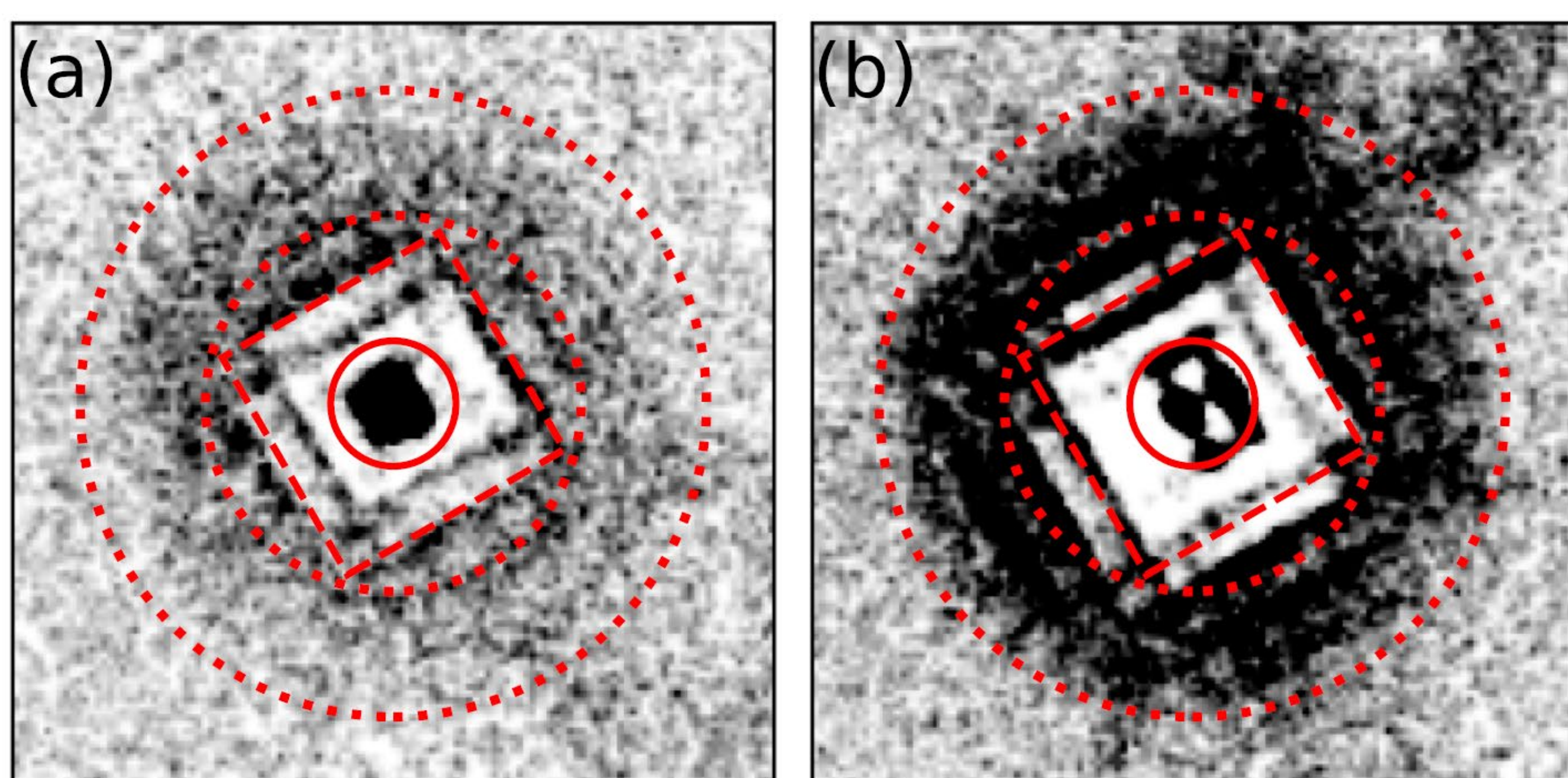


Methods to enhance the Swift/UVOT data and their applications

- **Why?** It has been 20 years since the launch of the Neil Gehrels Swift Observatory, but thanks to the photon-counting design, Swift/UVOT still has a strong scientific competition even in the SVOM era.
- **How?** The archive accumulated in the past 20 years is a huge treasure trove, and carefully selected observations can be used for photometric and spectroscopic calibration.

