University of St Andrews

Danmarks Grundforskningsfond
Danish National Research Foundation

directly probing the quasar **accretion disc** with **multi-epoch photometry**

Quasars in Crisis | Edinburgh, Scotland

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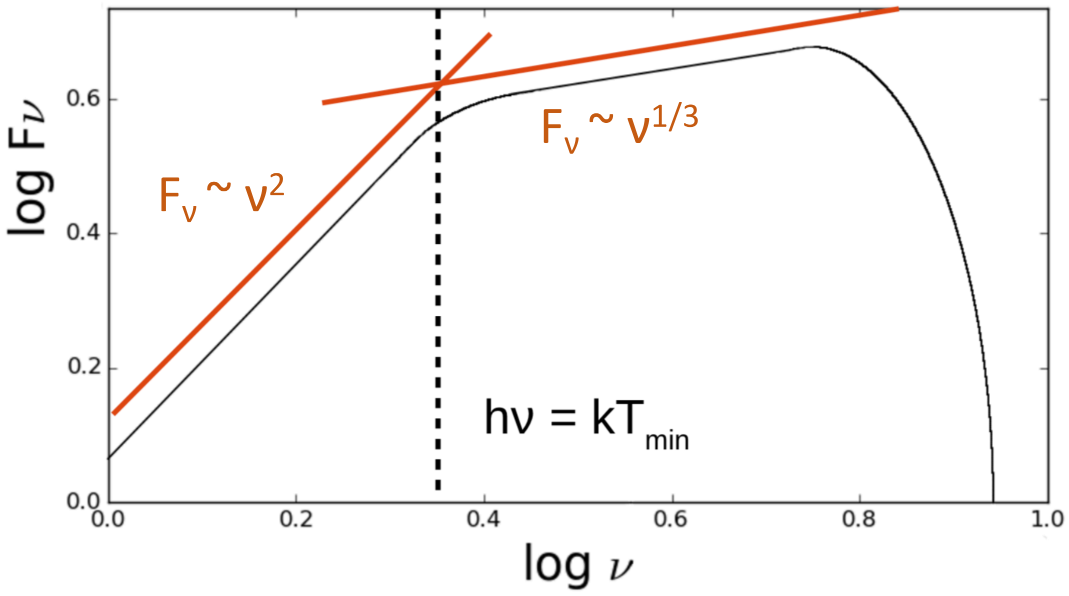
John R. Weaver
with Keith Horne (St Andrews)

scale leap required to bridge discovery and detailed study
{Schmidt et al. 1963; Dietrich et al. 1993}

access geometry through reverberation mapping of the BLR
{Peterson & Horne 2004; Horne et al. 2004}

prediction of accretion disc spectral slope → $F_\nu \sim \nu^{1/3}$
{Sakura & Sunyaev et al. 1973}

candidate for high-z standard candle
{Baldwin et al. 1989 ; Risalti & Lusso 2015}

