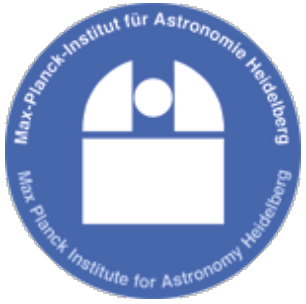
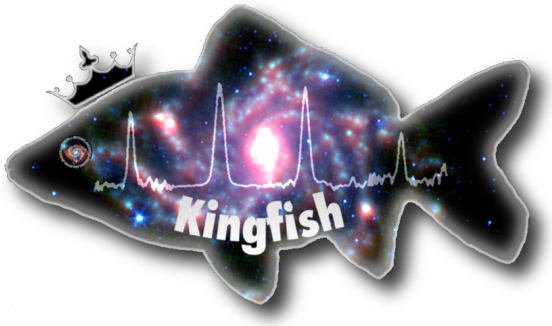
Mapping dust through emission and absorption in nearby galaxies

Kathryn Kreckel (MPIA)

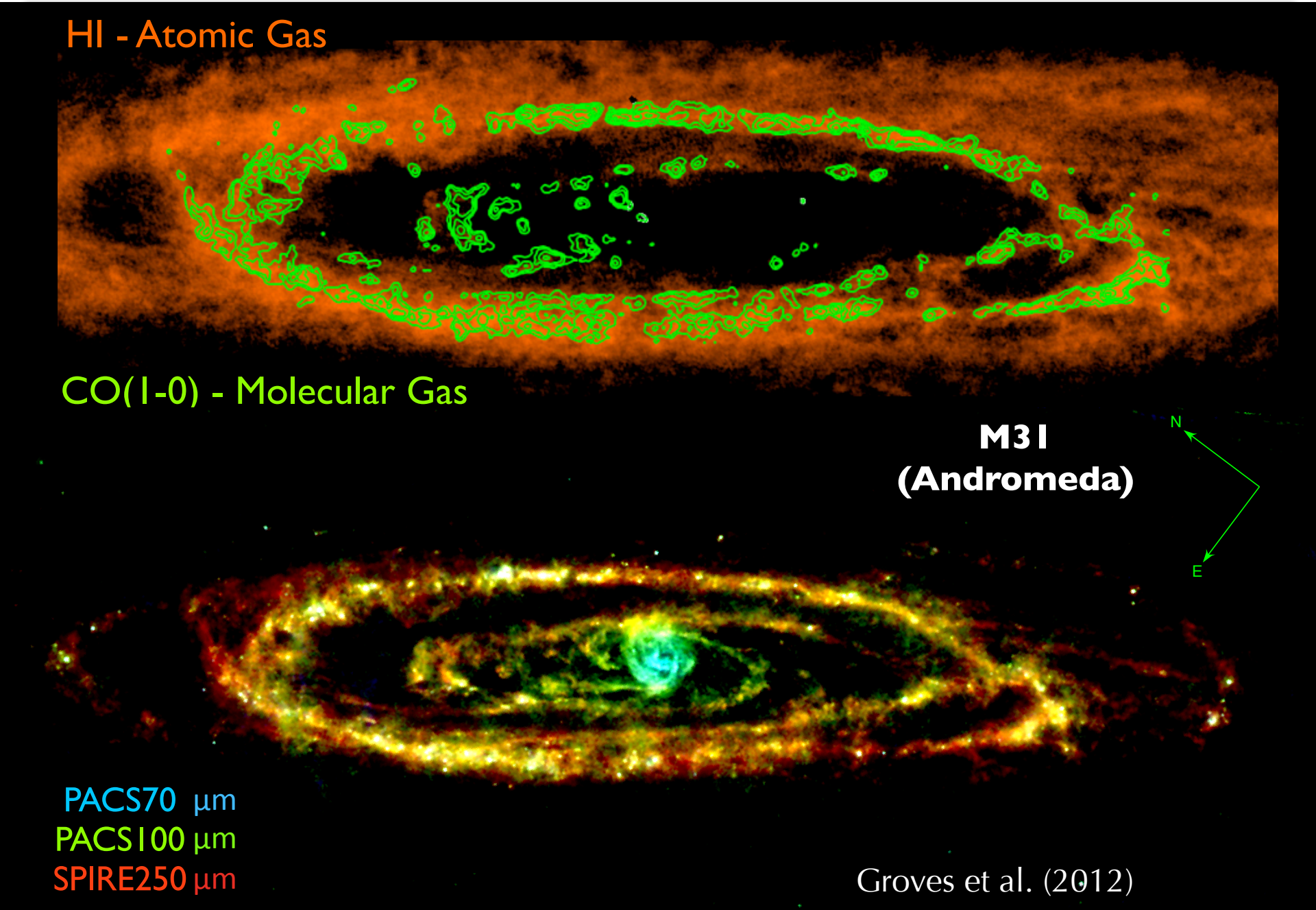
Brent Groves (MPIA), Eva Schinnerer (MPIA), Ben Johnson (IAP)
+ KINGFISH collaboration





