

# The Unusual Host Galaxies of Tidal Disruption Events

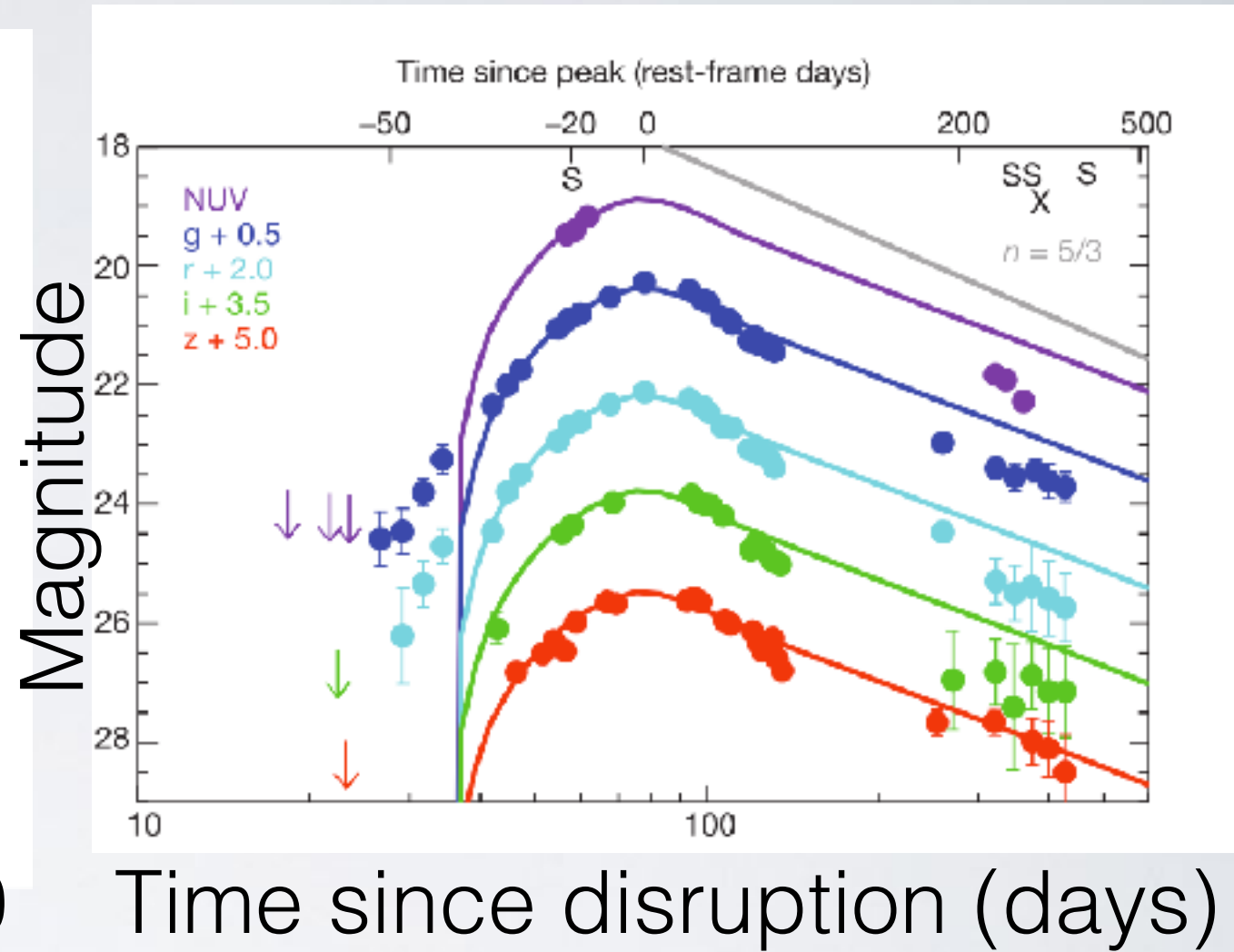
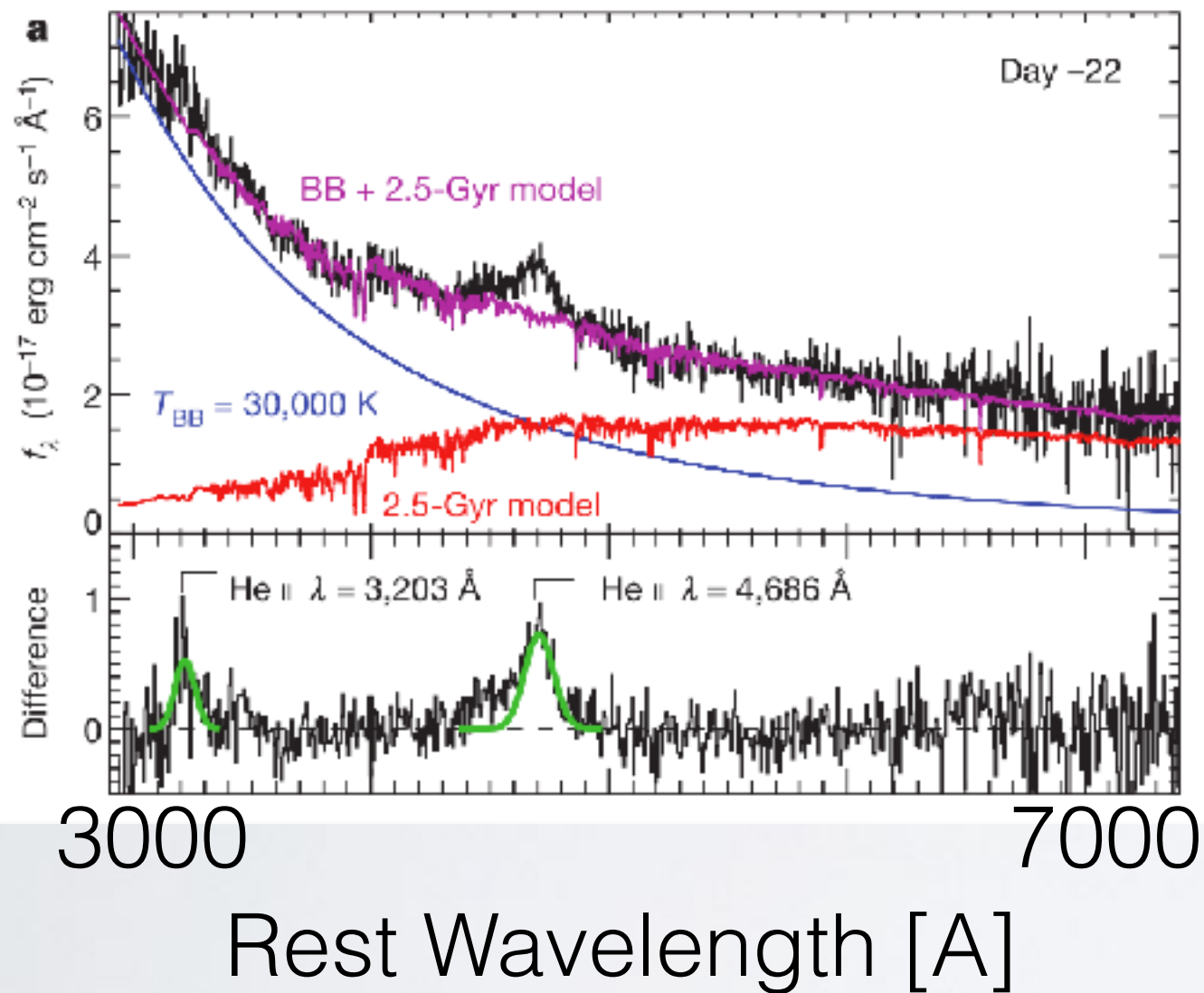


K. Decker French (U. Arizona)

Iair Arcavi (LCOGT), Ann Zabludoff (U. Arizona)

