The complete photometry is reported in Table E.3 and shown in Fig. E.1. Every magnitude is expressed in the AB system and has been converted into absolute magnitudes after cosmological K correction $2.5 \log_{10}(1+z)$ and considering a Milky Way extinction of $E_{B-V} = 0.0688$ (Schlafly & Finkbeiner 2011). We derived the values at the peak by smoothly interpolating the data points, obtaining $M_{\text{peak},g} = -18.68 \pm 0.03 \text{ mag}$ at $t_{\text{peak},g} = 61006.38 \pm 3.26 \text{ MJD}$ and $M_{\text{peak},r} = -18.41 \pm 0.2 \text{ mag}$ at $t_{\text{peak},r} = 61010.44 \pm 2.95 \text{ MJD}$. We use $t_p = t_{\text{peak},g}$ as the reference epoch throughout this work.

3.2. Swift-UVOT

Target of opportunity observations spanning several epochs between MJD 60979 and 61078 (PIs: Kuin, Stein, Miller, Charalampopoulos, Sun, Konno) were obtained with the UV-Optical Telescope (UVOT; Roming et al. 2005) and X-ray Telescope (XRT; Burrows et al. 2005) on board the Neil Gehrels Swift Observatory. We reduced the UVOT photometry via the `uvotredux` (Stein & Carney 2025) python wrapper, which is based on the `uvotsource` module of the `HEASoft` package (Nasa Heasarc

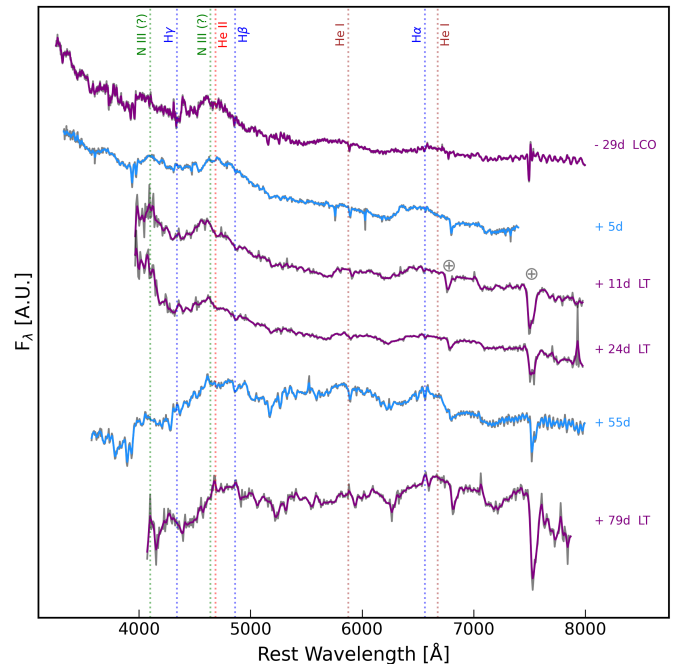


Fig. 1. Spectral evolution of TDE 2025aarm between -29 and +79 days from t_p . We show the original spectra in gray and the smooth interpolated in purple. For comparison, we show two spectra of AT 2023clx in blue. Fluxes have been normalized and offset for visual clarity. The dashed vertical lines are placed on the rest-frame position of the relevant spectral features.

2014). We subtracted the host contribution modeled by the `prospector` package (Johnson et al. 2021), based on publicly available data of the host galaxy (see Appendix C). After subtraction, the brightest filter is w_2 , reaching a peak of $M_{\text{peak},w_2} = -19.32 \pm 0.02 \text{ mag}$ at $t_{\text{peak},w_2} = 60988.42 \pm 3.53 \text{ MJD}$.

3.3. Swift-XRT

We searched for X-ray emission from the position of TDE 2025aarm in the XRT data. Notably, only upper limits were reported from the host galaxy (Miller & Mockler 2025). We report a stacked detection with a count rate of $(4.3 \pm 1.2) \times 10^{-4} \text{ cts s}^{-1}$ for a total exposure time of 59.2 ks between MJD 60979 and 61078. We used the `Xpsec` module (Arnaud 1996) within `HEASoft` to fit the spectrum, assuming a Galactic column density of $4.4 \times 10^{20} \text{ cm}^{-2}$ (Bekhti et al. 2016). Both power-law and blackbody models fit the data with reduced statistics of 0.87 and 0.93, respectively (see Appendix A). The resulting unabsorbed flux in the 0.3 – 10 keV range for the blackbody model is $F_{0.3-10 \text{ keV}} = (1.42 \pm 0.36) \times 10^{-14} \text{ erg cm}^{-2} \text{ s}^{-1}$, with a temperature of $k_B T = 0.39 \pm 0.08 \text{ keV}$, corresponding to a luminosity of $L_{0.3-10 \text{ keV}} = (6.42 \pm 2.07) \times 10^{39} \text{ erg s}^{-1}$. The power-law model yields a photon index of $\Gamma = 1.96 \pm 0.4$, consistent with Chandra (Somalwar et al. 2025).

Notably, by dynamically binning the counts across the entire time range, we obtained two bins above the threshold at 61004 MJD and 61065 MJD, with the second at a higher level, suggesting that the flux is increasing. Consistent with this trend, a second detection by Chandra on 61141 MJD confirmed the X-ray brightening by a factor of about ten compared to the XRT flux (Jaisawal et al. 2026). The measured unabsorbed flux in the 0.5 – 7 keV band is $1.4 \pm 2 \times 10^{-13} \text{ erg cm}^{-2} \text{ s}^{-1}$ for a power-law

model with photon index 1.6 ± 0.4 , corresponding to a luminosity of $6.3 \times 10^{40} \text{ erg s}^{-1}$.