Dust extinction and reddening

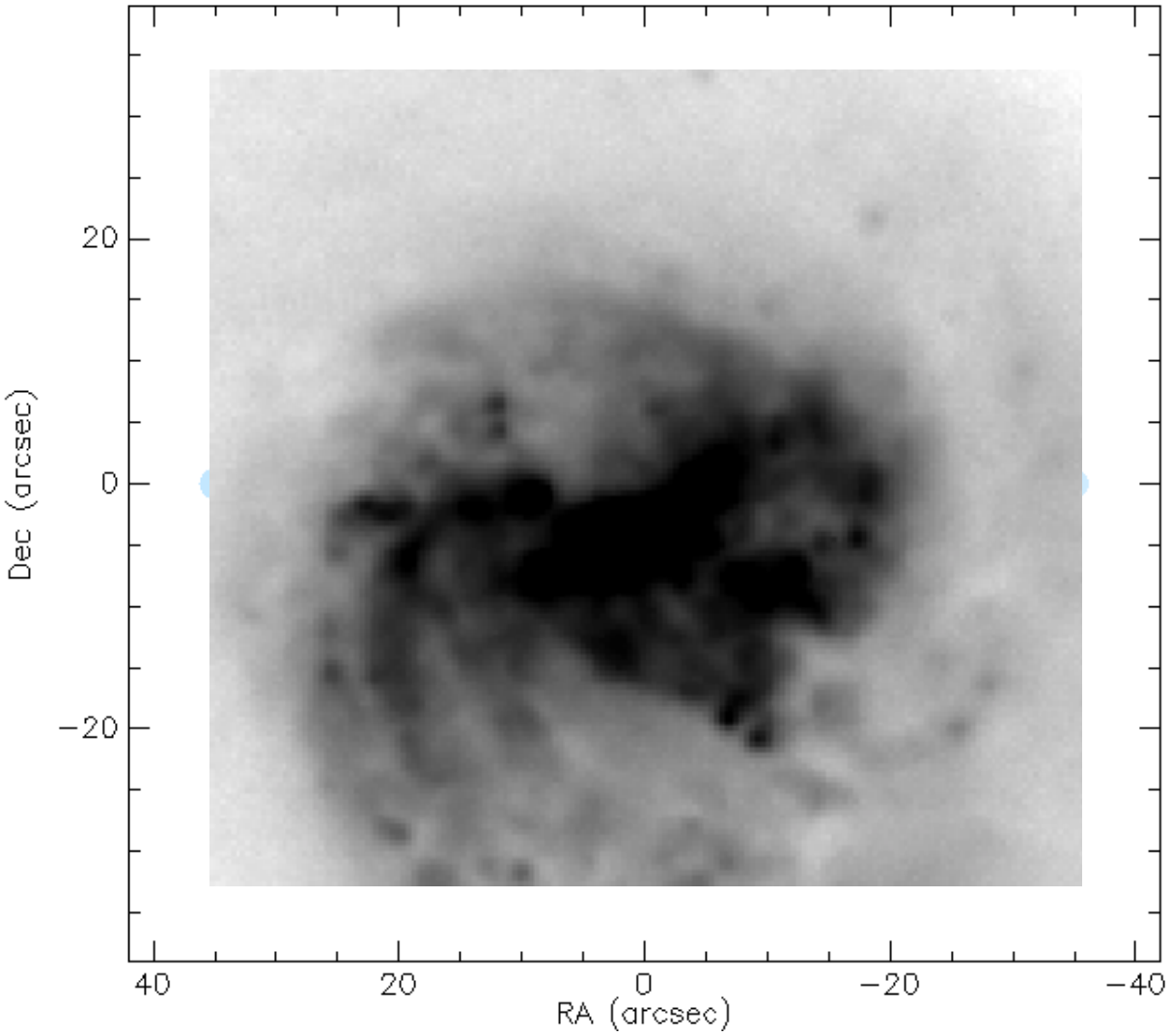
Dust tracing the cold ISM



Groves et al. (2012)