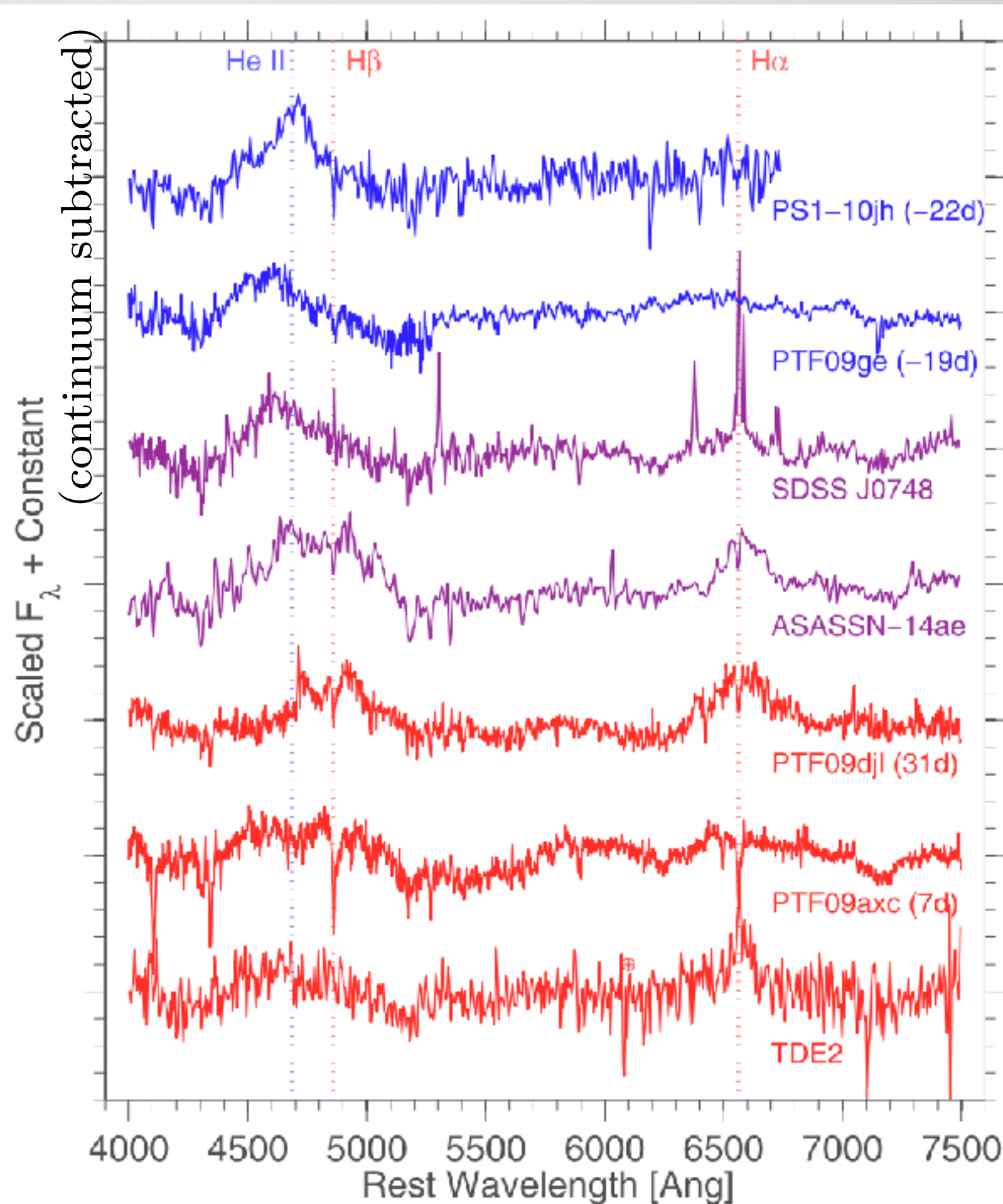
# Tidal Disruption Events:

Gezari+ 2012

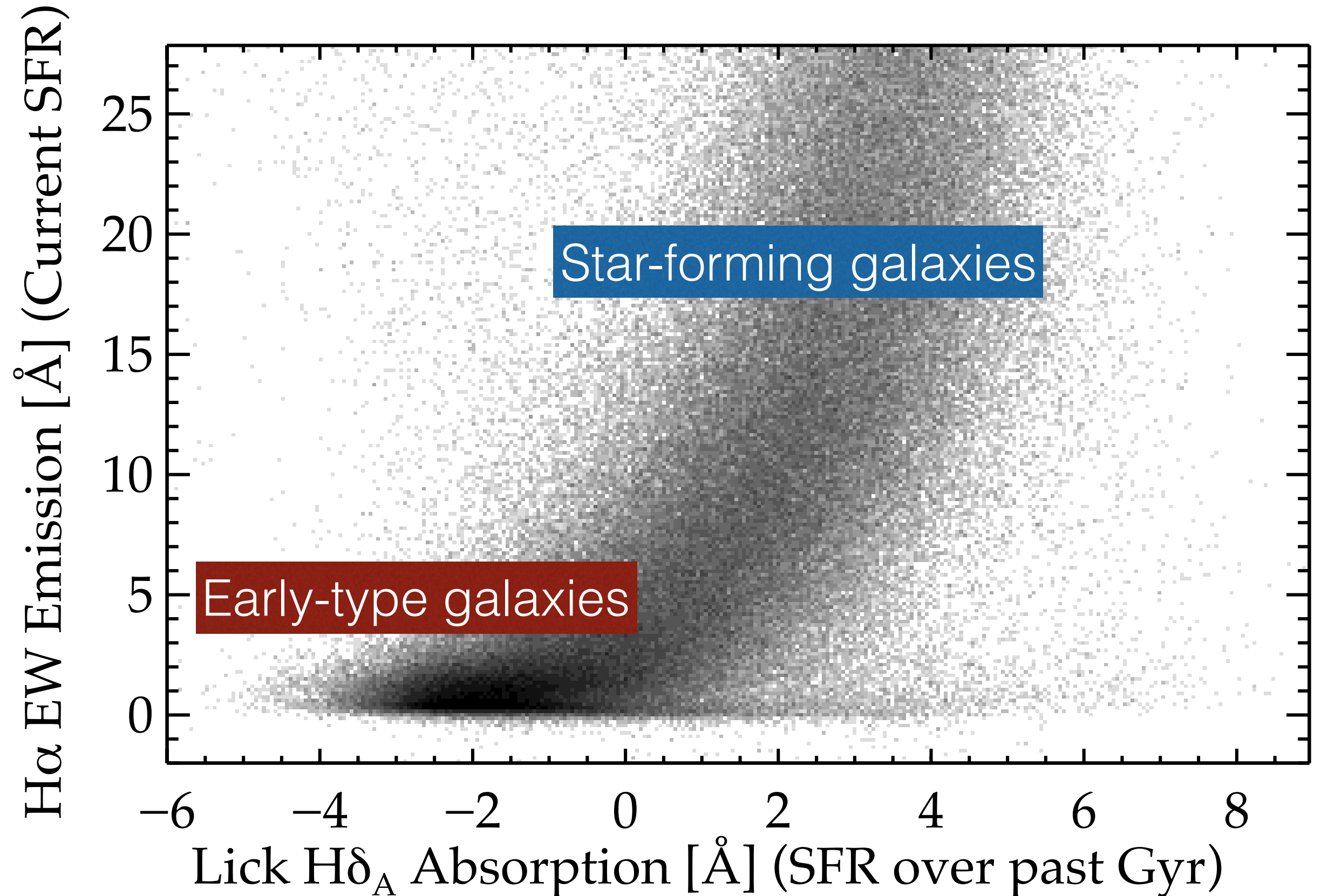


- UV/optical bright
- Broad H/He emission lines
- Characteristic  $t^{-5/3}$  time evolution

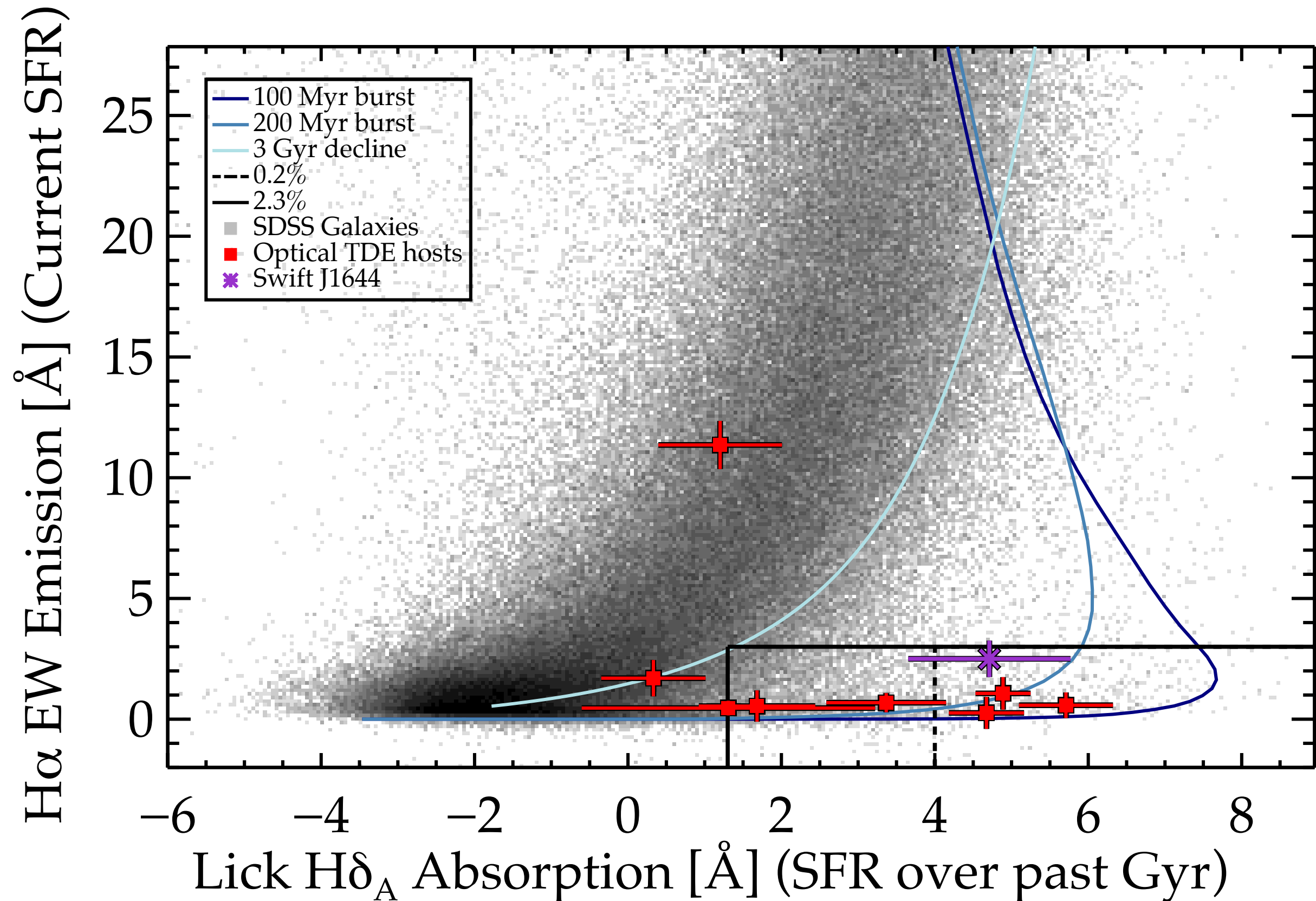
- Sample of 8 UV/optical bright TDEs from ASASSN, PTF, Pan-Starrs, SDSS