4. Analysis

4.1. Spectral analysis

We identified the spectral emission features of TDE 2025aarm by comparing our spectra with those of AT 2023clx (Charalampopoulos et al. 2024). In both cases, the spectra exhibit a blue-continuum on top of broad emission lines, which cools down tens of days after the peak (Fig. 1). Both sources display typical H+He class emission lines, including the Balmer series and the helium ions He I $\lambda\lambda 5876, 6678$ and He II $\lambda 4684$. The presence of Bowen fluorescence features cannot be ruled out nor robustly confirmed. The N III $\lambda 4640$ is strongly blended with He III, while N III $\lambda 4100$ is potentially blended with H δ (see Fig. D.1).

We subtracted the host light using the spectrum from DESI Data Release 1 (ID: 2842392105320449; Abdul Karim et al. 2026). We fit the spectral features of the continuum-subtracted spectra with PyQSOFit (Guo et al. 2018) to extract their relevant information, luminosity, full width at half maximum (FWHM), and offset as well as to track their evolution (Fig. D.2). The behavior of the lines after maximum is in concert with the described properties of TDEs H+He. They are broad, with an FWHM on the order of $10^3 - 10^4 \text{ km s}^{-1}$ and an increasing broadening over time. The luminosity of each line increases with time, reaching the peak between 11 – 24 days post t_p , although sparse sampling hinders the exact estimation of the time lag. The lag time roughly follows $\tau \sim r/c$ (Charalampopoulos et al. 2022). For TDE 2025aarm this translates into $r = 7 \times 10^{16} \text{ cm}$, which is two orders of magnitude higher than the blackbody radius. Charalampopoulos et al. (2022) noticed that the evolution of the spectral lines and the photospheric evolution are correlated, and the lag can be interpreted as low electron density reprocessing material with high recombination times. The correlation between spectral lines and the photosphere can also be seen in the He II/H α ratio, which is higher when the radius is expanding (receding) before (after) the peak and lower when the radius is at its peak. This hints at a stratified emitting structure, with Helium closer to the BH that becomes stronger when the photosphere recedes. Finally, all the lines are red- or blue-shifted and have a generally decreasing trend after the peak toward null.

4.2. Blackbody fit

We studied the evolution of the optical photon field using extrabol (Thornton et al. 2024), which reconstructs the bolometric luminosity, the blackbody temperature, and radius (Fig. B.1). See Appendix B for more details.

The bolometric luminosity peaks at -11 days, reaching $L_{\text{bb, peak}} = (3.4 \pm 0.1) \times 10^{43} \text{ erg s}^{-1}$, corresponding to a peak bolometric magnitude of $M_{\text{peak}} = -20.13 \pm 0.03 \text{ mag}$. The temperature exhibits a first peak of $T_{\text{bb, peak}_1} = (22.16 \pm 0.3) \times 10^3 \text{ K}$ at -24 days and then drops quickly after. It rises again at 37 days, reaching $T_{\text{bb, peak}_2} = (20.33 \pm 1.0) \times 10^3 \text{ K}$, corresponding to a second bump in the luminosity curve. The photospheric radius expands during the first ~ 60 days after discovery, reaching a maximum extension of $R_{\text{bb, peak}} = (6.6 \pm 0.1) \times 10^{14} \text{ cm}$, and it exhibits similar bumps as the temperature and luminosity curves. An equivalent behavior has been observed in other TDEs, such as ASASSN-15oi (Gezari et al. 2017), ASASSN-15lh (Leloudas et al. 2016), and AT 2018fyk (Wevers et al. 2019).

4.3. Fallback modeling

After tidal disruption, a fraction of the stellar mass is gravitationally bound to the BH. The subsequent fallback onto the BH can be subdivided into two phases: circularization and accretion. The resulting radiation directly depend on the BH mass, M_{BH} , by

$$\frac{dM}{dE} \frac{dE}{dt} = \frac{2\pi}{3} (GM_{\text{BH}})^{2/3} \frac{dM}{dE} t^{-5/3}. \quad (1)$$

This equation describes a complete fallback. If the fallback is partial, we expect a steeper rate of $t^{-9/4}$. Depending on the mass of the BH, the accretion rate can be in the super-Eddington or in the sub-Eddington regime. In particular, the relation that describes the Eddington luminosity is

$$L_{\text{Edd}} = \eta \dot{M}_{\text{Edd}} c^2 = 1.33 \times 10^{44} \left(\frac{M_{\text{BH}}}{10^6 M_{\odot}} \right) \text{ erg s}^{-1}, \quad (2)$$

where η is the accretion efficiency. See, for example, Strubbe & Quataert (2009) for additional details on this model.