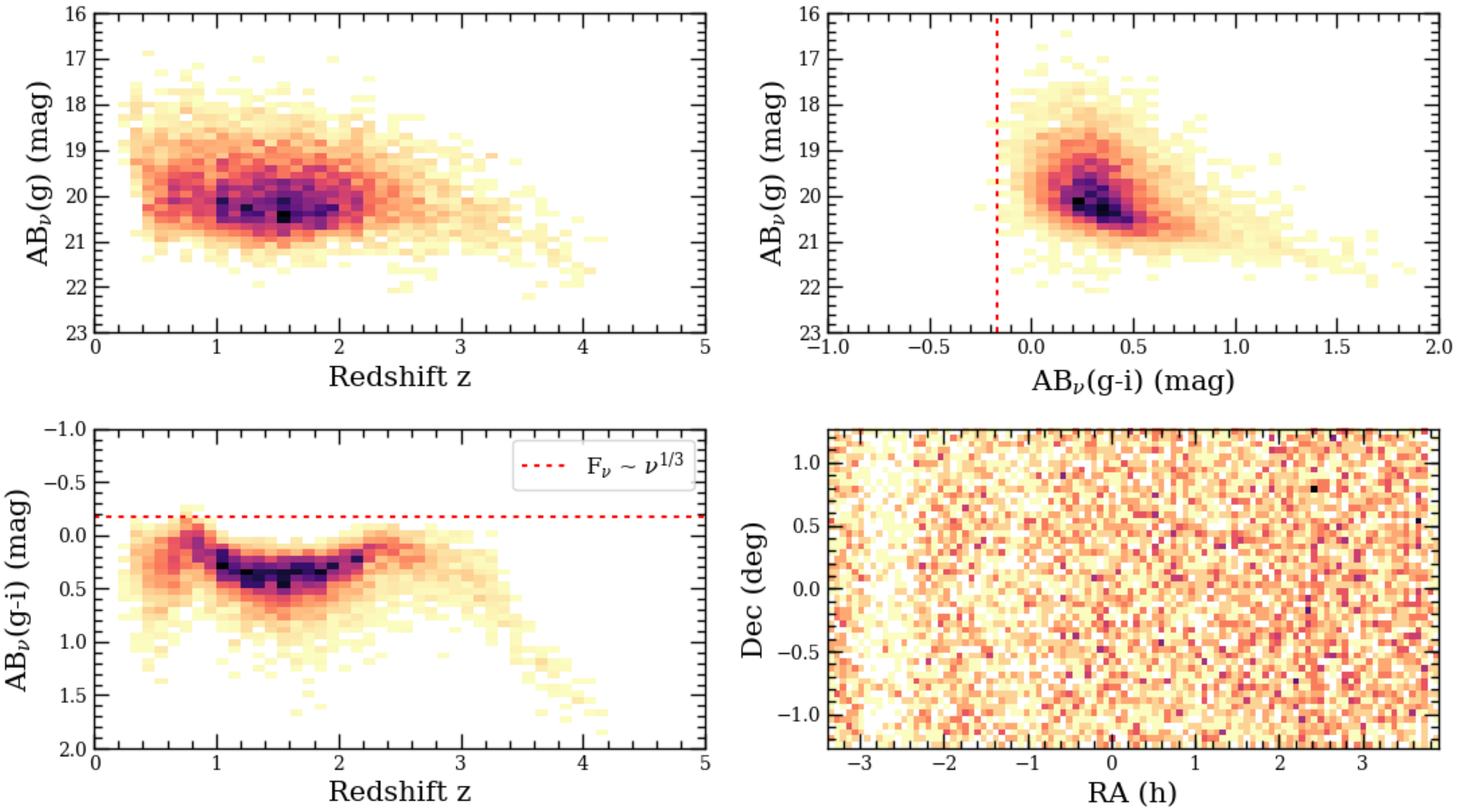


the SDSS Stripe 82 Southern Sample

{Macleod et al. 2012}

N_{qso} : 9258 | Area: ~290 deg^2

ugriz lightcurves with ~10yr baseline



leverage the **intrinsic variability** to recover component spectra

static component: **background galaxy**

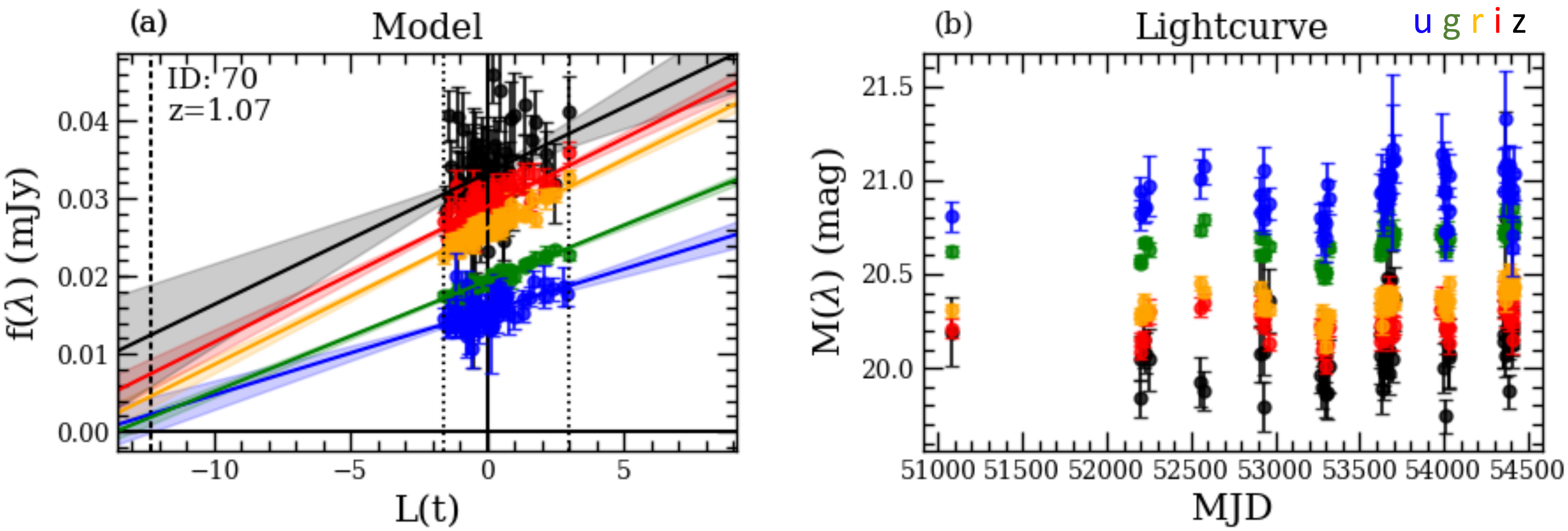
variable component: **accretion disc**

for **each** of the 9258 quasars in Stripe 82

in order to **constrain the accretion disc** spectral slope

I – solve for A(λ), B(λ), and L(t)