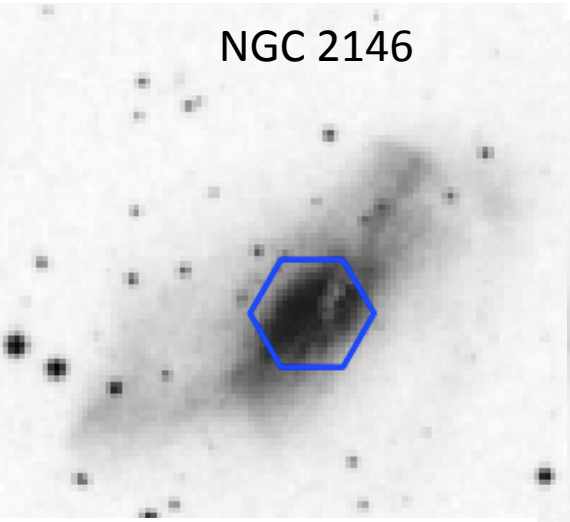
Mapping optical absorption - IFS data

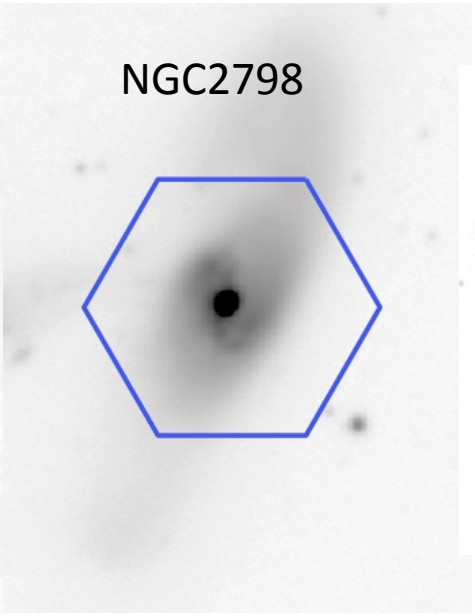
NGC 5713 – V band

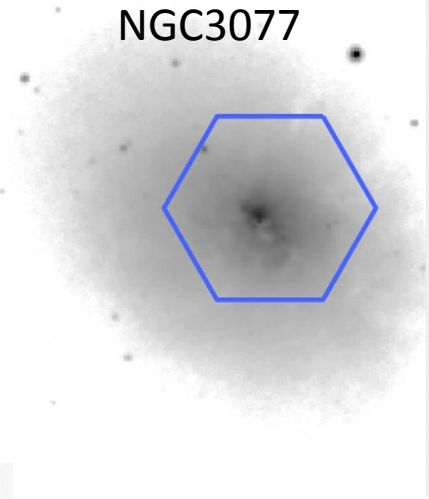


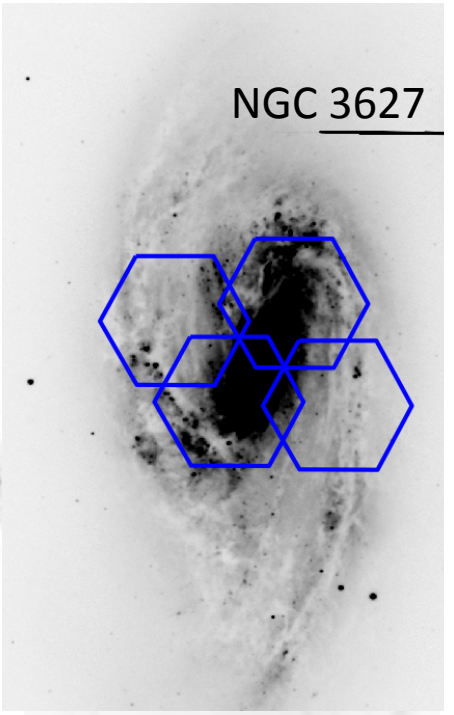
- PMAS/PPAK instrument at Calar Alto 3.5m
- 331 fibers x 3 dither positions
- 2.7'' diameter fibers
- 1' field of view
- 3700-7000 A
- V300 grating (FWHM~10 A ~200 km/s)