We modeled our light curves using the tde module from MOSFiT (Guillochon et al. 2018). We show the results in Fig. E.2 and report the prior and posterior of the free parameters in Table E.1. The model reproduces well most of the observed data, with the lowest chi-square yielded for the g -band $\chi^2_{\text{g}}/\text{d.o.f.} = 0.22$ and the $uvm2$ -band $\chi^2_{\text{uvm2}}/\text{d.o.f.} = 0.99$. The U -band yields the highest residuals, and in general, the UVOT filters are the hardest to reproduce, as seen in Nicholl et al. (2022). The fit yields a total reduced chi-square of $\chi^2/\text{d.o.f.} = 1.54$. Our results suggest a low-mass star, $M_{\star} = 0.16^{+0.03}_{-0.03} M_{\odot}$, disrupted by a high-mass BH, $M_{\text{BH}} = 1.87^{+0.3}_{-0.2} \times 10^7 M_{\odot}$, with a scaled impact factor of $b \sim 0.5$ and a relatively low efficiency of $\epsilon \sim 0.05$, which is in line with the population of H+He TDEs studied in Nicholl et al. (2022). These results indicate sub-Eddington accretion, with $L_{\text{OUV}}/L_{\text{Edd}} = 0.01$ and $L_{\text{X}}/L_{\text{Edd}} = 3 \times 10^{-6}$, and reveal an extremely underluminous X-ray emission. However, since MOSFiT measurements show only a marginal agreement with BH masses inferred from host-galaxy properties (see, e.g., Guolo et al. 2025), these values are not to be taken as exact estimates. In this regard, the independent measurement by prospector (see Sect. C) provides additional proof of the order of magnitude of the SMBH behind TDE 2025aarm.

5. Discussion and conclusions

TDE 2025aarm adds to the diversity of OUV bright TDEs that have been detected in the soft X-ray band (Van Velzen et al. 2020; Hammerstein et al. 2023). Remarkably, TDE 2025aarm exhibits one of the highest OUV to X-ray luminosity ratios at peak ever found (Hammerstein et al. 2023), with $L_{\text{OUV}}/L_{\text{X}} = 5.3 \times 10^3$. The faint X-ray emission observed in TDE 2025aarm may reflect inefficient accretion from a still-circularizing debris stream. This behavior was potentially already hinted at by the increasing counts in the XRT analysis, although the statistics are still too low to provide solid evidence. Alternatively, the X-ray emission could be obscured by optically thick material, although the early detection by Chandra may suggest only partial veiling, as discussed for other TDEs (Gezari et al. 2017).

Interestingly, the delayed accretion scenario is potentially probed by the bumps in the temperature evolution (Fig. B.1). Here, the first peak reflects radiation coming from circularization shocks, while the subsequent re-brightening is due to the prompt and efficient formation of the accretion disk and consequently

an increase in reprocessing X-rays to OUV light (Leloudas et al. 2016; Wevers et al. 2019; Charalampopoulos et al. 2024). For TDEs occurring in high-mass SMBHs, such as TDE 2025aarm, the disk formation is expected to be more efficient and to happen within tens to hundreds of days after disruption (Wong et al. 2022).

The spectral line evolution provides an additional argument. For Bowen lines to emerge, there must be a source of X-rays. In the orientation-dependent model, where the reprocessing happens around the accretion disk, the line width and the blueshift positively correlate with X-ray emission and should rise as the photosphere becomes transparent. This is the opposite of what we observed with TDE 2025aarm: The blueshift diminishes while the X-ray flux increases, indicating that the orientation scenario is not (the only) contributing factor. In the delayed accretion scenario, instead, the blueshift is unrelated to changes in the X-ray flux. Future X-ray observations of TDE 2025aarm will be crucial to testing these interpretations, as the delayed emergence of a luminous soft X-ray component is expected once a circularized accretion disk forms and viscous accretion becomes efficient or when the accreting material becomes optically thin (e.g., Gezari et al. 2017; Hammerstein et al. 2023). Early signs that potentially support this interpretation are already in place (Jaisawal et al. 2026).

In conclusion, we have presented an early characterization of TDE 2025aarm. Its proximity has enabled an exceptionally deep multiwavelength characterization, including the detection of soft X-ray emission that would likely have remained undetected at greater distances. The high-cadence optical photometric and spectroscopic monitoring provides an unusually detailed view of its temporal and spectral evolution. Future analyses will provide a more complete characterization of TDE 2025aarm. For now, this work has established an initial observational framework that can serve as a reference for future studies, with particular emphasis on the importance of coordinated multi-wavelength follow-up observations.

Data availability Table E.3 is only available in electronic form at the CDS via anonymous ftp to cdsarc.u-strasbg.fr (130.79.128.5) or via <http://cdsweb.u-strasbg.fr/cgi-bin/qcat?J/A+A/>.

Acknowledgements. The authors thank Patrik Veres for helpful discussion. The Liverpool Telescope is operated on the island of La Palma by Liverpool John Moores University in the Spanish Observatorio del Roque de los Muchachos of the Instituto de Astrofísica de Canarias with financial support from the UK Science and Technology Facilities Council. This research has made use of data and/or software provided by the High Energy Astrophysics Science Archive Research Center (HEASARC), which is a service of the Astrophysics Science Division at NASA/GSFC. ALO and JBG acknowledge support from the Agencia Estatal de Investigación del Ministerio de Ciencia, Innovación y Universidades (MCIU/AEI) under grant PARTICIPACIÓN DEL IAC EN EL EXPERIMENTO AMS and the European Regional Development Fund (ERDF) with reference PID2022-137810NB-C22. This work is part of the Project RYC2021-032991-I, funded by MICIU/AEI/10.13039/501100011033, and the European Union “NextGenerationEU”/PRTR.