# Tidal Disruption Events: Host Galaxies

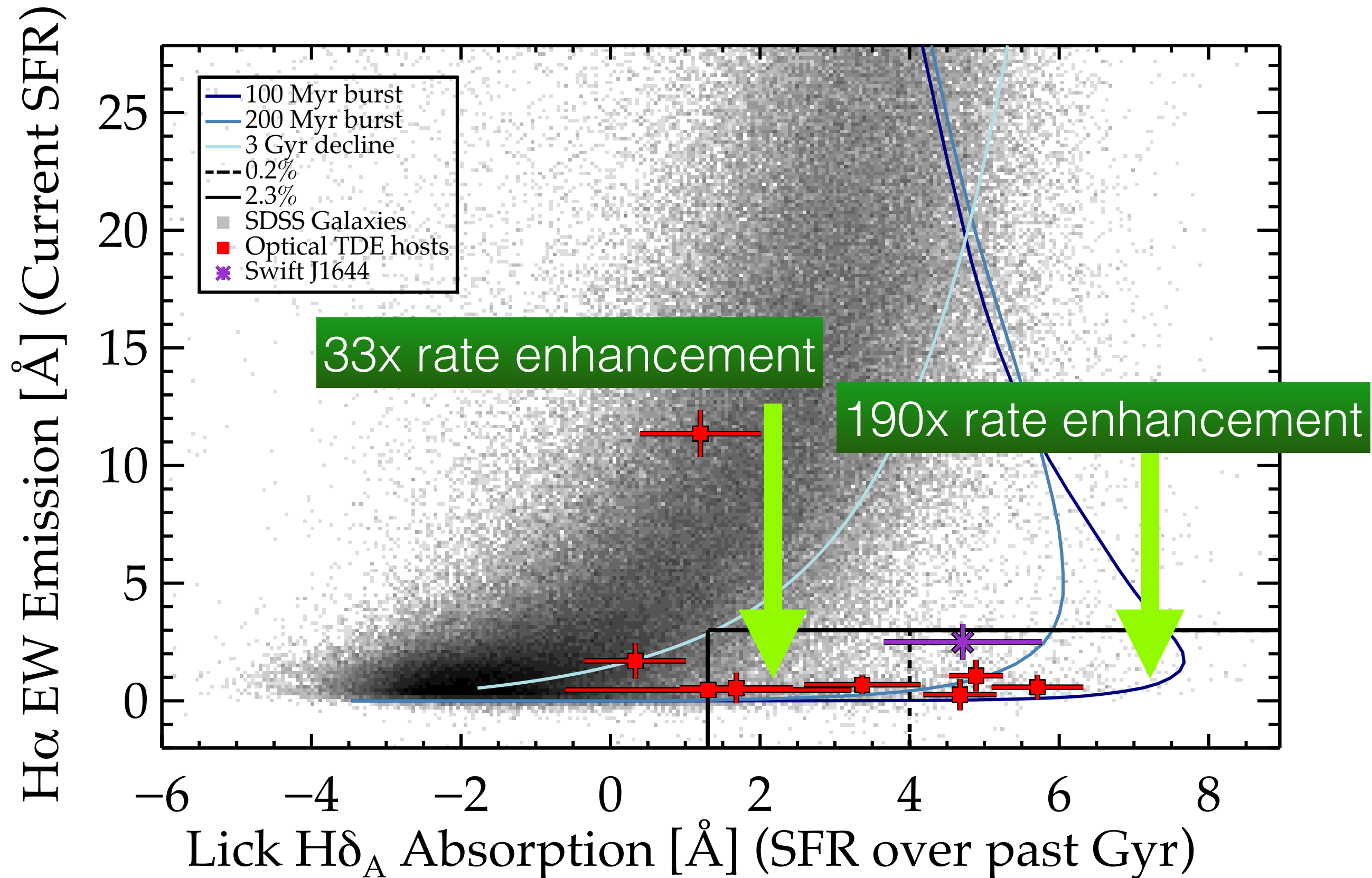


# TDEs Occur at Higher Rates in Post-Starburst Galaxies

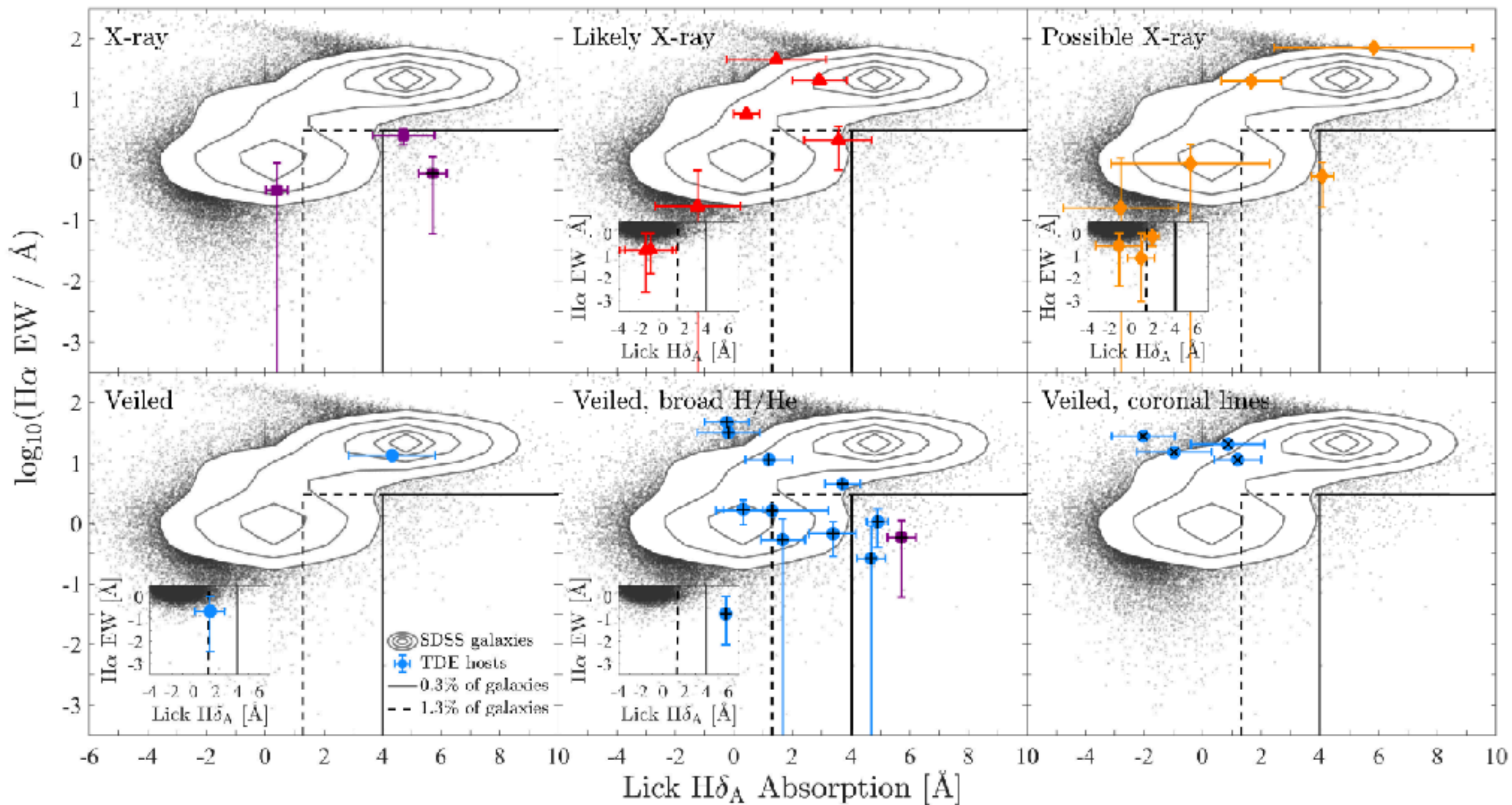




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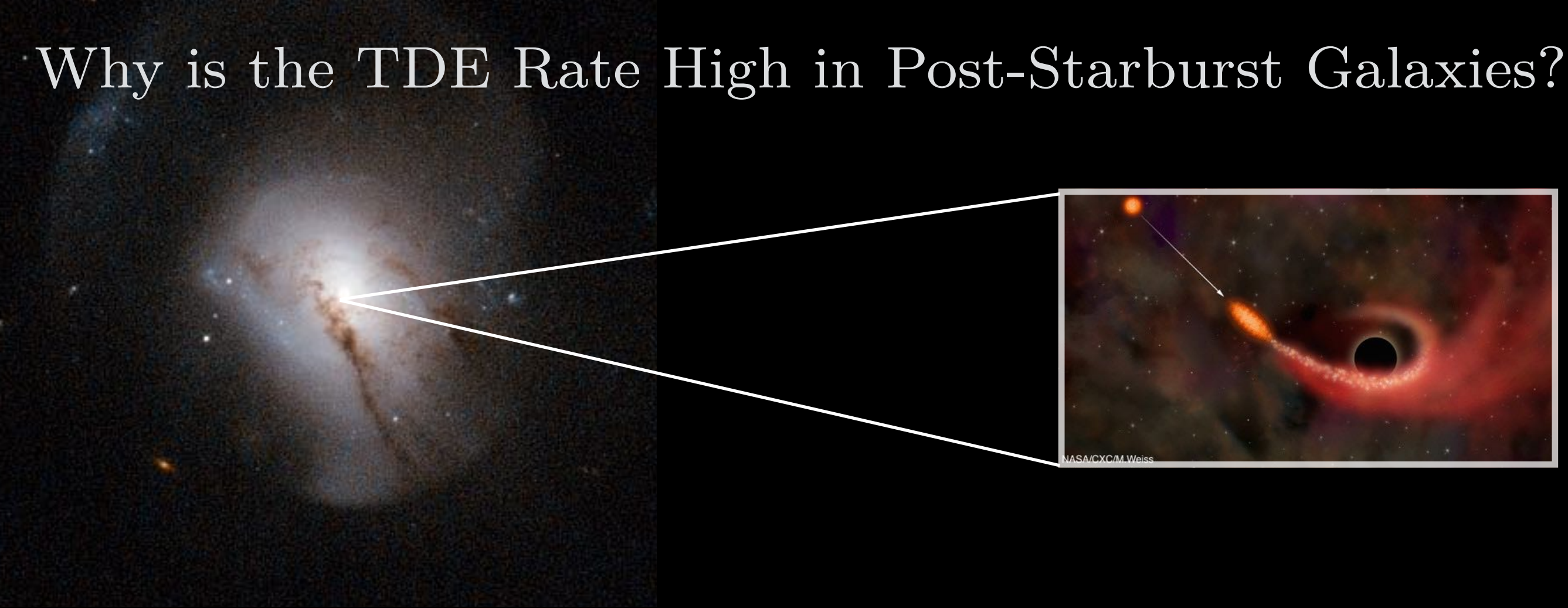