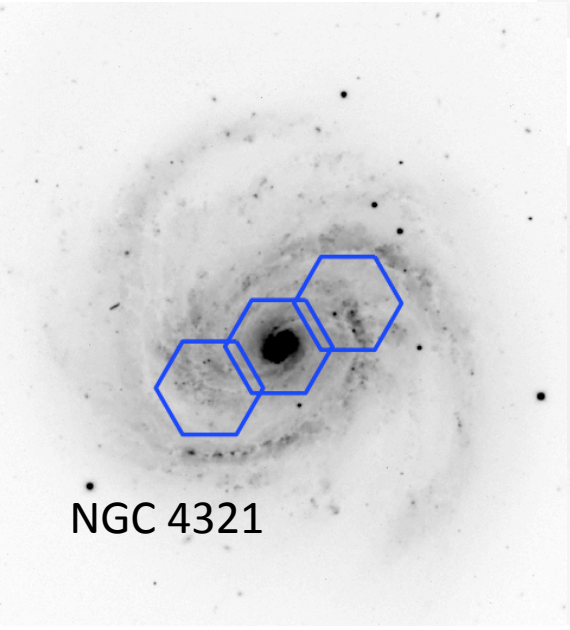
KINGFISH selected targets

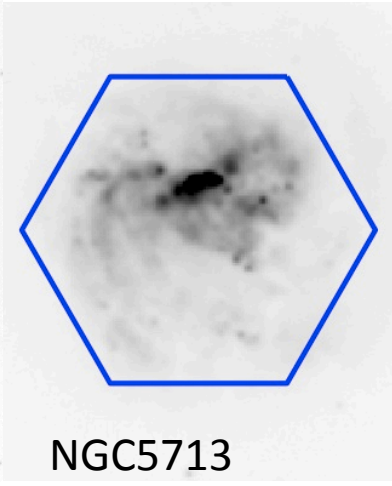