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Appendix A: XRT analysis

The intrinsic X-ray spectral energy distribution (SED) of TDE 2025aarm reconstructed from the *Swift*-XRT data is shown in Fig. A.1, where the correction of the spectral points for the Galactic extinction effects was performed as in Abe et al. (2025). We fit both a blackbody and a power-law model, accounting for photon absorption and the nominal Galactic hydrogen column density of $4.4 \times 10^{20} \text{ cm}^{-2}$ (Bekhti et al. 2016). The fit was performed by minimizing the Cash statistic. Results of the fit with the associated statistics are reported in Table A.1.

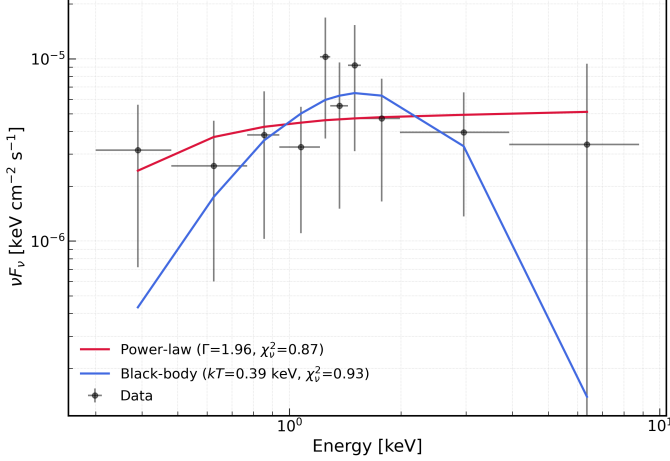


Fig. A.1. Spectral energy distribution fitting of the XRT data. Results for the power-law and blackbody models are shown in red and blue lines, respectively.

Table A.1. XRT fit results.

	Power-law	Blackbody
C-stat	38.45	40.89
Chi-squared	27.86	23.29
Reduced C-stat ^a	0.87	0.93
Flux ^b	2.47 ± 0.76	1.32 ± 0.34
Flux ^b (unabs)	2.74 ± 0.85	1.42 ± 0.36
Luminosity ^c	12.4 ± 4.57	6.42 ± 2.07

Notes. ^a With 44 degrees of freedom. ^b Fluxes are expressed in units of $10^{-14} \text{ erg cm}^{-2} \text{ s}^{-1}$. ^c Luminosities are estimated from the unabsorbed flux values, in units of $10^{39} \text{ erg s}^{-1}$.

The resulting power-law has a photon index of $\Gamma = 1.96 \pm 0.4$, while the blackbody temperature is $k_B T = 0.39 \pm 0.08 \text{ keV}$, where the uncertainties are estimated with 200 simulations and a 68% confidence level.

Appendix B: extrabol fitting

Here we summarize the workflow of the *extrabol* code (Thornton et al. 2024). Once a set of light curves is given, the first step is to smoothly interpolate each of them using Gaussian process regression techniques. We excluded the *o*, and *c* bands to avoid redundancy, as their bandpasses significantly overlap with those of other filters. They use a 2-dimensional kernel to interpolate the curves both in the time and wavelength domains. The interpolation is self-regulated and, if it results in large errors, for example

when the data are very sparse, it uses template libraries to reduce the uncertainties, although the farthest from the data points, the highest the errors. For this reason, the absence of UV data at times earlier than the first point produces systematically higher errors, until the fit explodes. This is why we executed the fit starting from -40 days before t_p instead of utilizing the entire time range. Once the interpolation is done, magnitudes are converted into fluxes at every epoch, building an SED (Fig. B.2). The bolometric luminosity is then obtained by integrating the SED, while temperature and radius are obtained by fitting a blackbody model to it using Monte Carlo sampling (Fig. B.1). The default priors are $T_0 = 9000 \text{ K}$ and $R_0 = 1 \times 10^{15} \text{ cm}$. Temperature is constrained to positive values below $T_{\text{max}} = 40000 \text{ K}$, while radius can assume any positive values. See Thornton et al. (2024) for more details.

