Analyzing the Ambiguous Nuclear Transient AT2020adpi

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Introduction

We present the light curve and spectral properties of the Nuclear Transient AT2020adpi (z=0.26). Owing to the presence of strong MgII lines in spectrum and a power-law spectral energy distribution, we conclude that AT2020adpi is an Ambiguous Nuclear Transient and not a TDE.

Ambiguous Nuclear Transients (ANTs) are transient events occurring near galactic nuclei that do not fit into known categories like Tidal Disruption Events (TDEs), Active Galactic Nuclei (AGN) variability, or Supernovae (SN). They are typically marked by long-duration, bright optical flares with smooth rises and power-law decay, making their classification uncertain and their origins still a mystery. This poster details the analysis of the ANT AT2020adpi (ZTF20acvfraq) which is located at z=0.26.

Light Curve

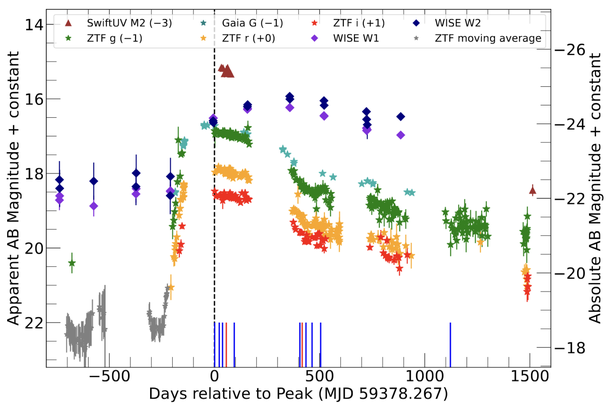


Figure 1 shows the light curves of AT2020adpi relative to r-band maximum light in observer frame. The data ranges from IR, Optical and UV wavelengths.

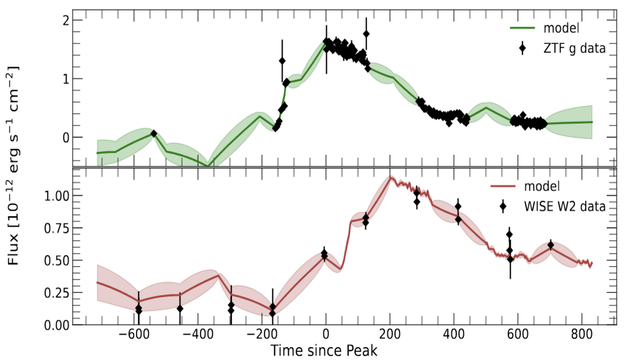


Figure 2 provide a comparison of the lag in the ZTF optical and WISE IR light curve, with best the best fit lag values of 210 days in rest frame, using JAVELIN.

Results

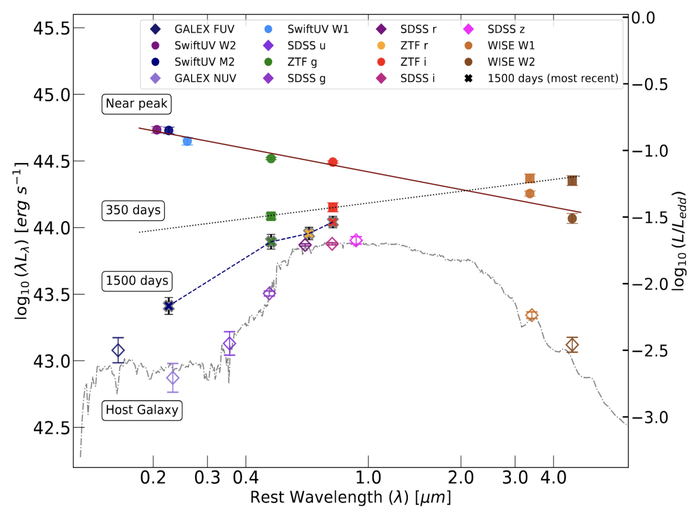
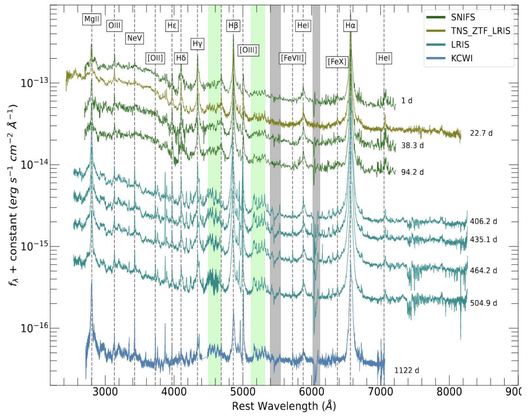


Figure 3 shows the Spectral energy distribution (SED) of AT2020adpi near peak, at 350, and 1500 days post-peak. Open markers show the host galaxy SED (FAST model). Power-law fits yield α = 0.44 ± 0.04 near peak and α = −0.29 ± 0.05 at 350 days. Peak luminosity reaches ~15% of the Eddington limit (right axis).

Key Results

- **MIR echo delayed by ~210 days → hot dust at ~0.2 pc**
- **Peak g-band luminosity (3.6 ± 0.6) × 10^{44} erg s^{-1}**
- **AGN-like power-law SED**
- **Spectral features (broad H, He I, Mg II) inconsistent with a TDE → classified as an ambiguous nuclear transient**

Figure 4 shows the Optical spectral evolution of AT2020adpi from ~1 to 1122 days post-peak. Spectra were obtained with SNIFS, LRIS, and KCWI. Key emission lines are labeled; green shading marks the Fe II complex, gray shading indicates telluric bands. Spectra are vertically offset for clarity..



References

[1] P. Wiseman et al 2025, MNRAS 537, 2024–2045 [2] Jason T. Hinkle 2024 MNRAS 531, 2603–2614; [3] Holoein et al 2022 ApJ 933:196 (28pp)

Have questions? Want to learn more? Send me an e-mail: pandey.176@osu.edu