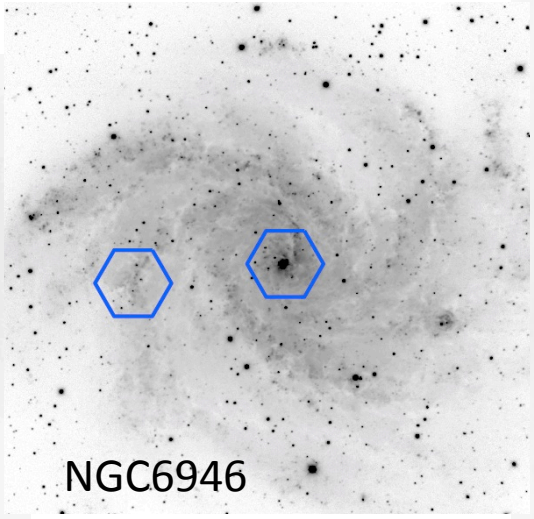


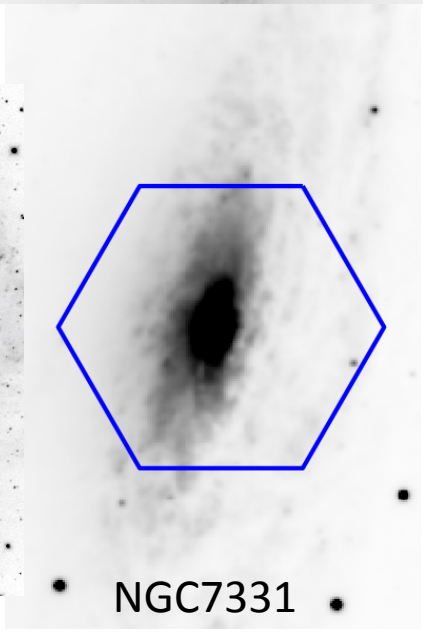




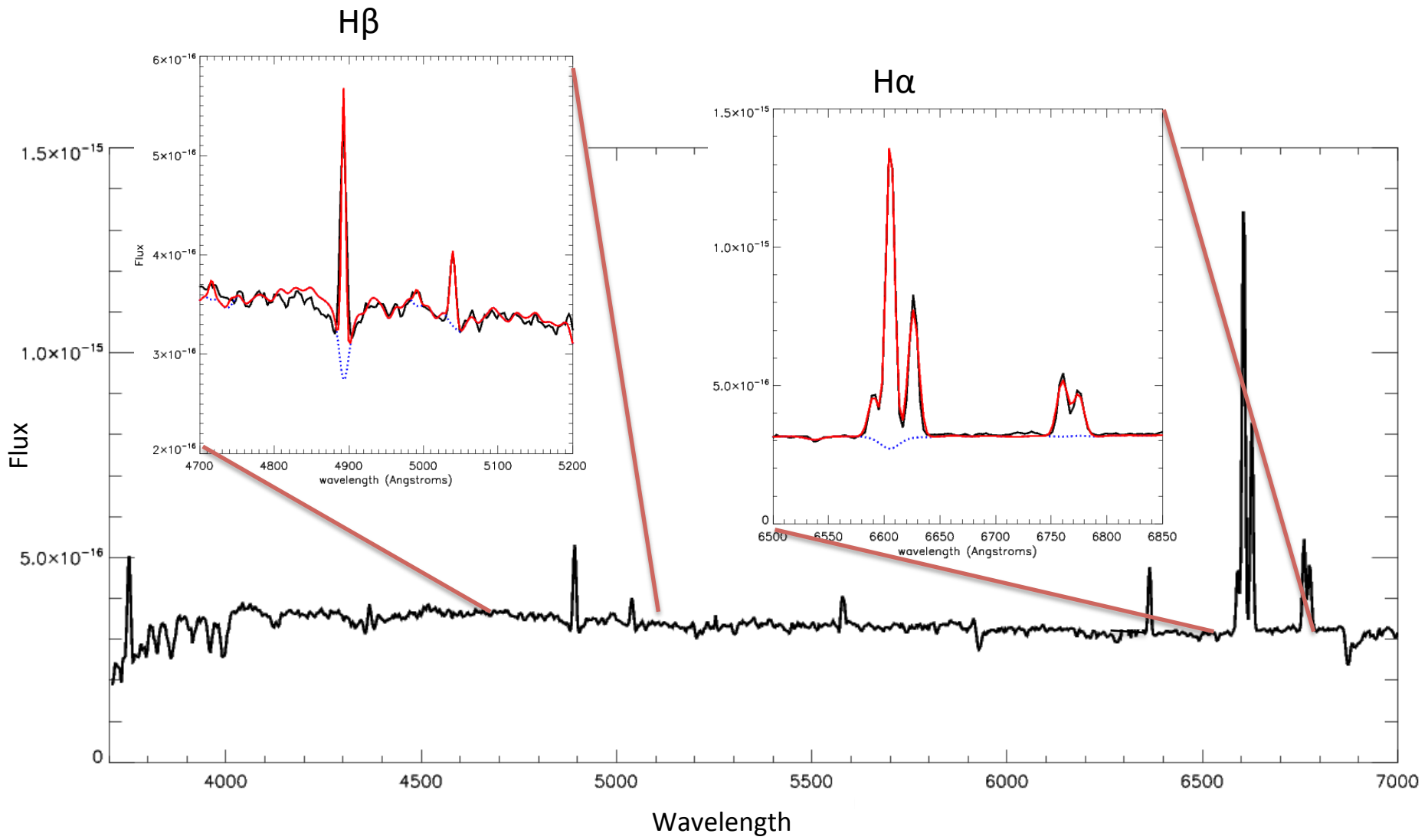