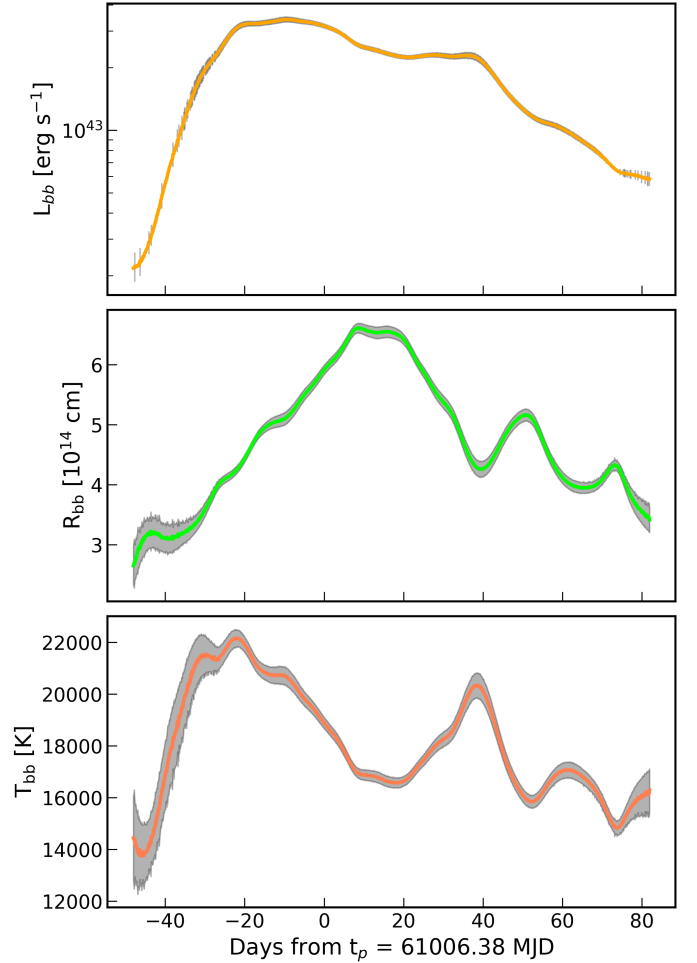


Fig. B.1. Photospheric evolution of TDE 2025aarm. *Top*: Bolometric luminosity. *Middle*: Blackbody temperature. *Bottom*: Blackbody radius. Gray shaded areas represent 1σ uncertainty.

Appendix C: Host modeling with prospector

The host galaxy contribution was modeled using the SED fitting code *prospector* (Johnson et al. 2021), which models stellar population parameters from UVOIR photometry. Host archival magnitudes were obtained from the Sloan Digital Sky Surveys (SDSS) Data Release 16 (DR16) catalog (Ahumada et al. 2020)

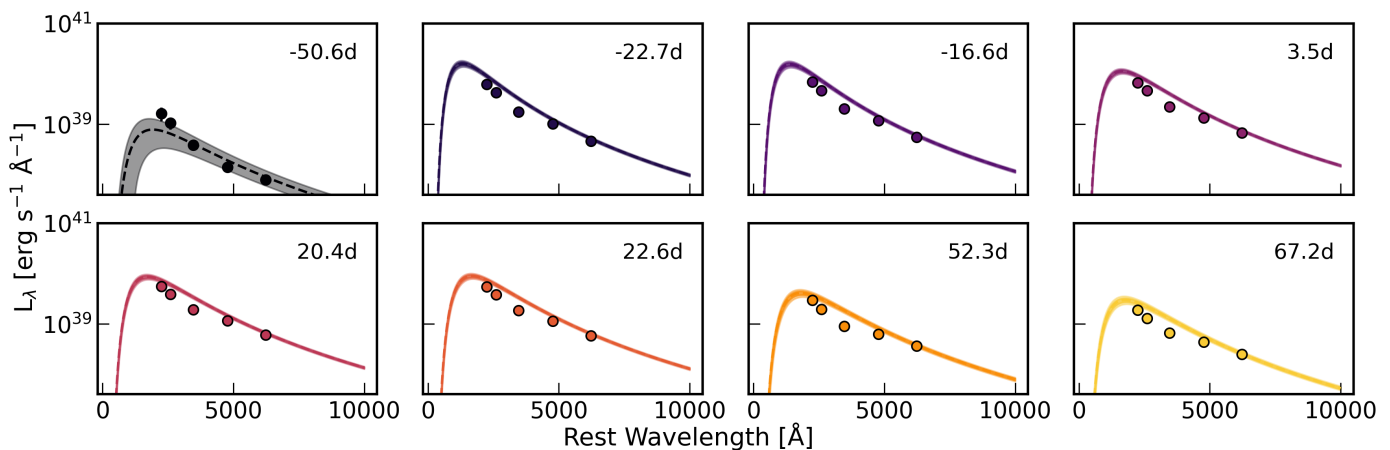


Fig. B.2. Blackbody fits to the SEDs. We show the epochs at which all five filters are available within a window of ± 1 day. The top left subpanel is instead obtained with interpolated points.

for filters *ugriz* and from the GALEX-DR5 (GR5) sources catalog (Bianchi et al. 2011) for the NUV filter. In addition, the archival host photometry at UVW1 filter published by Miller & Mockler (2025) was also included in the model. We adopted a parametric star-formation history including nebular emission, and sampling was performed with the *dynesty* nested sampler. The best-fit model SED was then used to estimate the host flux in the observed bands. *prospector* provides an estimate of the total stellar mass of the galaxy as well as its age. We estimate the BH mass based on the empirical relation by Reines & Volonteri (2015) finding $\log_{10}(M_{\text{BH}}) = 6.92 \pm 0.55$ dex, where the uncertainty estimate is the systematic uncertainty of the relation, and $t_{\text{age}} \sim 3.39$ Gyr. The host flux was subtracted from the UVOT measurements in each corresponding bandpass using SNCosmo¹.

Table C.1. Archival host photometry from SDSS, GALEX, and UVOT used for the construction of a synthetic galaxy model with *prospector*.

Filter	AB magnitude
SDSS u	16.65 ± 0.01
SDSS g	14.786 ± 0.002
SDSS r	14.050 ± 0.002
SDSS i	13.667 ± 0.002
SDSS z	13.449 ± 0.003
GALEX NUV	19.3 ± 0.1
UVOT W1	18.7 ± 0.1

Appendix D: Line fitting details

We fit the host+continuum subtracted spectra using a custom python script based on PyQSOFit (Guo et al. 2018). This software allows to fit a spectrum taking as only input the spectral data, the source redshift, and a line-fitting parameter list with the prior information of each line. These information include the broadness of the line, the expected centroid, and the region where to perform the fit. Each individual line or blend of lines was fit with a combination of narrow or broad Gaussian features that can be specified by the user (as shown in Fig. D.1). Markov-Chain Monte-Carlo routines are used to measure the uncertainties of the fitting results. From the best-fit model, we derived the FWHM, estimate the line luminosity by integrating over the fit region, and computed the wavelength offset as the difference between the Gaussian peak and the rest-frame line centroid.