# TDEs Occur at Higher Ratès in Post-Starburst Galaxies



X-ray TDEs from Auchettl+17a may have lower post-starburst rate enhancement  $\sim 20\text{-}40\times$

Decker French (U. Arizona) (Graur, KDF, et al. 2017; Law-Smith+17)

# Why is the TDE Rate High in Post-Starburst Galaxies?

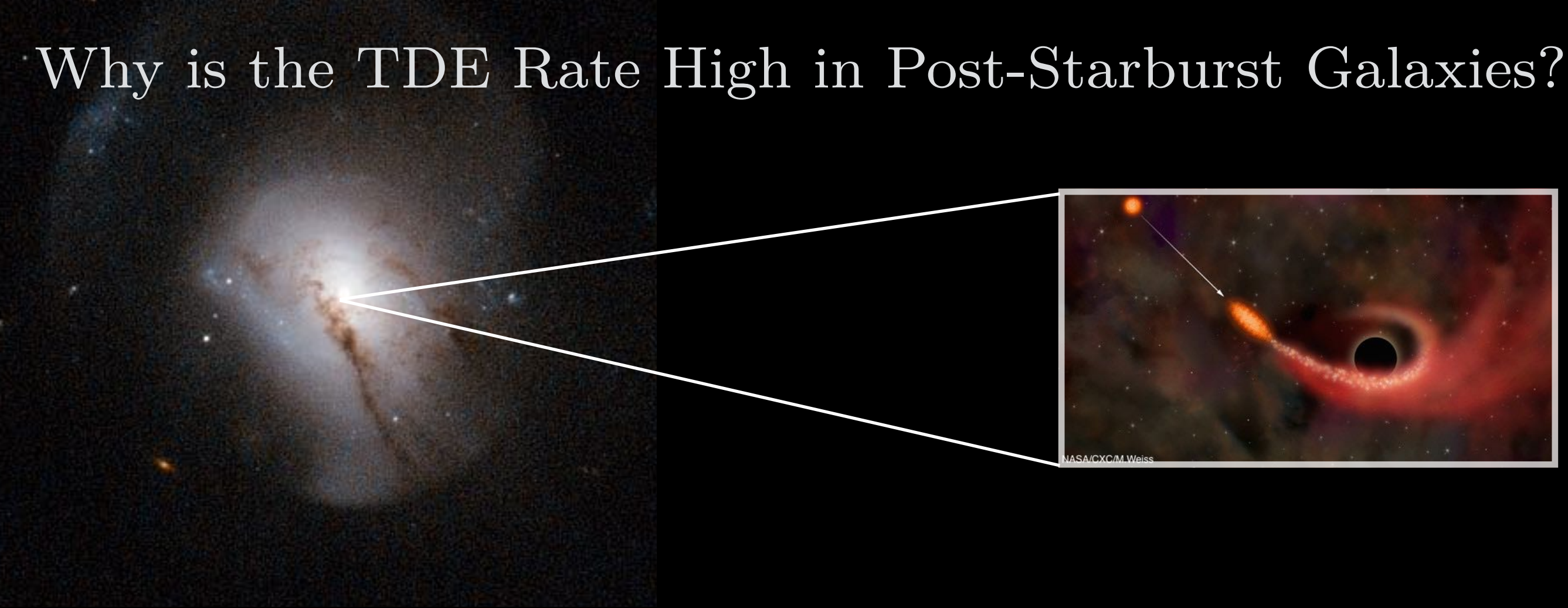


Merger  $\rightarrow$  starburst:

- 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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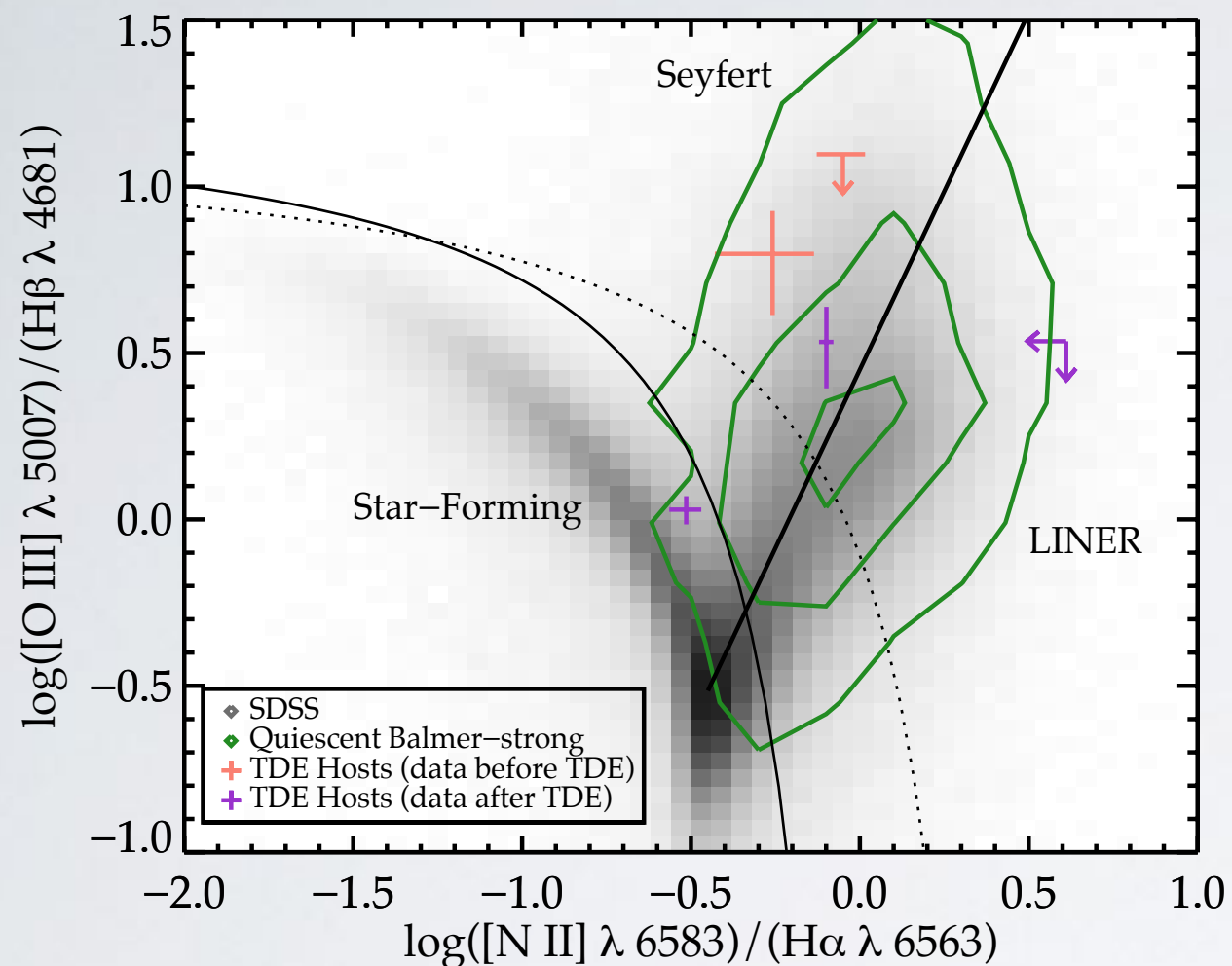


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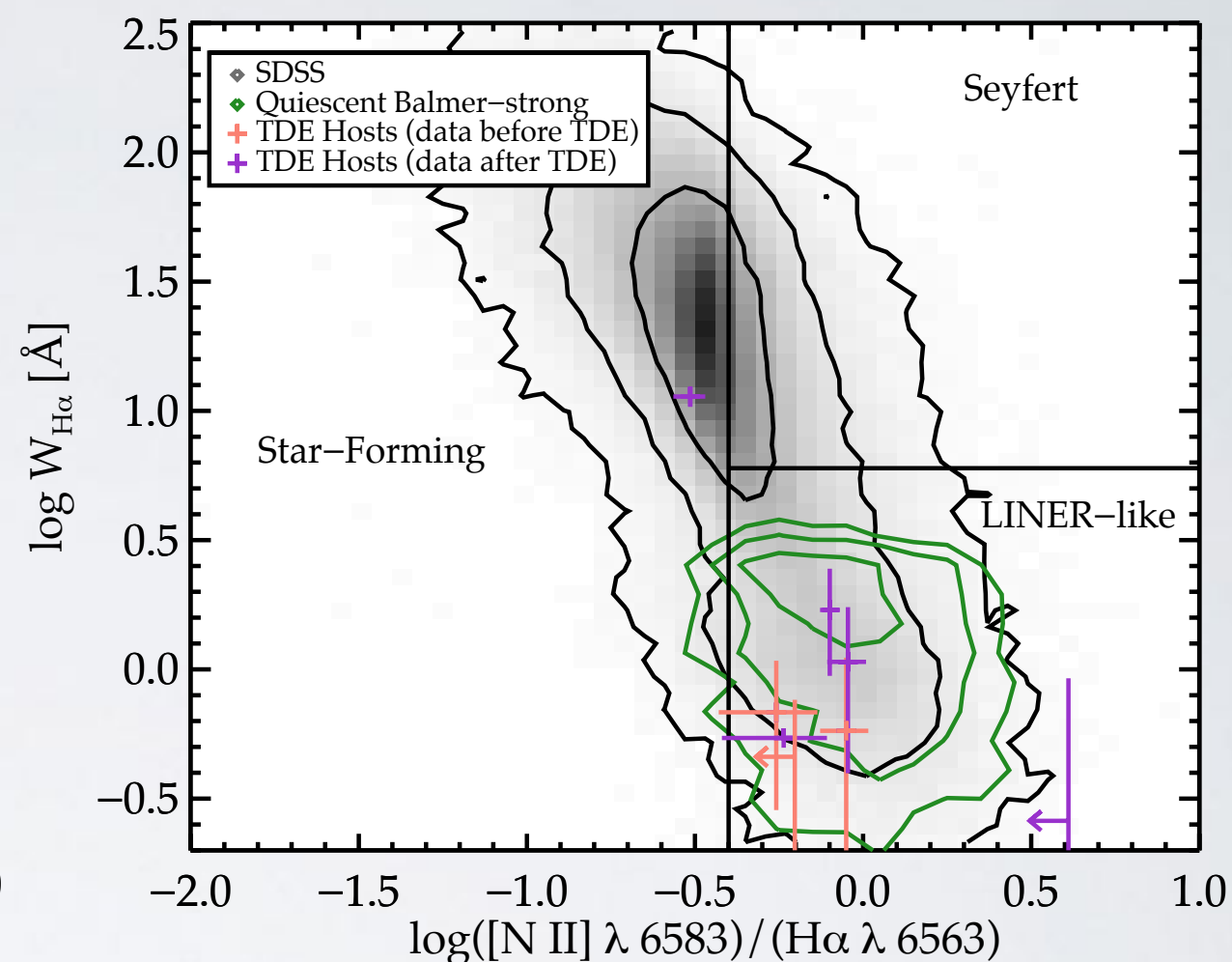
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# TDE Host Ionization Sources Inconsistent with Star Formation