No. 70 | z = 1.07



$$F(\lambda,t) = A(\lambda) + B(\lambda)\, L(t)$$

average rms variability

II – separate **disc** and **galaxy** components

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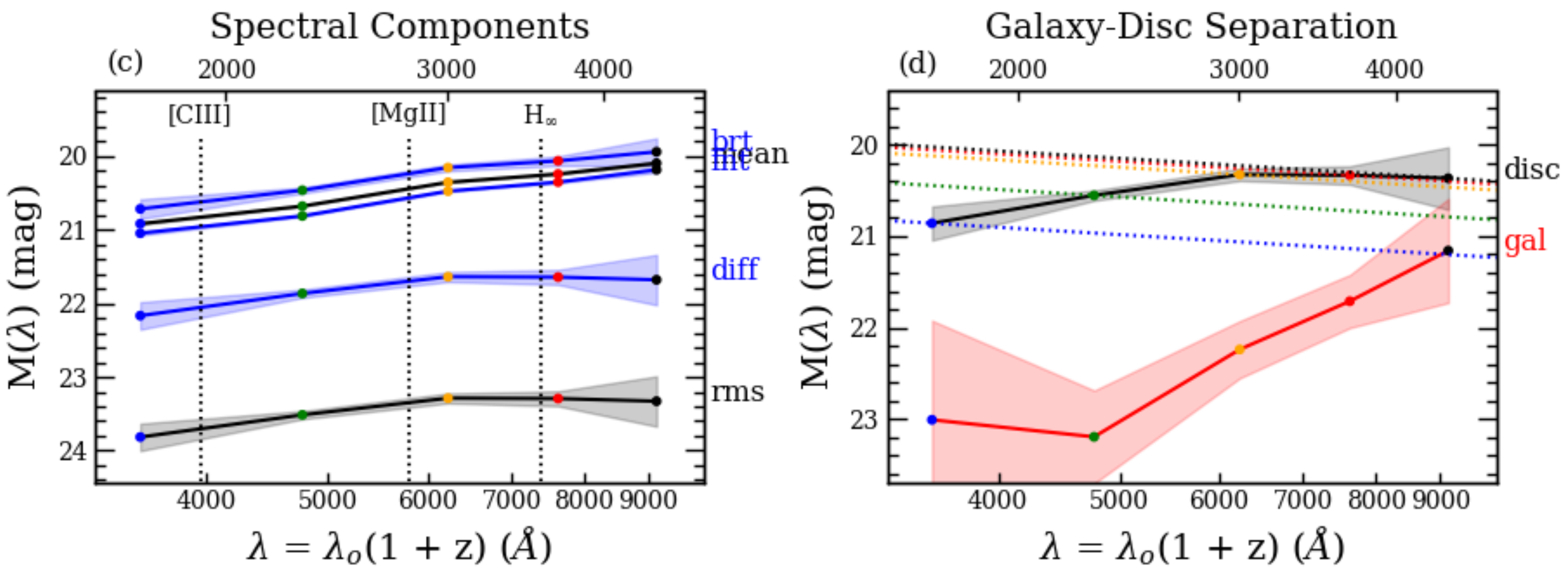


$$F(\lambda,t) = A(\lambda) + B(\lambda)\,L(t)$$

average rms variability

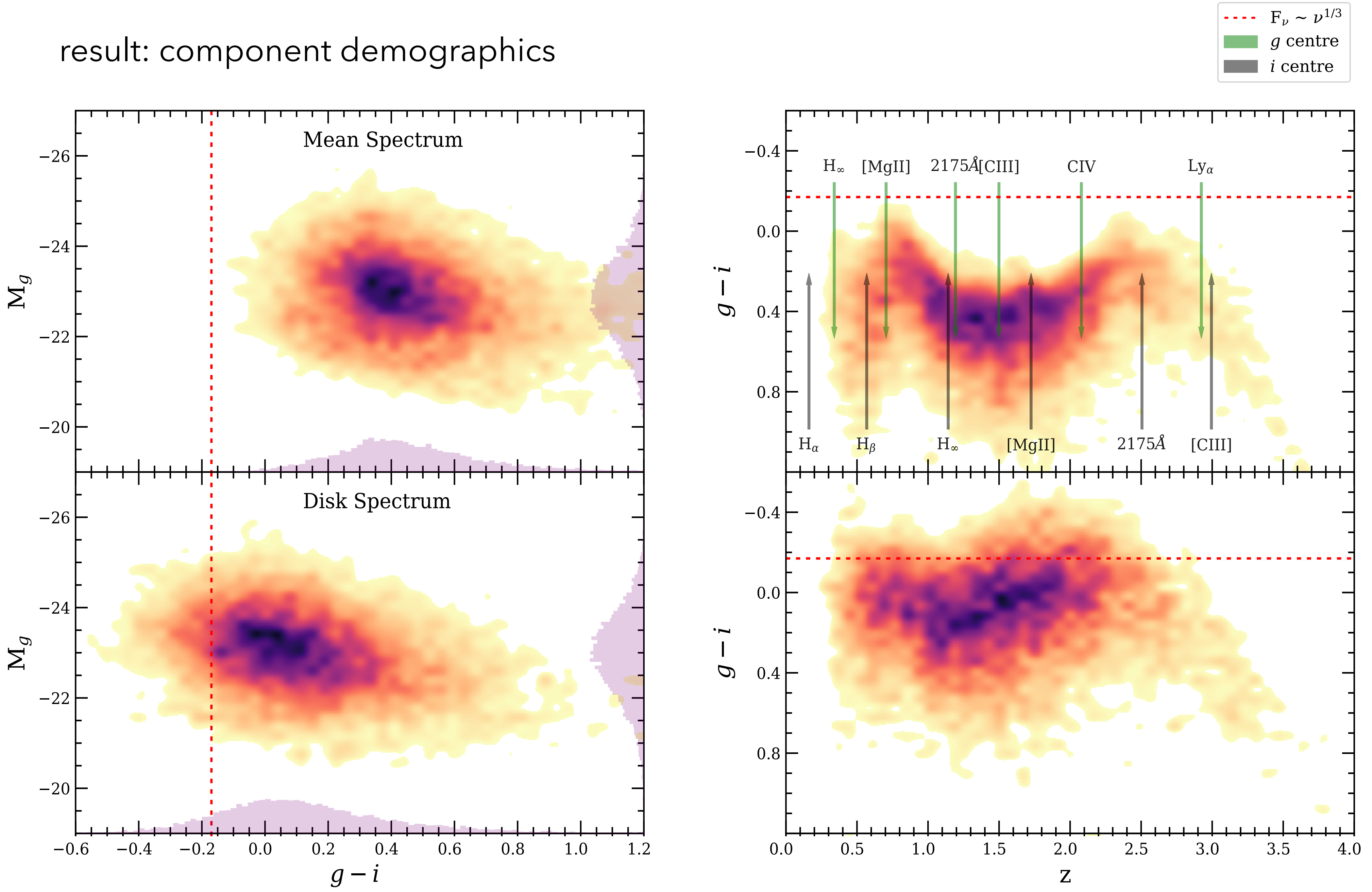
motivation

decomposition

de-reddening

results

result: component demographics



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disc components are **strongly affected by dust**

determine minimum dust extinction required to fit $F_\nu \sim \nu^{1/3}$

I – Small Magellanic Cloud
{Gordon et al. 2003}

II – Large Magellanic Cloud
{Gordon et al. 2003}

III – Milky Way Galaxy
{Seaton et al. 1979; Nandy et al. 1975}

IV – Gaskell AGN
{Gaskell et al. 2004}

for **each** of the 9258 quasars in Stripe 82

in order to **constrain the best-fit dust law** for this sample

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For each dust law, for each object:

I – determine best-fit **E(B-V)**

II – remove extinction term

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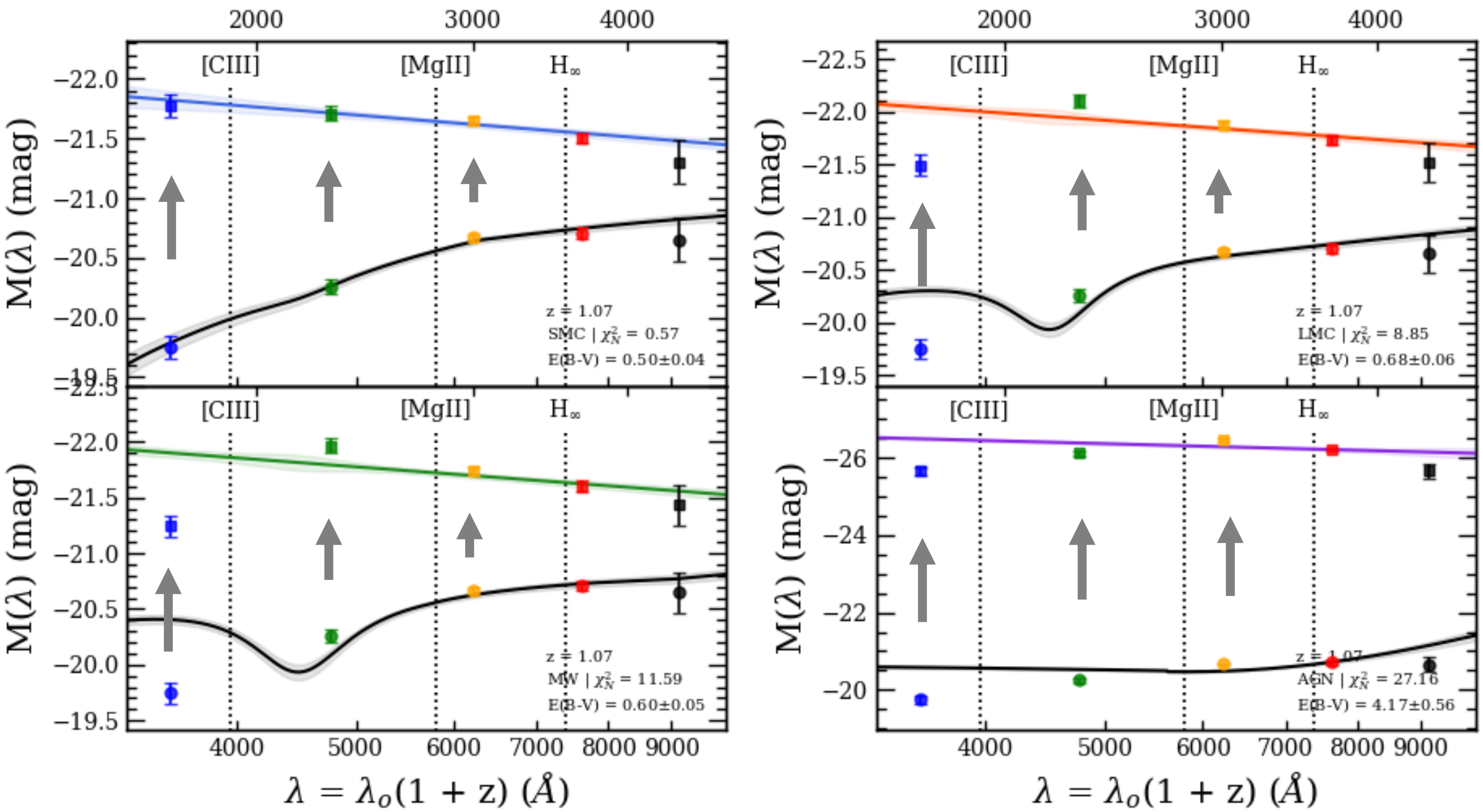