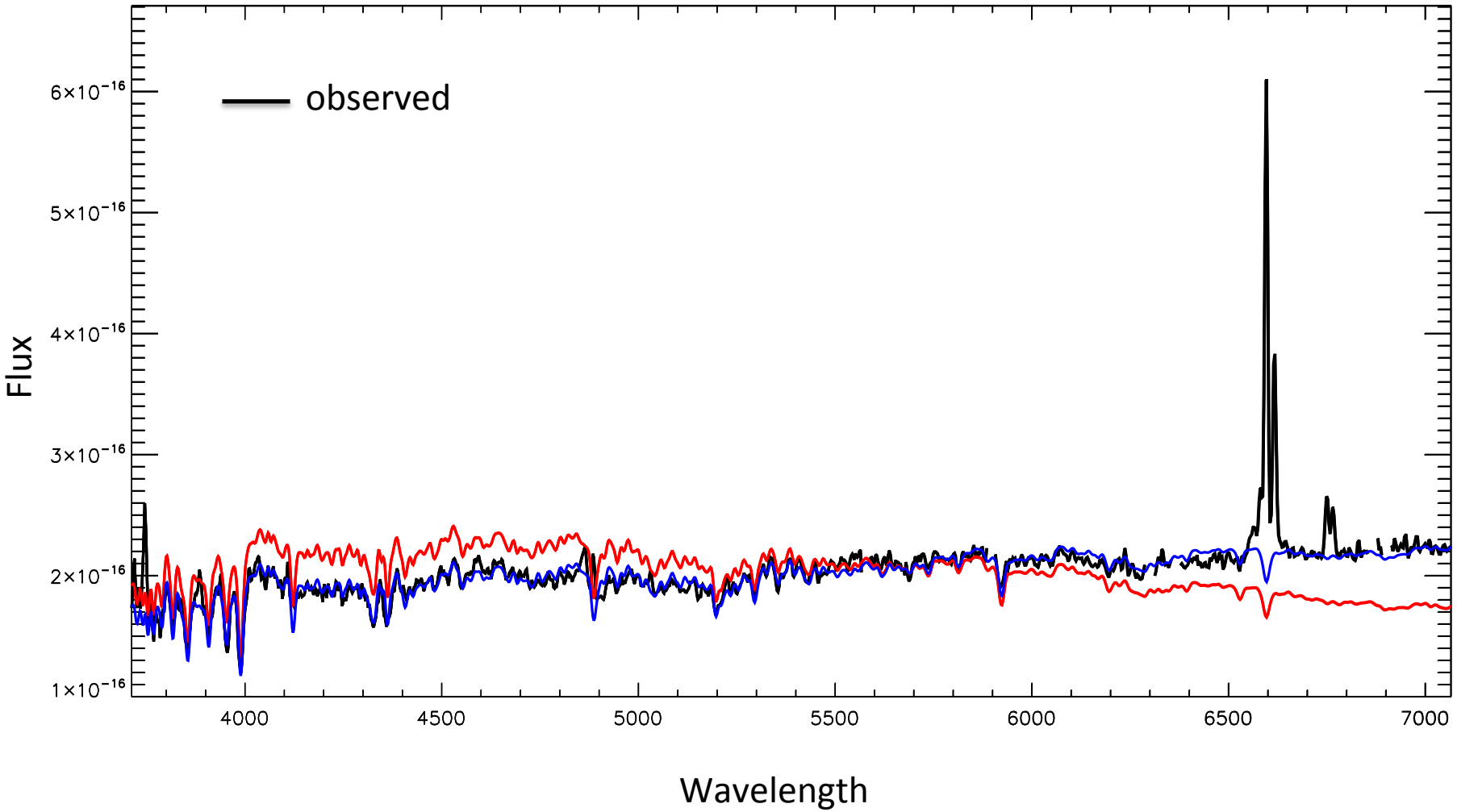
Line reddening



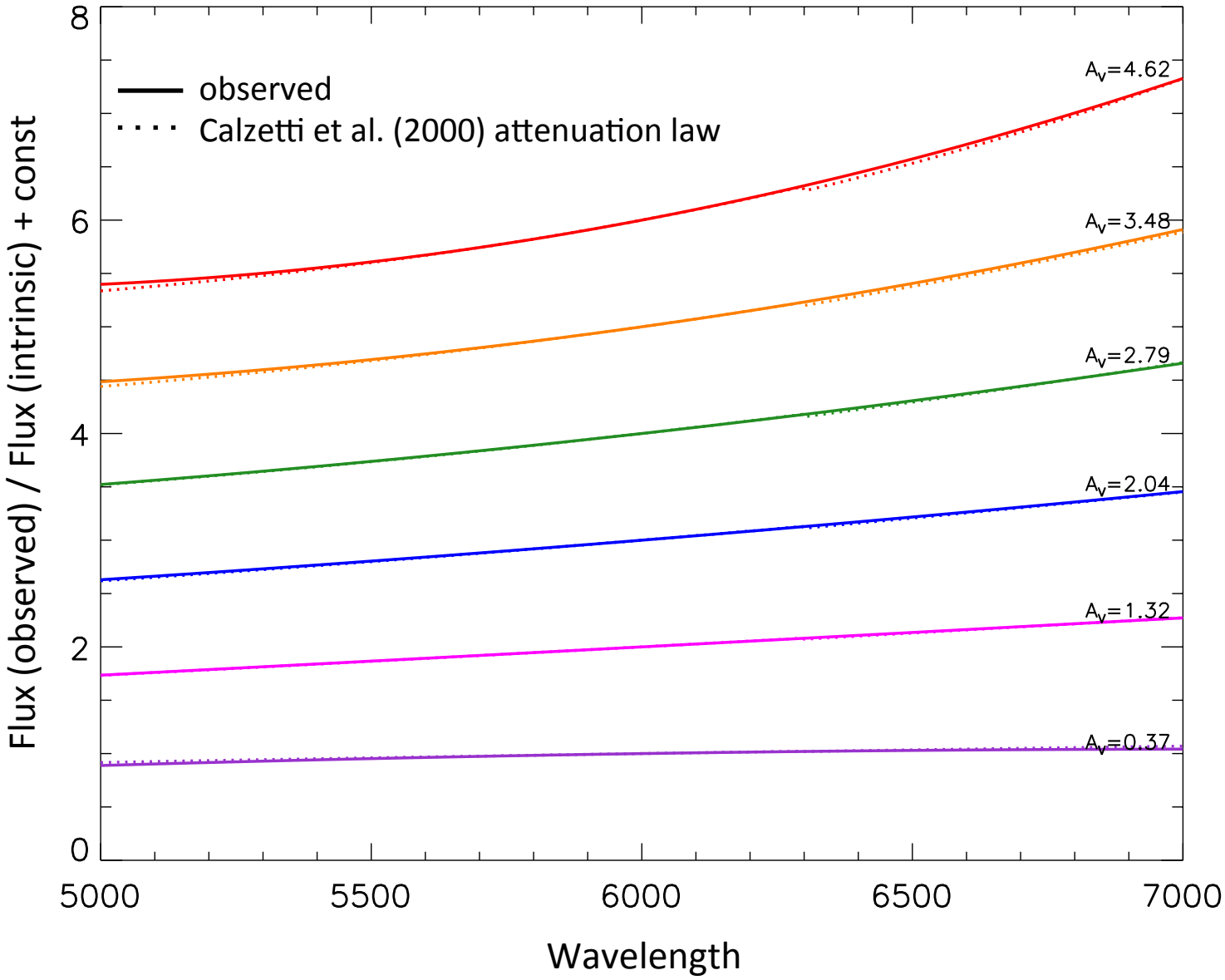
Hα/Hβ → Reddening → A_V (Balmer)

