AT 2024wpp in UV to NIR:
The unprecedented evolution and properties of the most Luminous Fast Blue Optical Transient

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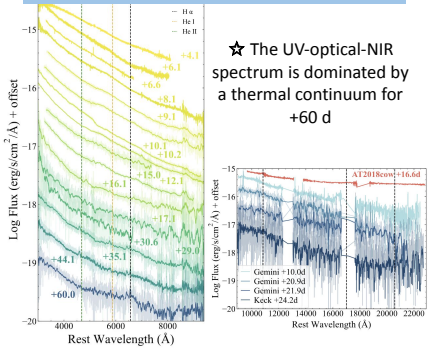
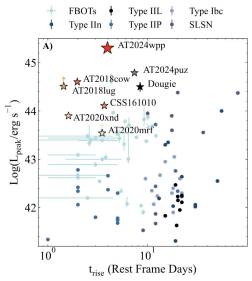
Broadly Featureless Thermal Continuum



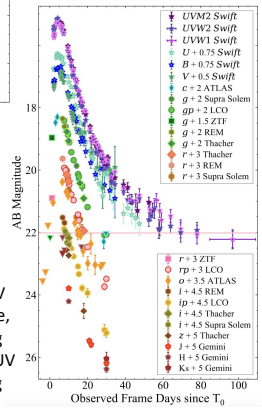
☆ The UV-optical-NIR spectrum is dominated by a thermal continuum for +60 d

Most UV Luminous LFBOT Discovered



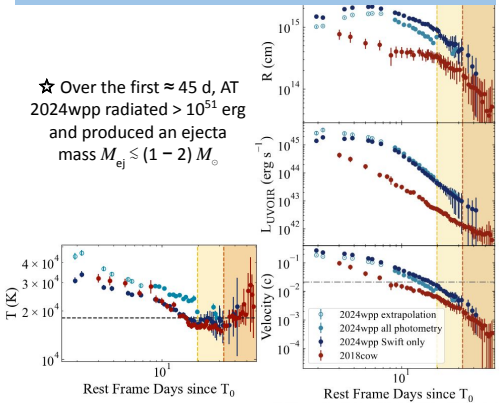
☆ AT 2024wpp is the most UV-luminous FBOT discovered to date both at UV wavelengths and bolometrically

☆ L_{pk} ~ 2 x 10^{45} erg s^{-1}

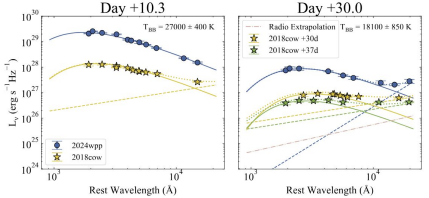


Blackbody Properties

☆ Over the first ≈ 45 d, AT 2024wpp radiated > 10^{51} erg and produced an ejecta mass $M_{ej} \lesssim (1-2)\, M_\odot$

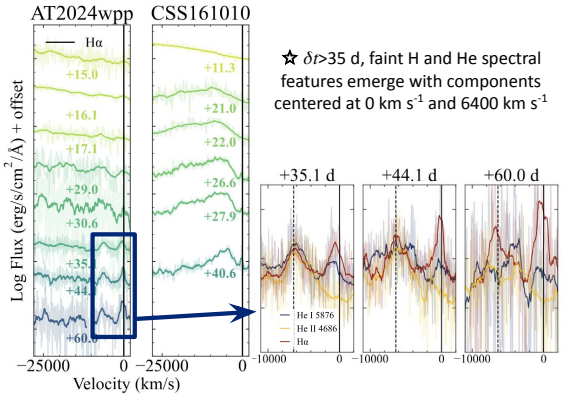


2nd NIR Excess Observed in an LFBOT



☆ NIR excess of emission above the optical blackbody at 30 d with L_{NIR} = 1.9 ± 0.3 × 10^{41} erg s^{-1}

Weak Lines Emerge After ~30d

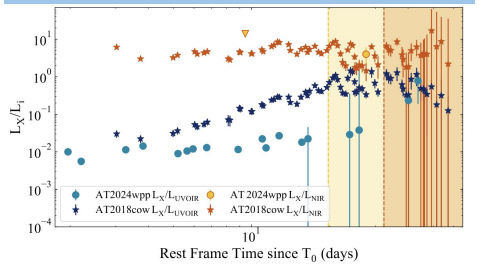


☆ δt>35 d, faint H and He spectral features emerge with components centered at 0 km s^{-1} and 6400 km s^{-1}

☆ Most detailed LFBOT UV light curve, including pre-peak UV sampling

Third LFBOT Well-Sampled in UVOIR

UV-Optical Emission as Reprocessed X-rays



☆ As proposed for AT 2018cow, we posit that at peak, UV-optical emission is dominated by partial reprocessing of the inner X-ray source

Models & Conclusions

☆ As AT 2024wpp radiated an extreme ~ 10^{51} erg, we require a power source beyond the radioactive ^{56}Ni decay of traditional SNe. Likely, one with a central compact object undergoing super-Eddington accretion.

CSM Interaction (e.g., Khatami & Kasen 2024): Would require very long lived, continuous interaction to maintain >18,000 K for ~55 rest frame days. Also struggles to reproduce the X-ray non-thermal spectrum and rapid variability (see Nayana+2025 *in prep*).

TDE of star by BH companion: Super-Eddington accretion about a stellar mass black hole is able to provide the energy radiated by AT 2024wpp, produce the multiple outflow components, and can form shocks between outflows launched by the accretion disk and/or between disk outflows and pre-existing CSM which can thermalize some of the energy released by the central engine. Models in this category such as Tsuna & Lu 2025 and Metzger 2022 predict broadly consistent phenomena to that observed in AT 2018cow (and thus AT 2024wpp).

Ultimately, LFBOT power sources are unconstrained and a larger sample of LFBOTs needs to be observed to shed more light on the physics of these enigmatic objects.