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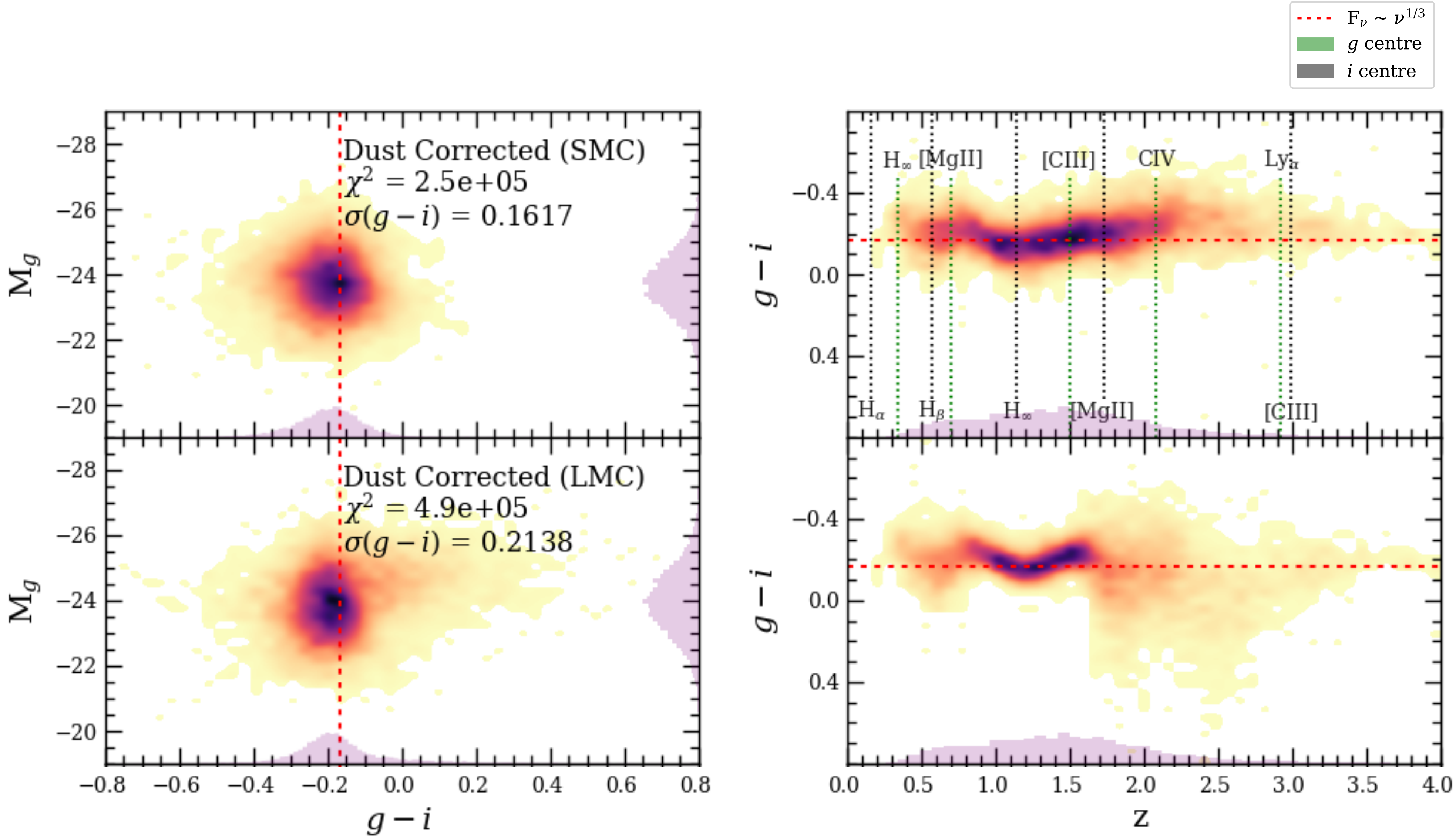

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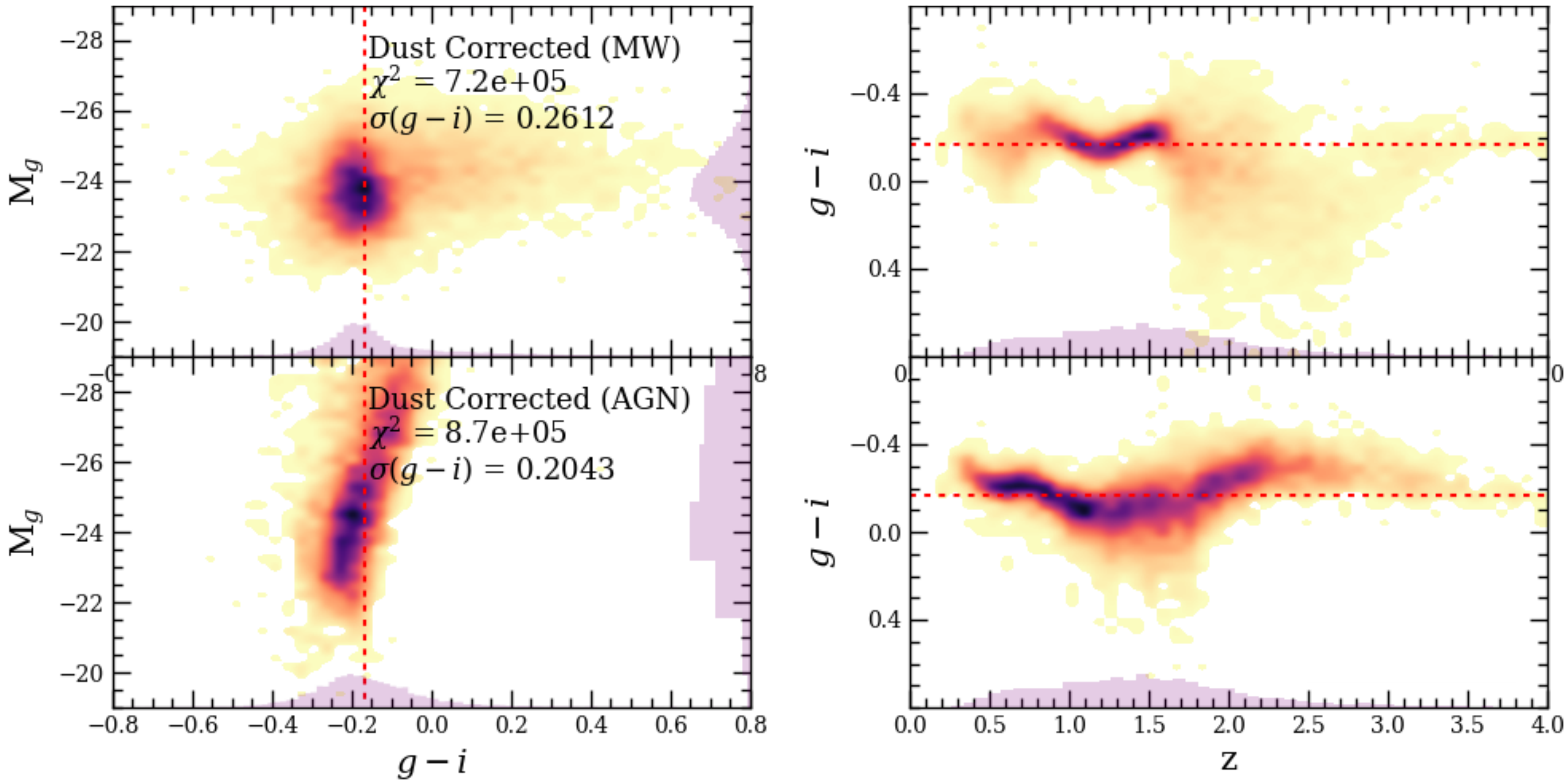