Attenuation Law

Stellar continuum reddening



Stellar continuum reddening



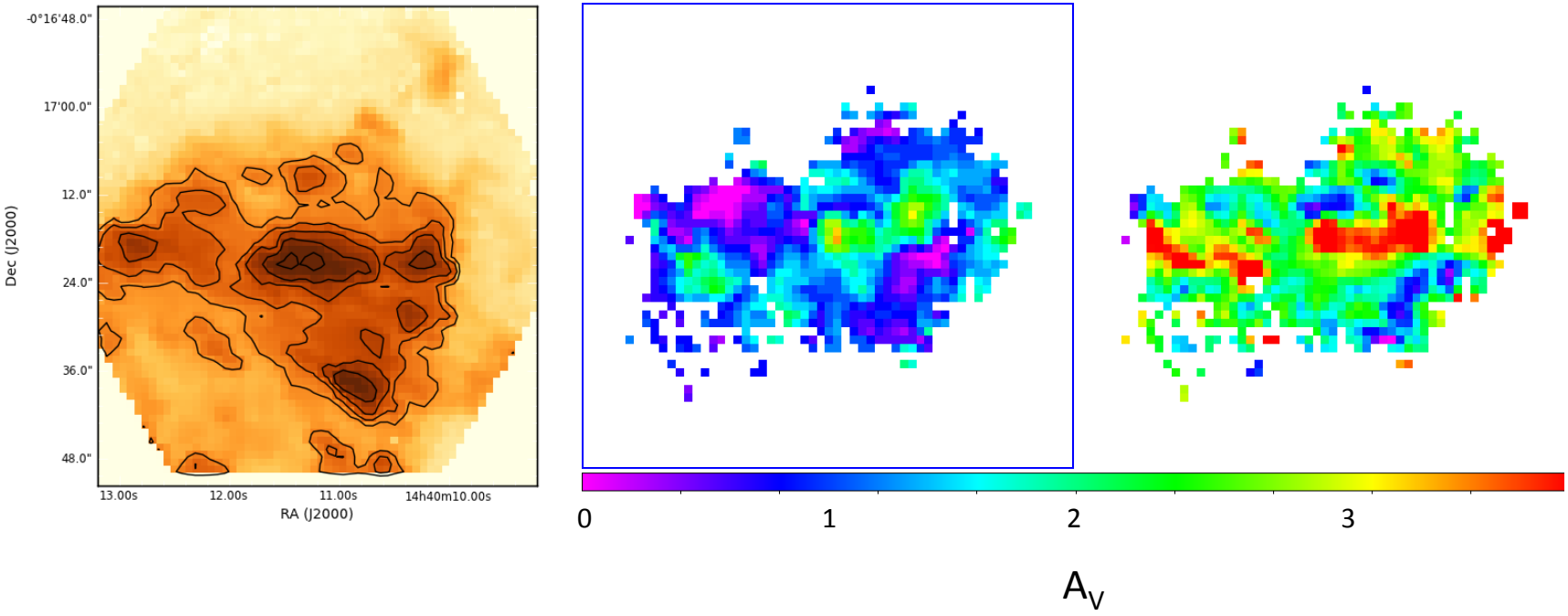
A_V (Stellar)