Results of line fitting are shown in Fig. D.2. Despite the fit manages to individuate the contribution from N III, He II, and H β at every step, we note that the line is heavily blended, hindering a perfect separation of the two. This could, for instance, be reflected in the high redshift (and, conversely, high blueshift) of the He II (N III) line during the first epochs. Similarly, the H α and He I $\lambda 6678$ features are strongly degenerate, although being more separated. For these reasons, these results serve mostly as a general indication of the evolution of the spectral lines, more than a precise measurement. The He I $\lambda 5876$ line is only marginally detected and appears a strong feature (FWHM ~ 20000 km s $^{-1}$, $L_{\text{He I}} \sim 3 \times 10^{40}$ erg s $^{-1}$) only in our first spectrum. Notably, the He II / H α luminosity ratio assumes the following values: 0.49 ± 0.22 , 0.26 ± 0.15 , 0.20 ± 0.11 , and

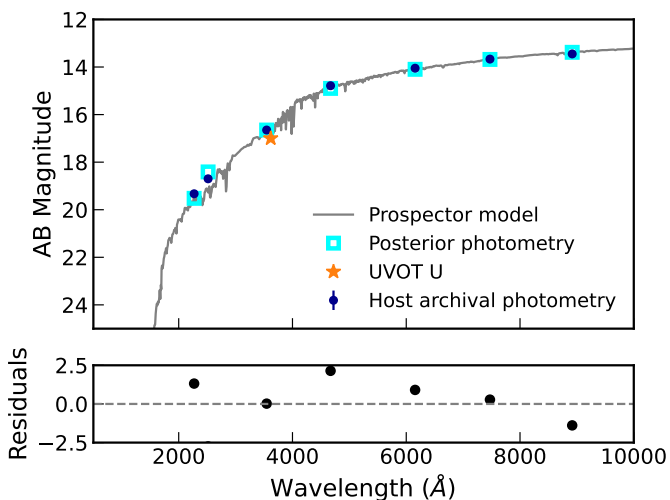


Fig. C.1. Top: Host-galaxy photometry fitting with *prospector* and corresponding archival data. Bottom: Residuals calculated in magnitudes.