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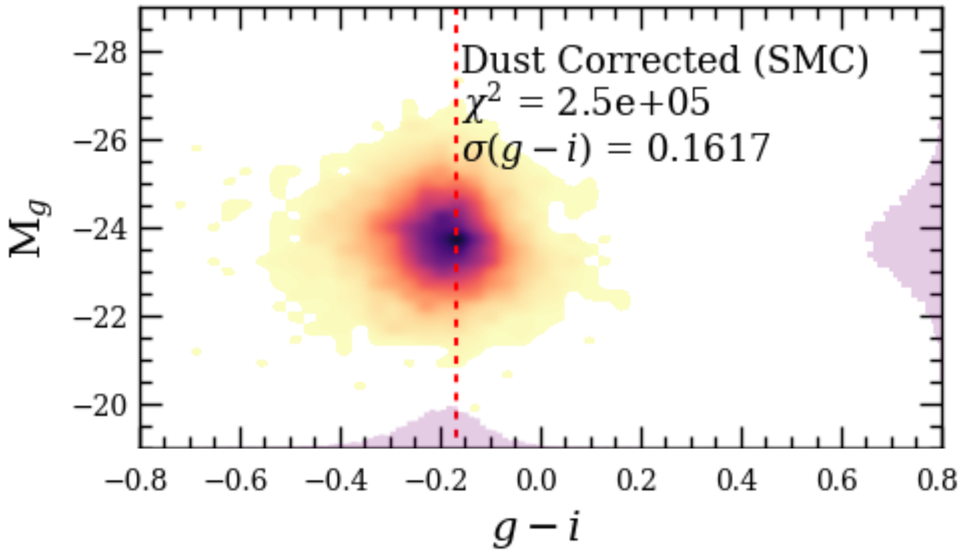
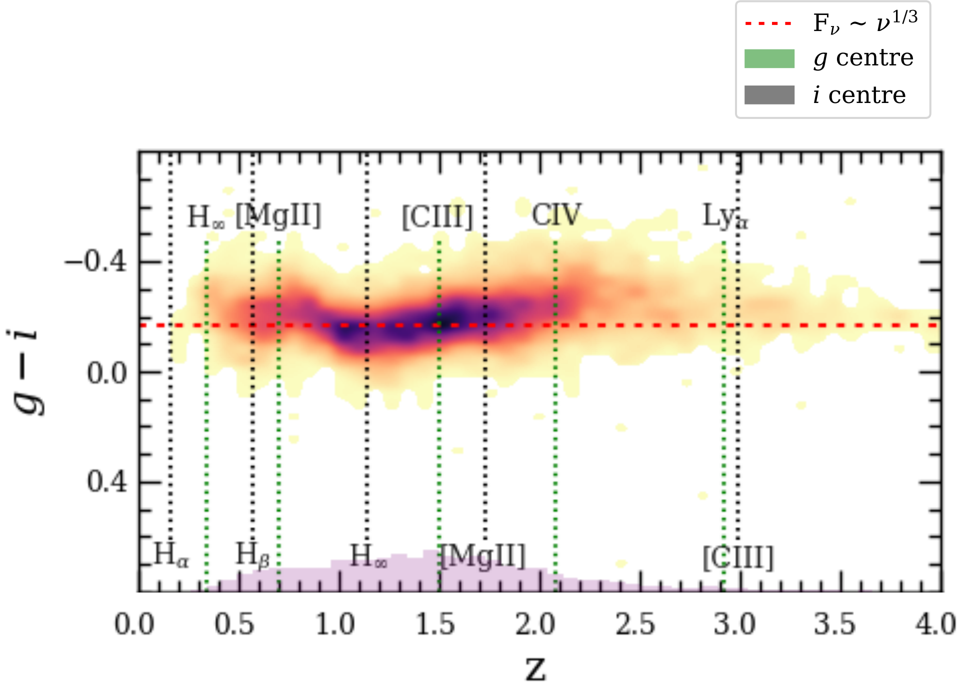
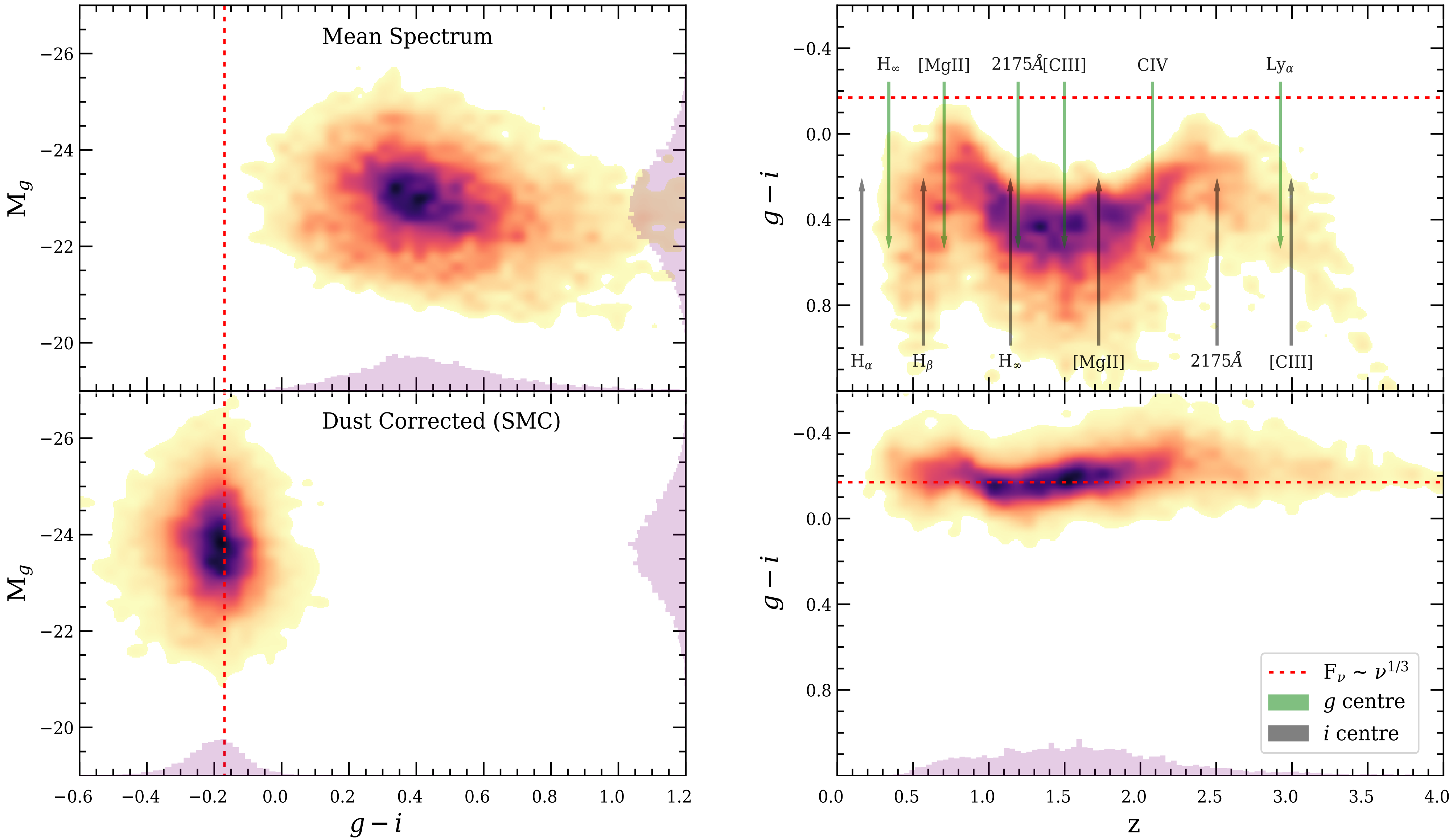
smc – smallest χ^2 and σ(g-i)