A Method to Measure Photometries of Moderately Saturated UVOT Sources

Hao Zhou, Zhi-Ping Jin, Stefano Covino, Yi-Zhong Fan, and Da-Ming Wei



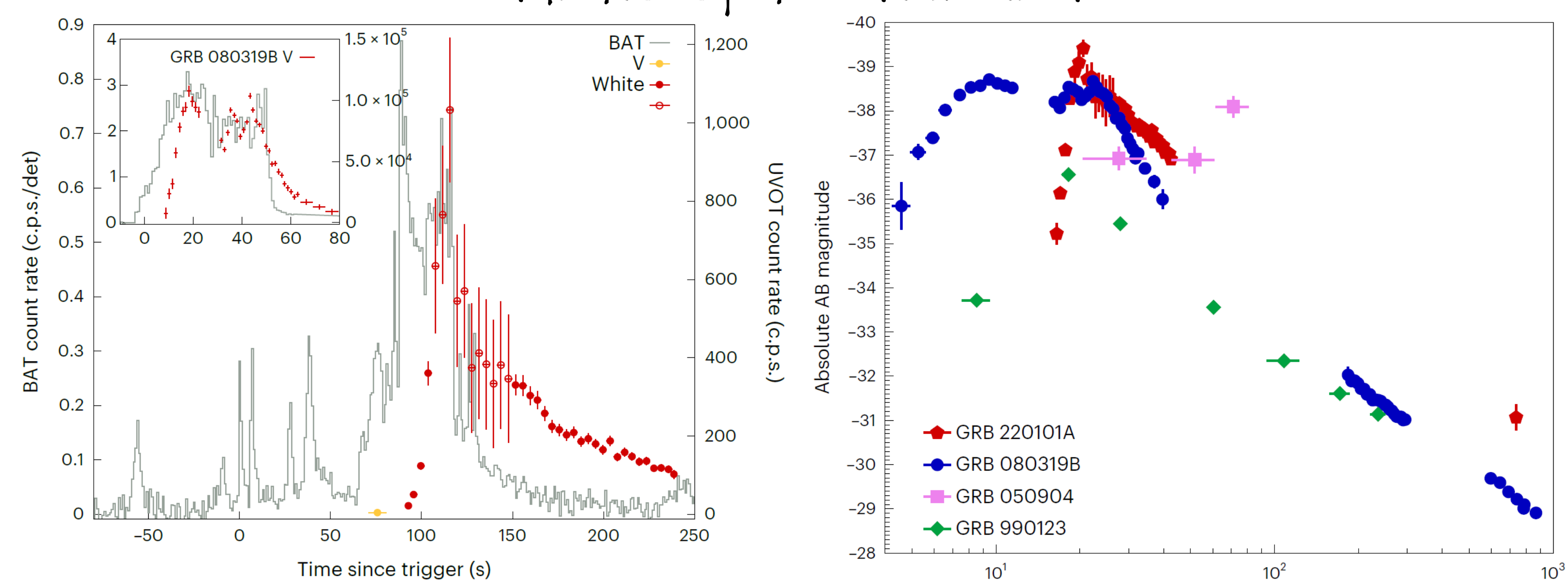
- The annular region (dotted) is proved to be able to measure photometries of moderately saturated sources (figure a). A strongly saturated source is shown in figure b.
- For the moderately saturated source, the uncertainty of our method is smaller than the read-out streak method (Page et al. 2013).
- Our method can extract the light curve with high temporal resolution (a few seconds).

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An optical-ultraviolet flare with absolute AB magnitude of -39.4 detected in GRB 220101A

Zhi-Ping Jin*, Hao Zhou*, Yun Wang, Jin-Jun Geng, Stefano Covino, Xue-Feng Wu, Xiang Li, Yi-Zhong Fan, Da-Ming Wei, and Jian-Yan Wei

