The Unusual Host Galaxies of Tidal Disruption Events

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Tidal Disruption Events:

- UV/optical bright
- Broad H/He emission lines
- Characteristic $t^{-5/3}$ time evolution

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Tidal Disruption Events:

- Sample of 8 UV/optical bright TDEs from ASASSN, PTF, Pan-Starrs, SDSS

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Tidal Disruption Events: Host Galaxies

- Star-forming galaxies
- Early-type galaxies

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TDEs Occur at Higher Rates in Post-Starburst Galaxies

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X-ray TDEs from Auchettl+17a may have lower post-starburst rate enhancement ~20-40x

Decker French (U. Arizona) (Graur, KDF, et al. 2017; Law-Smith+17)
Why is the TDE Rate High in Post-Starburst Galaxies?

Merger -> starburst:
- SMBH binary? (e.g., Chen+09,11; Li+15)
- Central concentration of stars/ Central eccentric disk? (Stone+16, Madigan+17, Law-Smith+17, Graur+17)
- Related to circumnuclear gas? (Kennedy+16)

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TDE Host Ionization Sources Inconsistent with Star Formation

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Could circumnuclear gas fuel LINER and boost TDE rate?

Both TDE/LINER signatures caused by same source?

Could TDE debris fuel a LINER?
Is the LINER even an AGN?

Post-AGB stars or merger shocks can mimic low luminosity AGN, and possible during post-starburst phase

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Is the LINER even an AGN?

Prieto+16

ASASSN-14li host shows extended high-ionization filaments

But what’s going on in the nucleus?

Need spatially resolved stellar population info to account for strong Balmer absorption
Could Circumnuclear Gas Boost TDE rate?

Kennedy+16: Circumnuclear gas can increase TDE rate by ~10x

But, 2-20x additional factor needed, even for X-ray TDEs

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Are TDEs the Extreme Tail of LINER Variability?

UV light curves of LINERs from Maoz+05

Greatest variation comparable with some TDEs

Monotonic decays (c.f. Auchettl+17b) seen, w/ less variation

But, can’t explain high post-starburst fraction, or unusual spectral features

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Could TDE Debris Fuel a LINER?

Potential difference in TDE host spectra before vs. after TDE

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French+ 2017
Conclusions

Many TDEs found in post-starburst, LINER-like galaxies

- Is the LINER even related to AGN activity?
  Need more spatially resolved host galaxy data
- Could circumnuclear gas fuel LINER and boost TDE rate?
  Yes, but not by enough
- Both TDE/LINER signatures caused by same source?
  Probably not, ->more observations of LINER v.TDE variability
- Could TDE debris fuel a LINER?
  Maybe, need more long term spectral monitoring

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