properties of de-reddened accretion discs

assuming an smc-like attenuation curve



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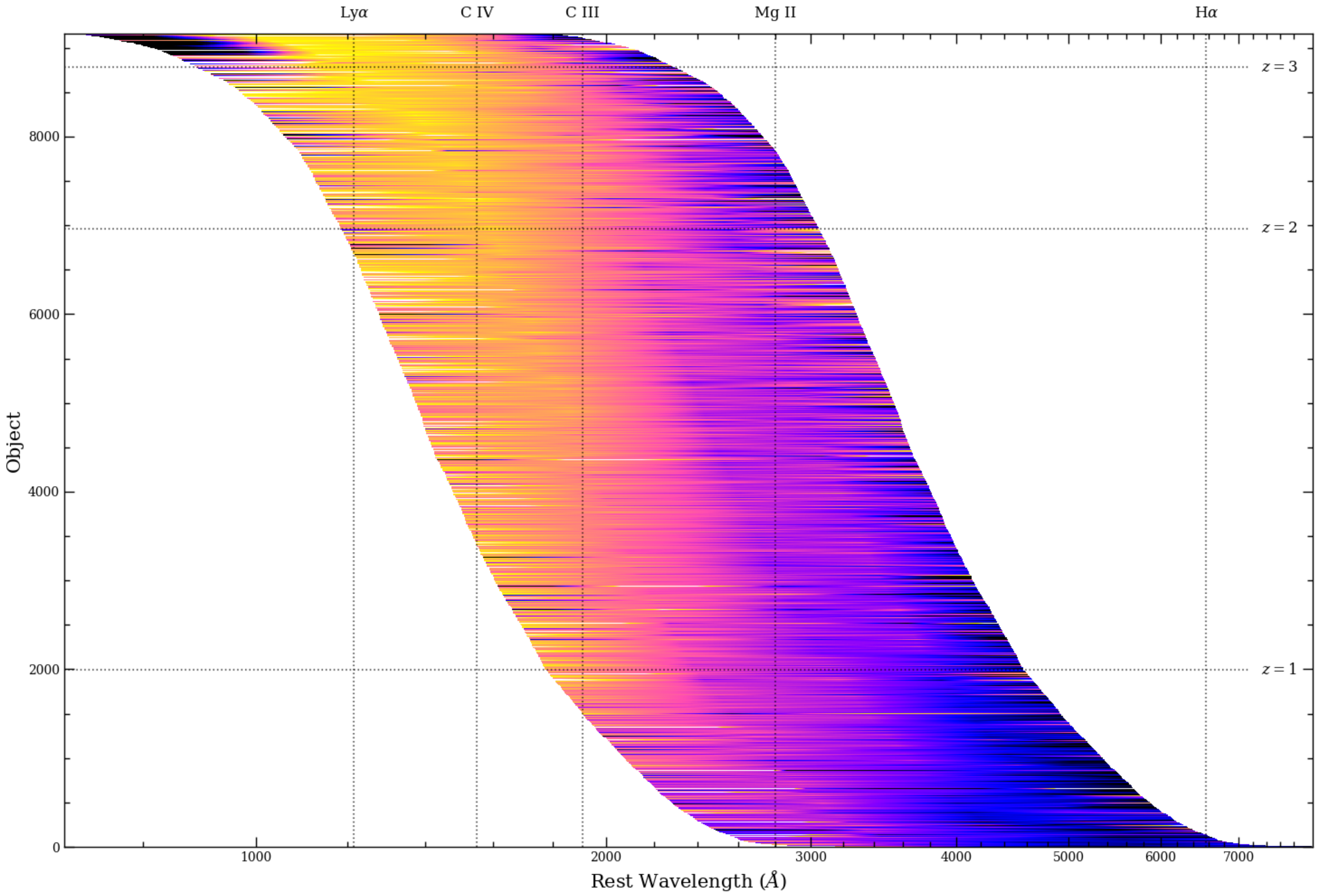