## BPT

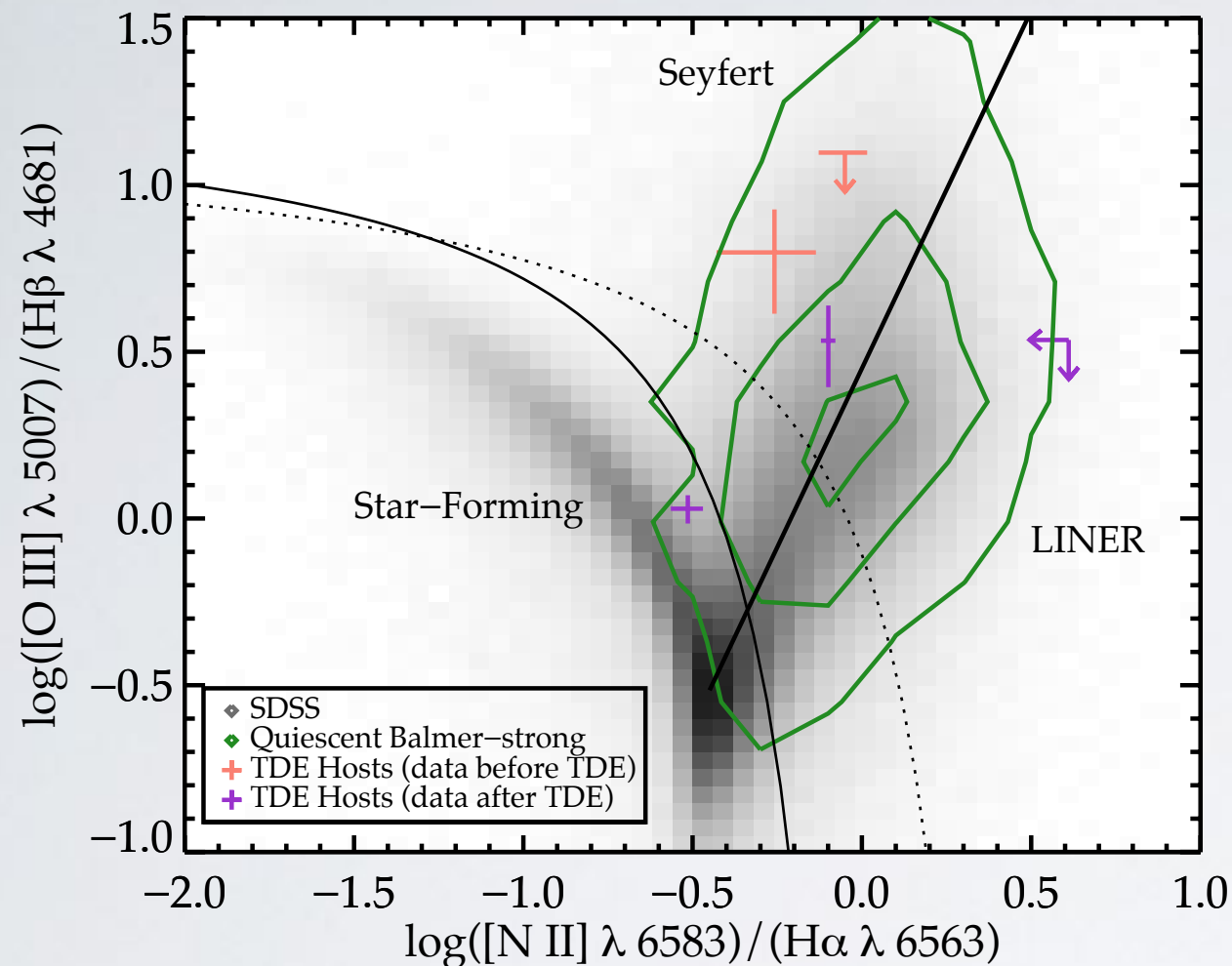


## WHAN

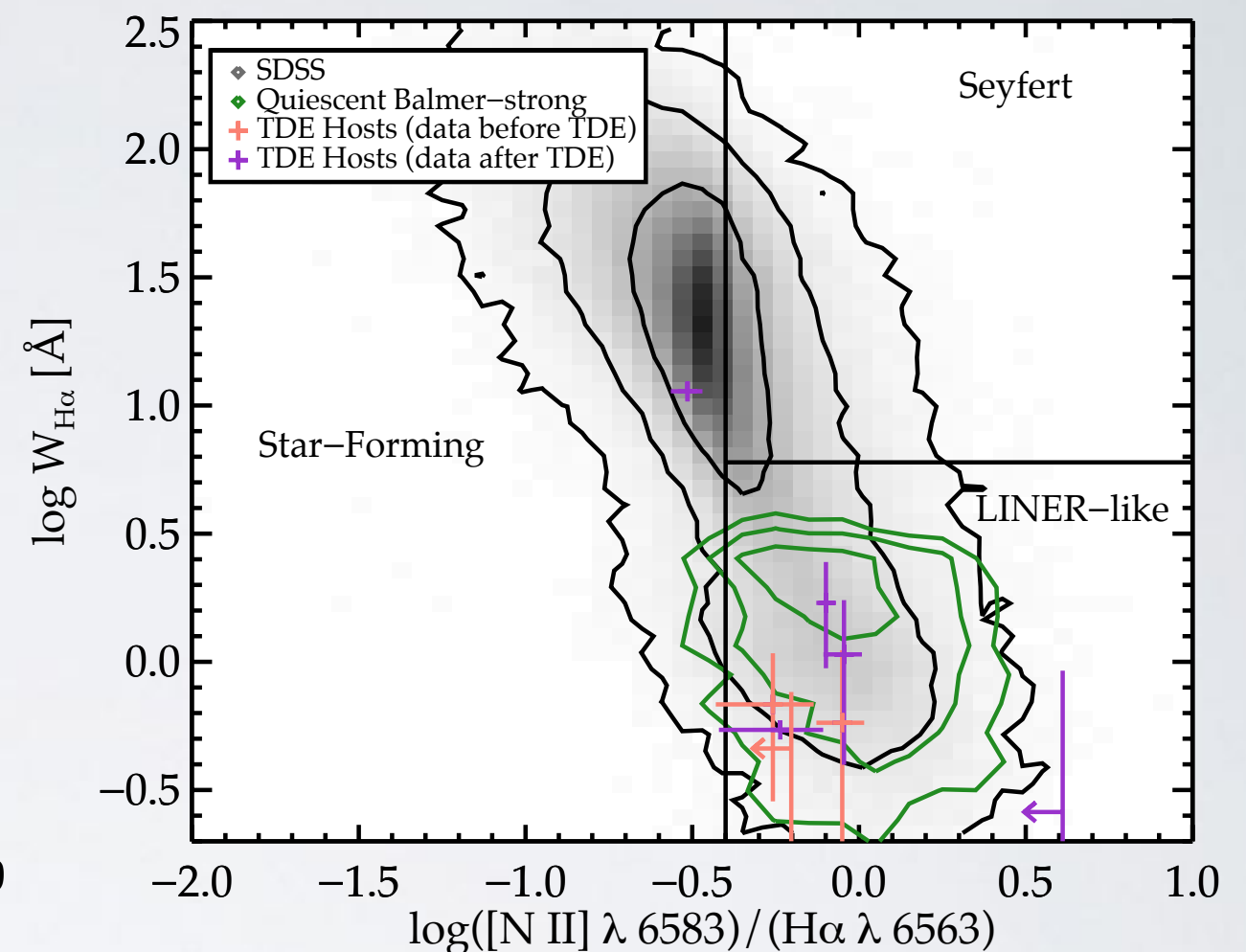


# TDE Host Ionization Sources Inconsistent with Star Formation

## BPT



## WHAN

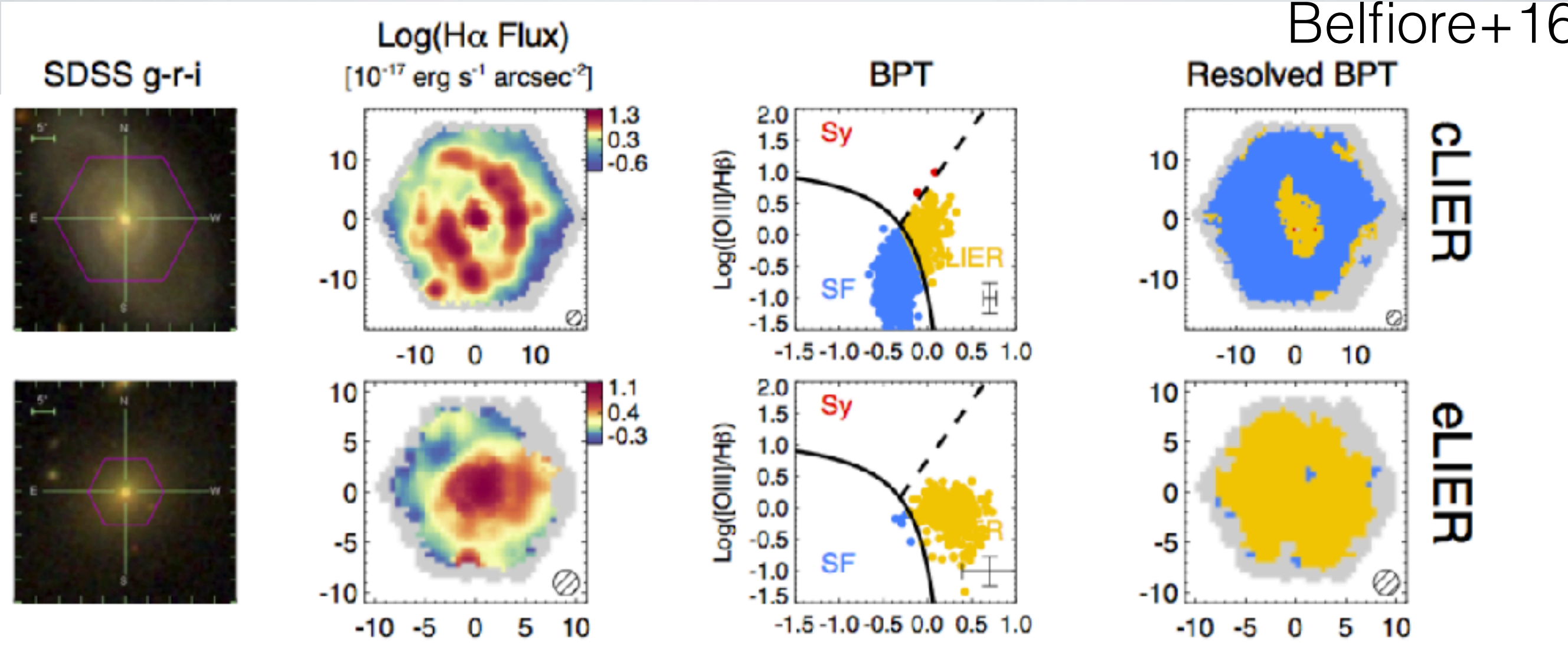


- Could circumnuclear gas fuel LINER and boost TDE rate?
- Both TDE/LINER signatures caused by same source?
- Could TDE debris fuel a LINER?