¹ <https://github.com/sncosmo/sncosmo>

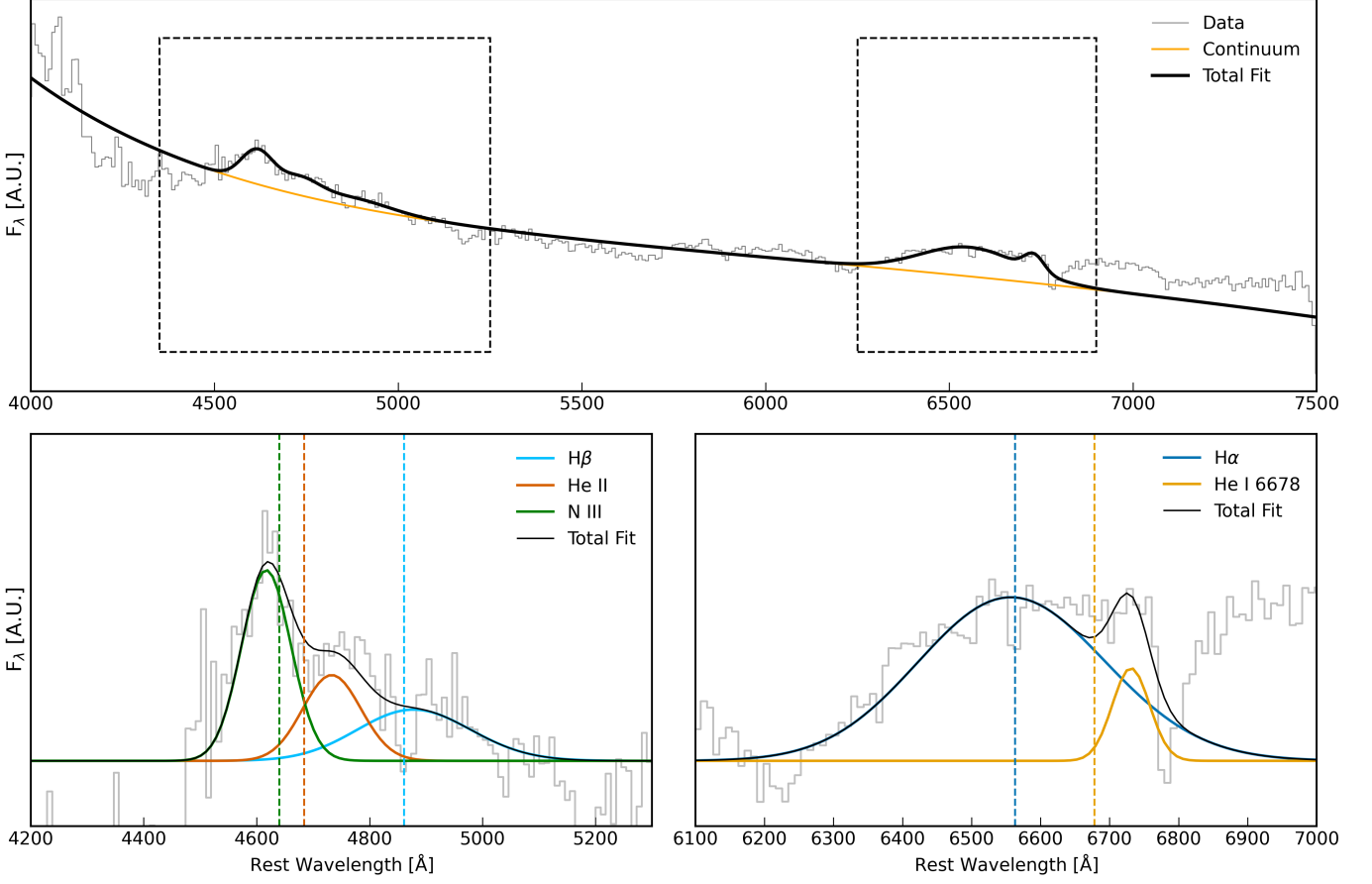


Fig. D.1. Visualization of multi-Gaussian fit as executed by PyQSOFit on our third spectrum. We zoomed in around the N III + He II + Hβ complex (bottom left) and the Hα + He I 6678 broad region (bottom right).

0.54 ± 0.03 . As commented in the main text, this evolution inversely mirrors the evolution of the photometric radius.

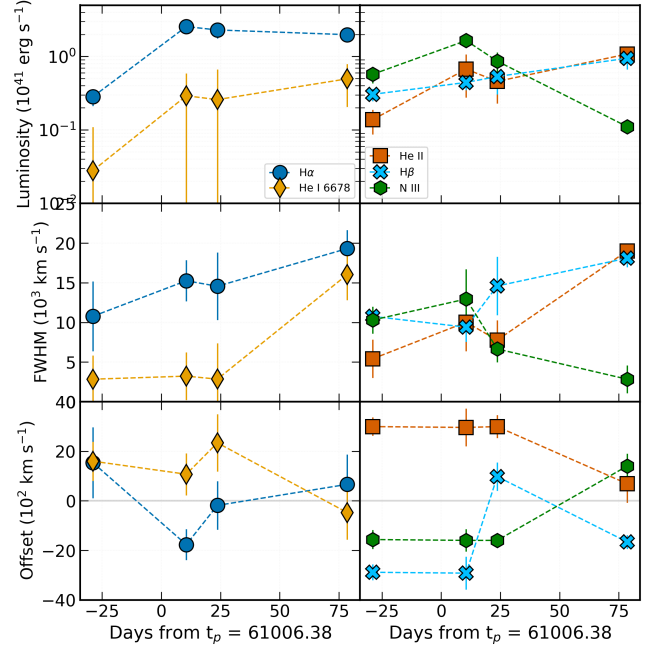


Fig. D.2. Luminosity, FWHM, and velocity offset of the Hα + He I 6678 group and the N III + He II + Hβ complex. Note that a negative offset corresponds to a blueshift of the line.

Appendix E: Extra tables and figures

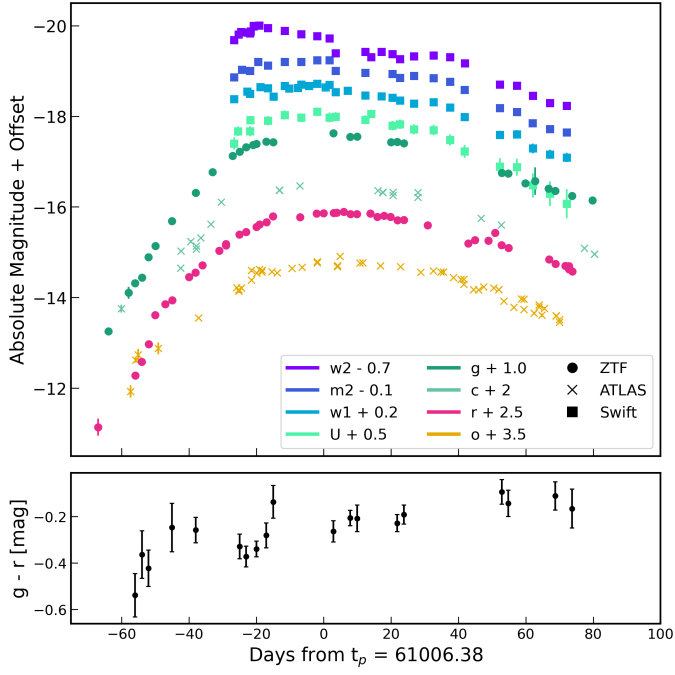


Fig. E.1. *Top:* Light curves of TDE 2025aarm during the first ~ 150 days after discovery. Filters are offset for visual clarity. *Bottom:* $g - r$ color evolution.