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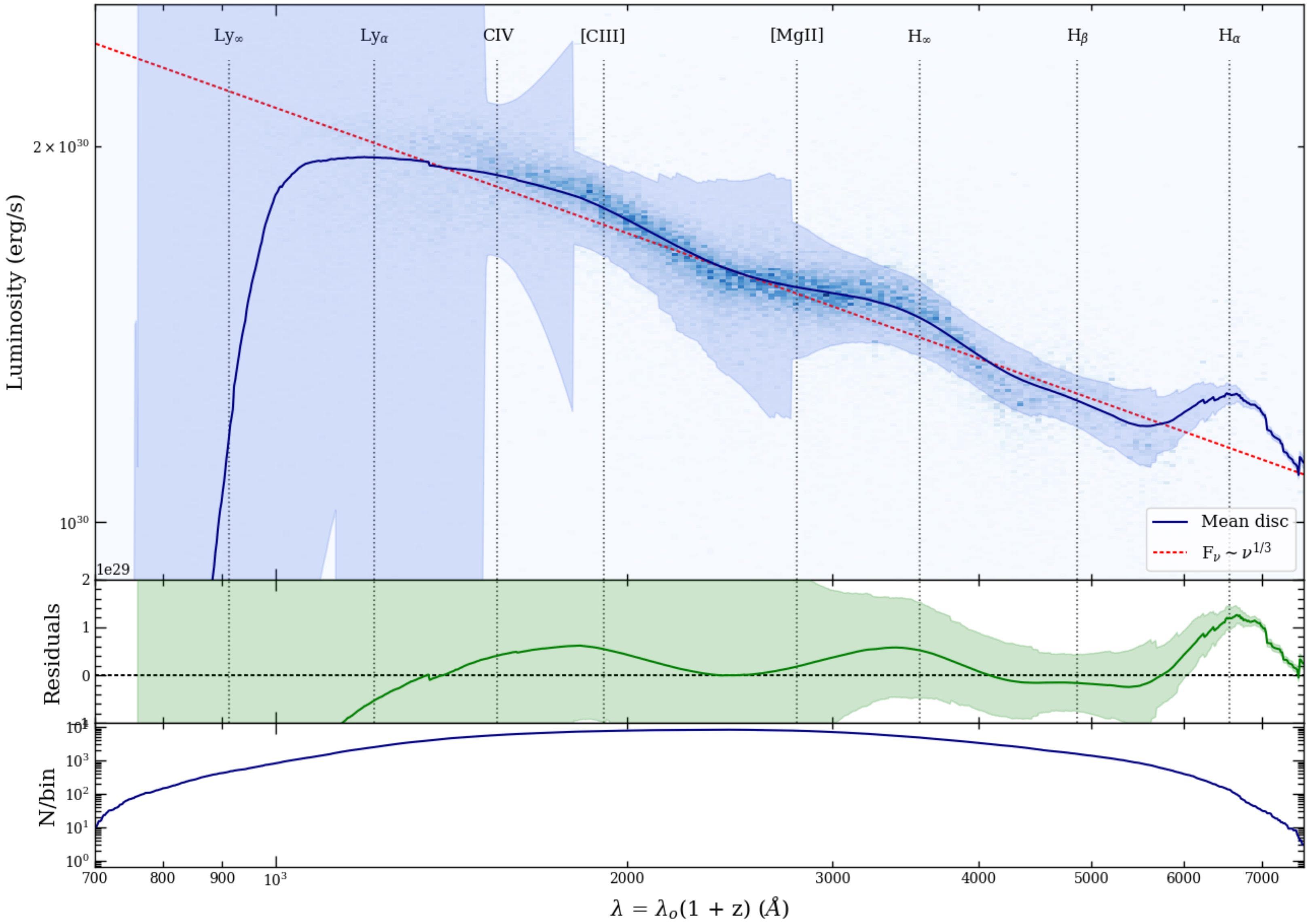

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decomposed 9258 *ugriz* quasar lightcurves

(static) galaxy component

(variable) disc component

de-reddened with four dust laws

smc | lmc | mw | agn

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strong evidence for $F_\nu \sim \nu^{1/3}$ discs

smc requires the least reddening, best fit

candidate selection for continued monitoring

(Image credit: Frosty Drew Observatory; Scott MacNeill)

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