# Is the LINER even an AGN?

Belfiore+16

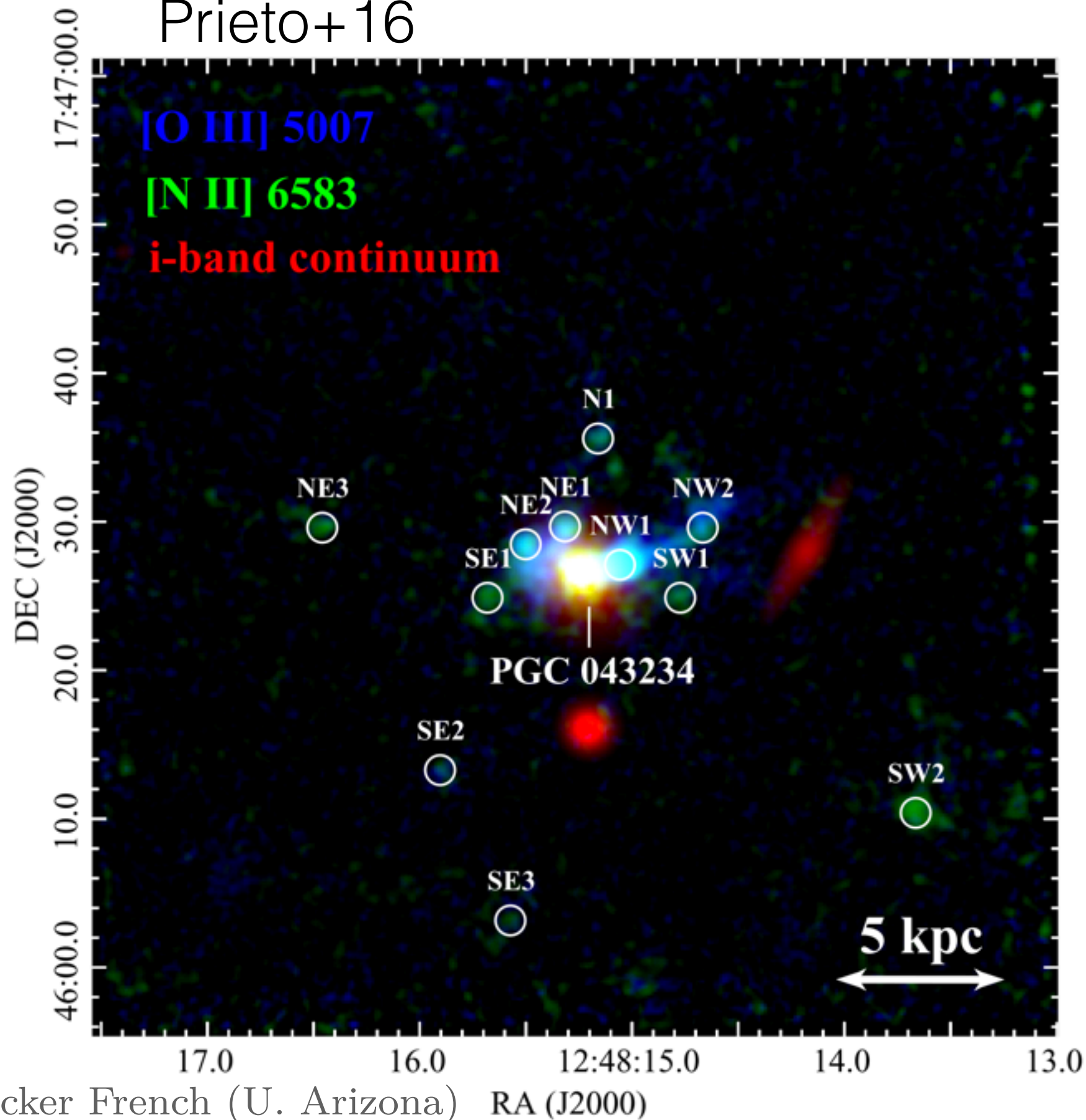


Post-AGB stars or merger shocks can mimic low luminosity AGN, and possible during post-starburst phase



# Is the LINER even an AGN?

Prieto+16



ASASSN-14li host  
shows extended  
high-ionization  
filaments

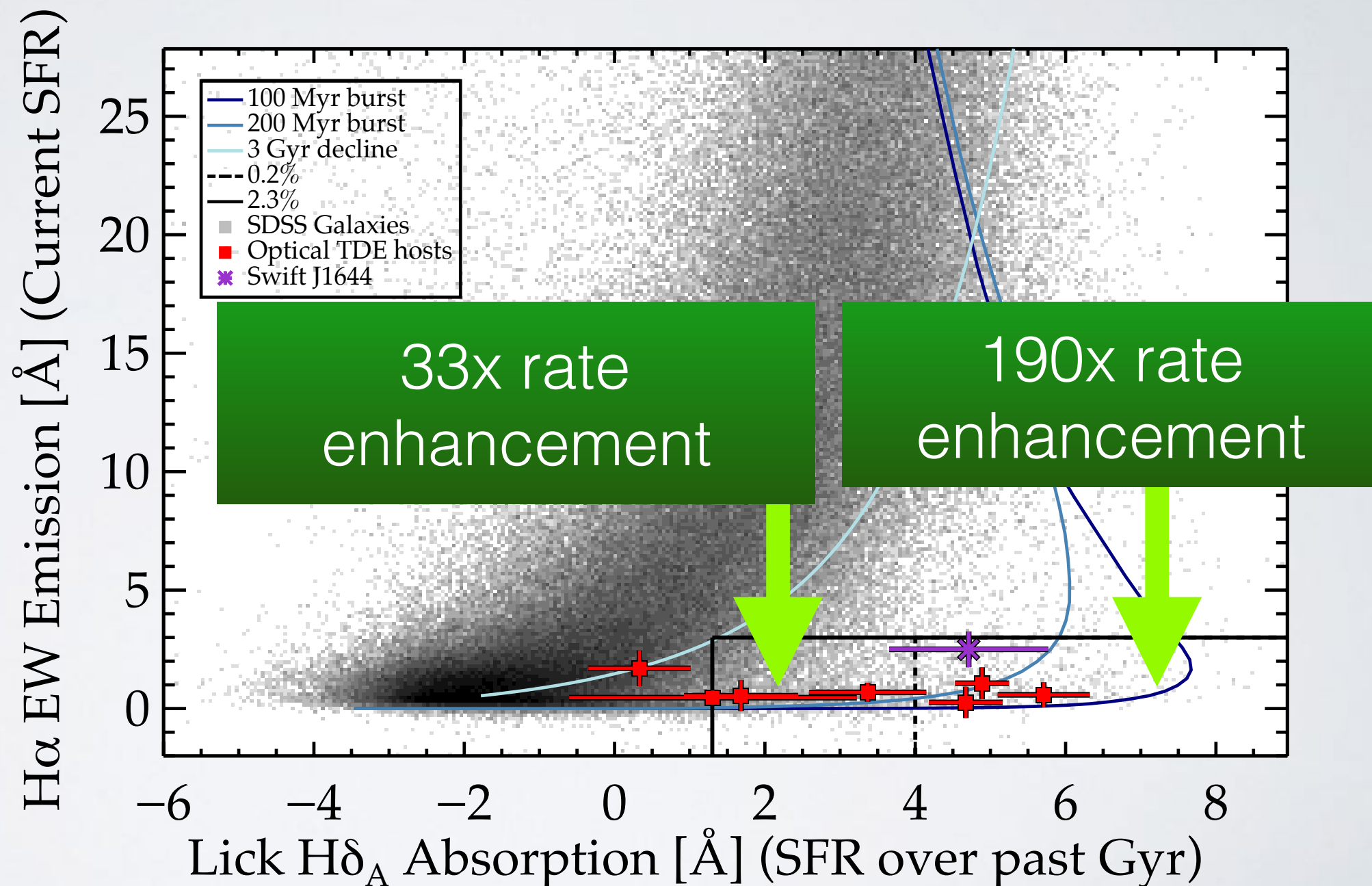
But what's going  
on in the nucleus?

Need spatially  
resolved stellar  
population info to  
account for strong  
Balmer absorption