* Indicates equal contribution



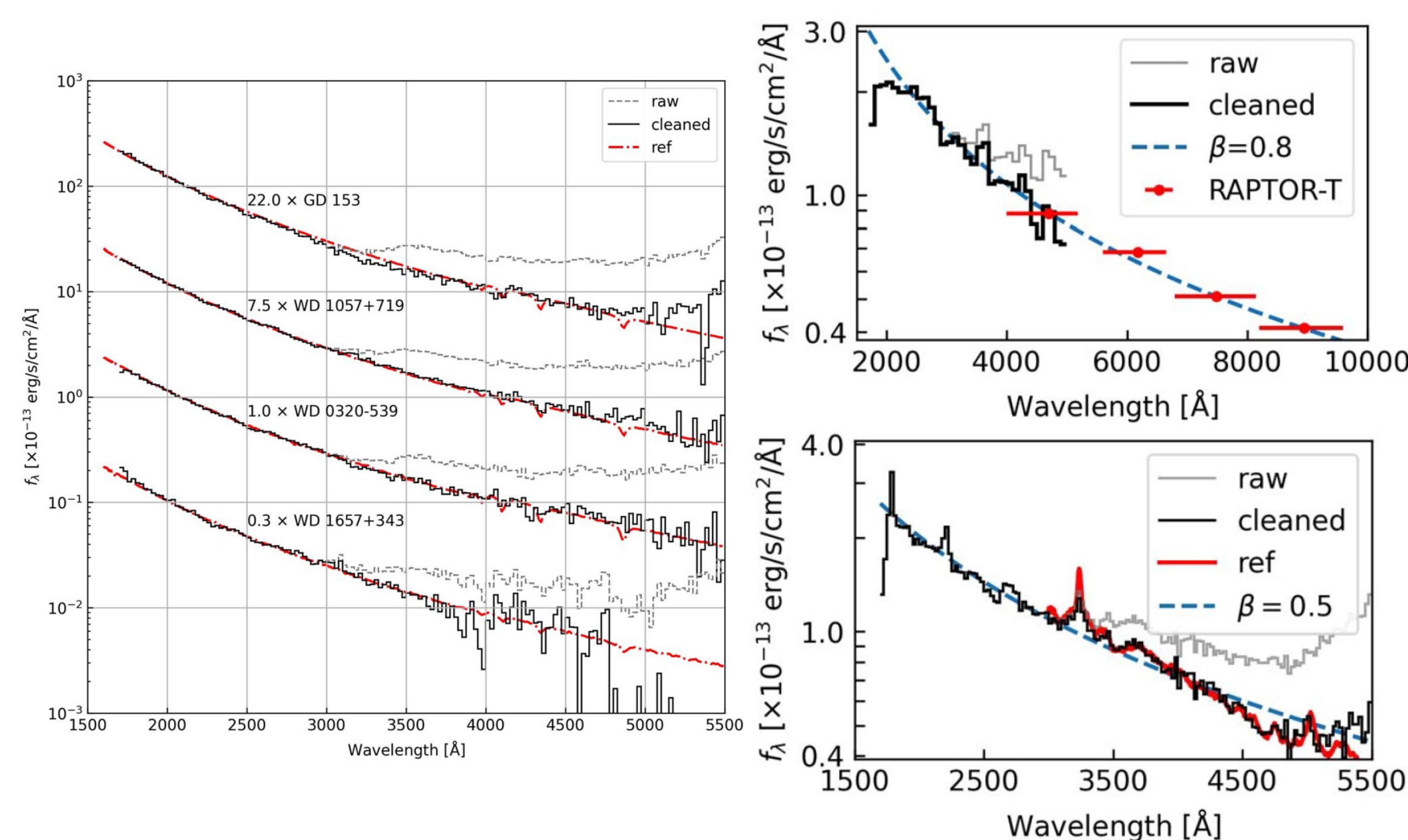
- With the method proposed by us, the UV/optical light curve of GRB 220101A during the prompt phase was restored (red points in the left figure). The UV/optical flare traces the last γ -ray flare.
- After the extinction correction, we found that the UV/optical flare became the brightest one ever found (red points in the right figure), and it was attributed by the refreshed shock.

Nat. Astron. 2023 7:1108, doi: 10.1038/s41550-023-02005-w

Extracting Cleaned Swift/UVOT Ultraviolet Grism Spectra with the *uvotpy* Package

Hao Zhou, Stefano Covino, Zhi-Ping Jin, Yi-Zhong Fan, Da-Ming Wei, and N. Paul Kuin

- The Swift/UVOT UV grism spectra suffer from the high-order contamination.
- With observations of 4 white dwarfs (the left figure), we recalibrated the 2nd-order effective area and managed to remove the 2nd-order contamination.
- We then applied this method to observations of GRB 130427A (upper right figure) and 3C 273 (lower right figure), and the cleaned spectra are pretty good!
- Note: The gray, red and black lines in all figures are for the raw, reference and cleaned spectra.



ApJS 2025 277:27, doi: 10.3847/1538-4365/adb419, <https://github.com/HaoZhou0810/cluvotpy>