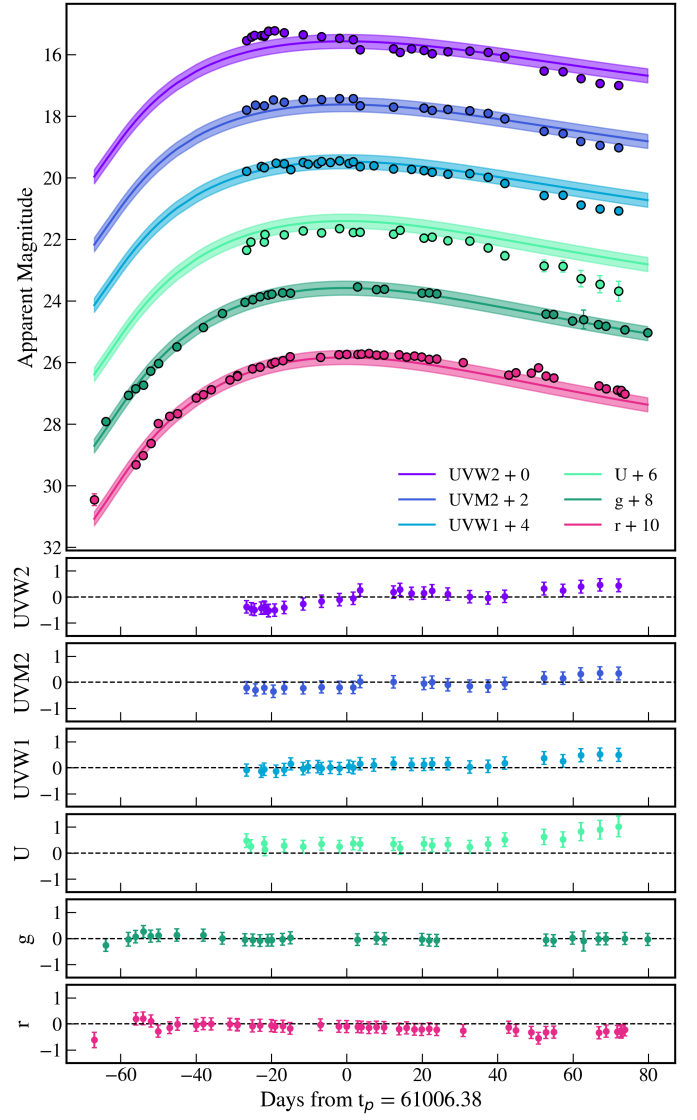


Fig. E.2. Fallback modeling of the optical light curves of TDE 2025aarm using MOSFiT. *Top panel:* Points identify our data, while the lines are the fit. Light curves are offset for visual clarity. *Bottom panels:* Residuals of the fit in mag units.

Table E.1. Input and output parameters for the `tde` model from `MOSFiT`.

Parameter	Prior range	Prior type	Posterior
$M_{\star} [M_{\odot}]$	[0.1 – 10]	Uniform	$0.155^{+0.0297}_{-0.0309}$
$M_{\text{BH}} [10^6 M_{\odot}]$	$[5 \times 10^{-1} - 1 \times 10^2]$	Log-uniform	$18.74^{+3.25}_{-2.22}$
$t_{\text{dis}} [\text{day}]$	[-30, 0]	Uniform	$-18.92^{+2.01}_{-2.6}$
$T_{\text{viscous}} [\text{day}]$	$[10^{-2} - 10^2]$	Log-uniform	$17.38^{+6.1}_{-8.37}$
b	[0.5 – 1.5]	Uniform	$0.54^{+0.072}_{-0.029}$
ϵ	[0.03 – 0.3]	Log-uniform	$0.03575^{+0.00773}_{-0.00441}$
l	[1 – 2]	Uniform	$1.847^{+0.097}_{-0.172}$
R_{ph0}	$[10^{-4} - 10^4]$	Log-uniform	$156.6^{+110}_{-72.2}$
σ	[0.01, 10]	Log-uniform	$0.2241^{+0.0178}_{-0.097}$

Notes. The fit was executed giving as input redshift, Galactic extinction, line-of-sight hydrogen column density, luminosity distance, number of walkers (100) and number of iterations (50000). We used the same nomenclature as in (Mockler et al. 2019), where: $M_{\star}$ is the stellar mass; M_{BH} is the BH mass; t_{dis} is the time since first detection; T_{viscous} is the viscous delay time; b is the scaled impact parameter; ϵ is the efficiency; l is the photosphere power-law exponent; R_{ph0} is the photosphere power-law constant; σ is the variance.

Table E.2. Log of spectral observations.

Date MJD	Phase (day)	λ_{min} (Å)	λ_{max} (Å)	Exposure time (s)	$\Delta\lambda$ [Å]	Instrument	Telescope
60977.43	-28.78	3200	10000	2700	2	FLOYD	LCO
61016.93	10.72	4000	8000	1600	10	SPRAT	LT
61030.04	23.82	4000	8000	1600	10	SPRAT	LT
61084.90	78.68	4000	8000	1600	10	SPRAT	LT

Notes. Phases are expressed with respect to the g -band maximum t_p in the observed frame.

Table E.3. Photometric data of TDE 2025aarm (extract).

Date MJD	Phase day	Mag AB	Err AB	Band	Telescope
60939.42	-66.97	20.46	0.01	r	ZTF
60942.46	-63.92	19.92	0.02	g	ZTF
60946.28	-60.10	18.39	0.00	c	ATLAS
60948.44	-57.94	19.07	0.02	g	ZTF
60949.07	-57.31	18.65	0.01	o	ATLAS
60950.34	-56.05	18.86	0.02	g	ZTF
60950.42	-55.97	19.32	0.01	r	ZTF
60950.55	-55.83	17.96	0.01	o	ATLAS
60951.28	-55.10	17.84	0.01	o	ATLAS
60952.40	-53.98	19.02	0.01	r	ZTF
:	:	:	:	:	:
:	:	:	:	:	:

Notes. Phases are expressed with respect to the g -band maximum t_p in the observed frame. The full table is available at the CDS.