# Could Circumnuclear Gas Boost TDE rate?

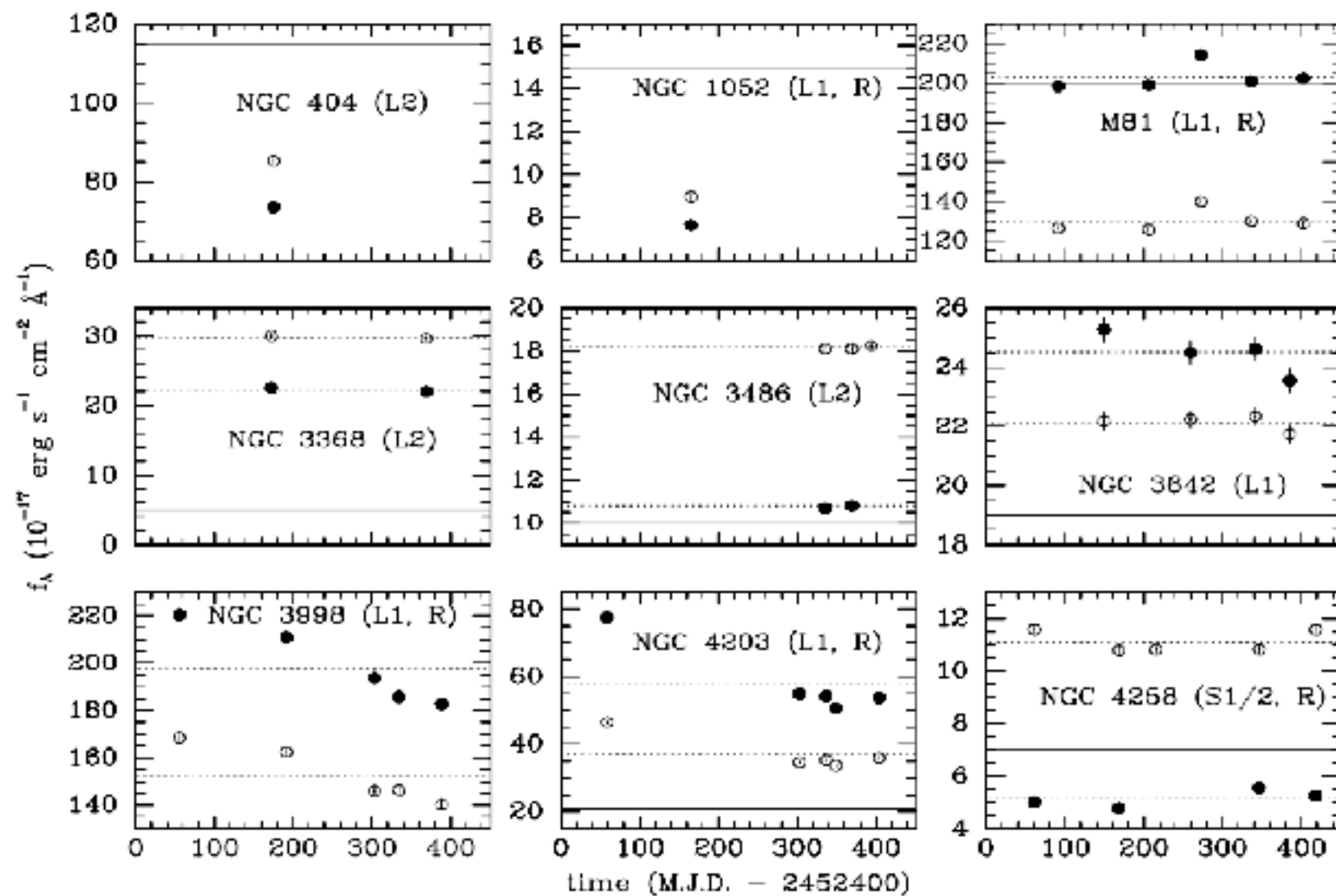
Kennedy+16: Circumnuclear gas can increase TDE rate by  $\sim 10\times$

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



# Are TDEs the Extreme Tail of LINER Variability?

UV light curves of LINERs from Maoz+05



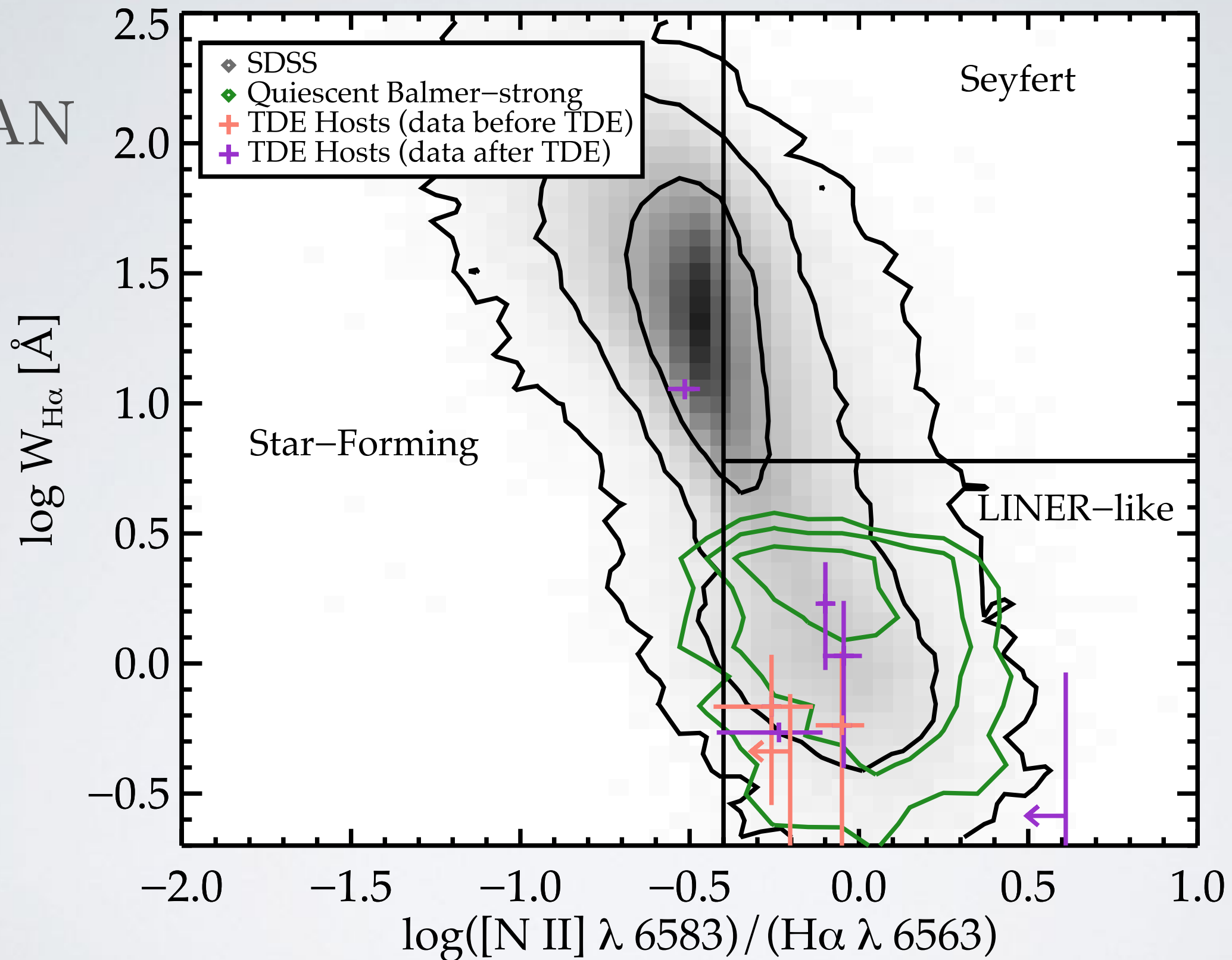
Greatest variation comparable with some TDEs

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

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

# Could TDE Debris Fuel a LINER?

WHAN

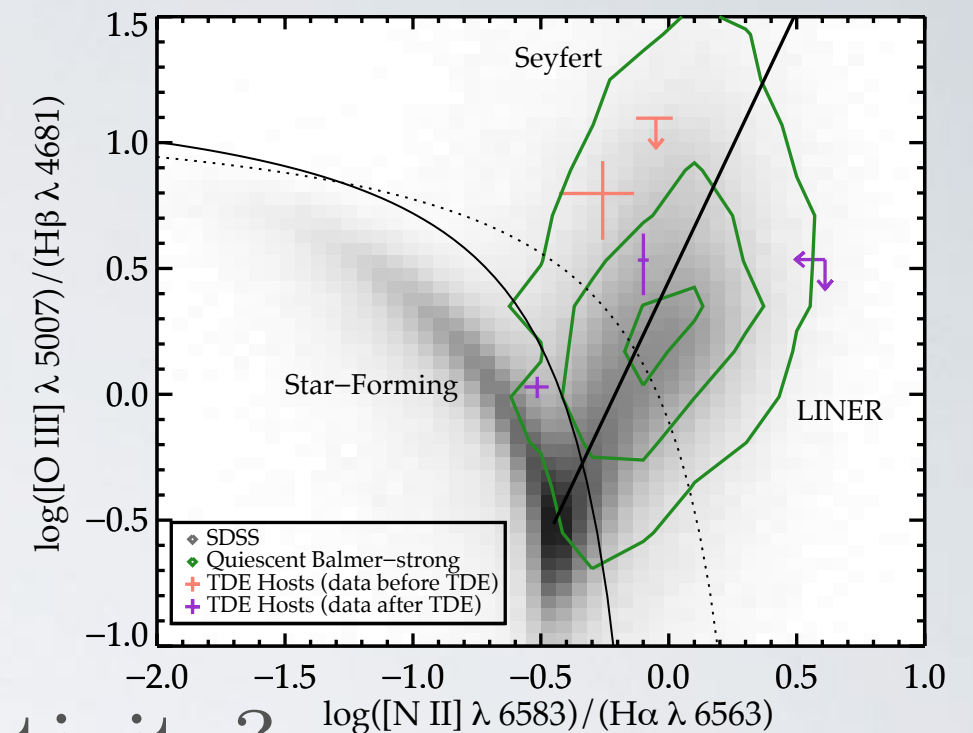


Potential difference in TDE host spectra **before** vs. **after** TDE



# 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