Line vs stellar continuum reddening

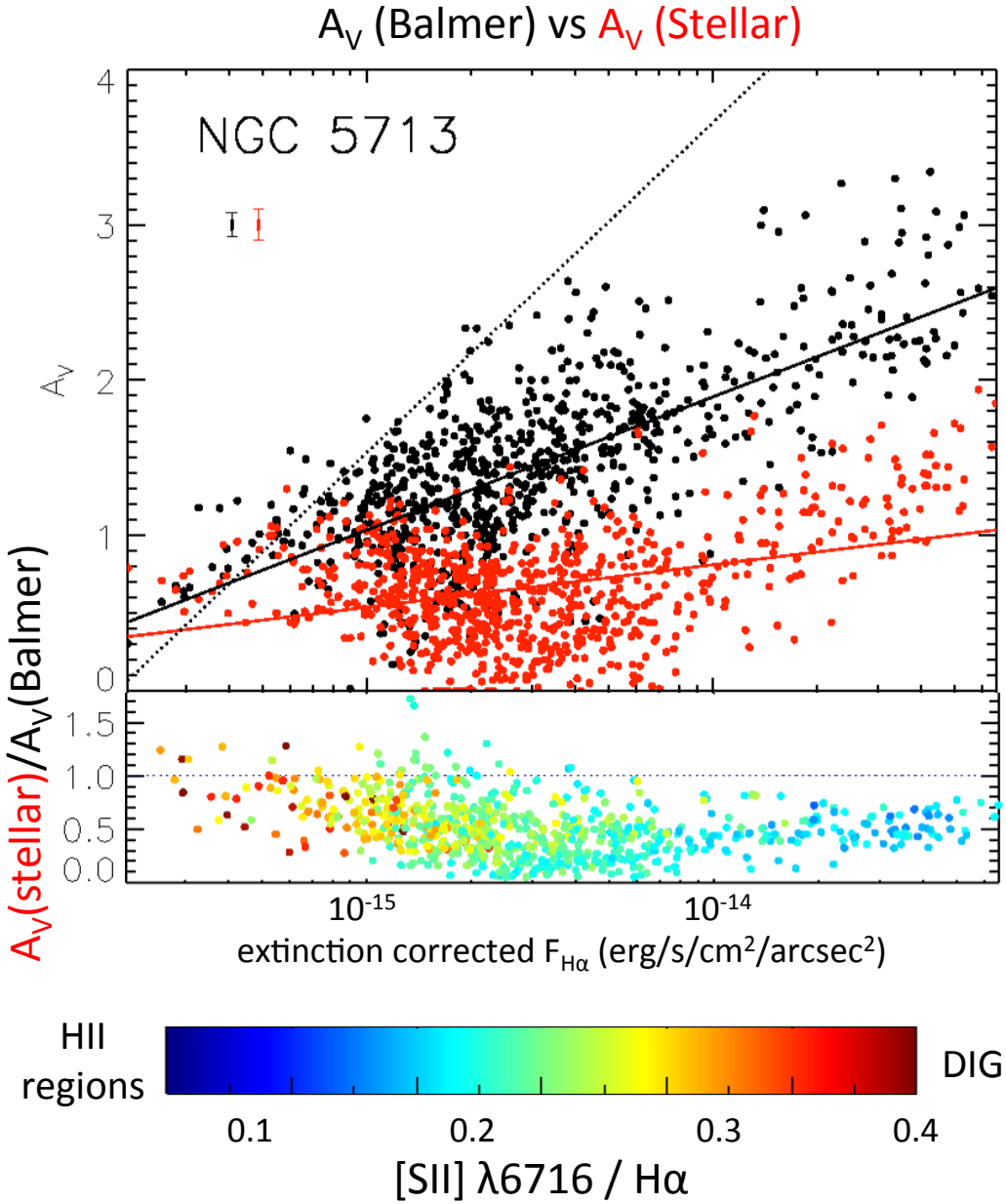
NGC 5713 - Hα image

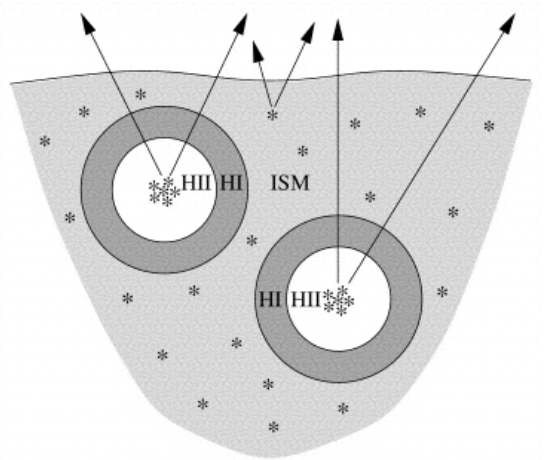
Stellar continuum

Balmer decrement



Line vs stellar continuum reddening





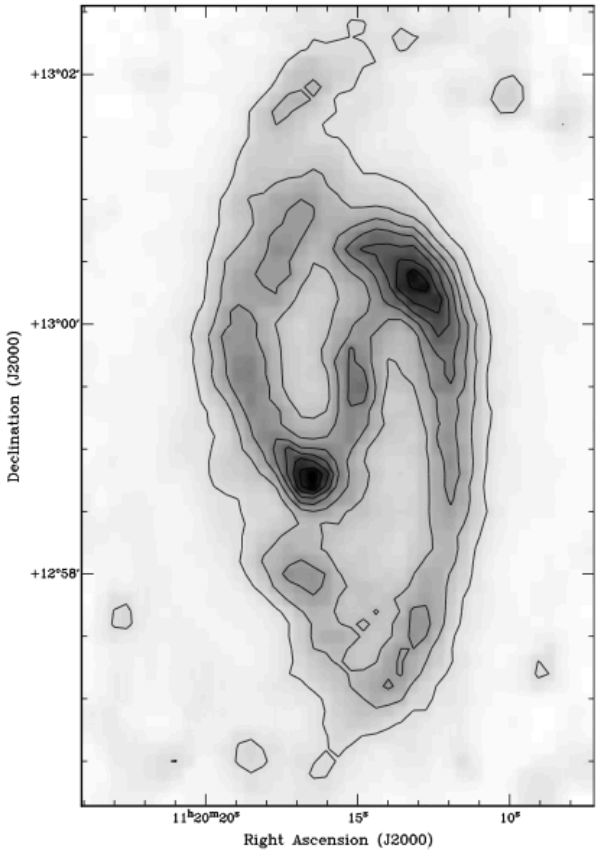
Charlot & Fall 2000

A_V (Stellar) = 0.47 x A_V (Balmer)
for HII regions

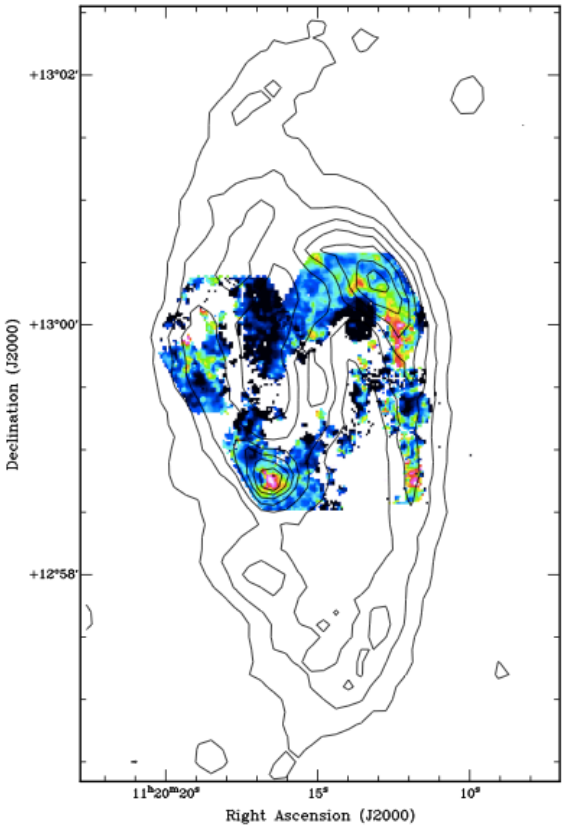
~ 0.7 x A_V (Balmer)
for DIG dominated regions

Dust emission vs dust absorption

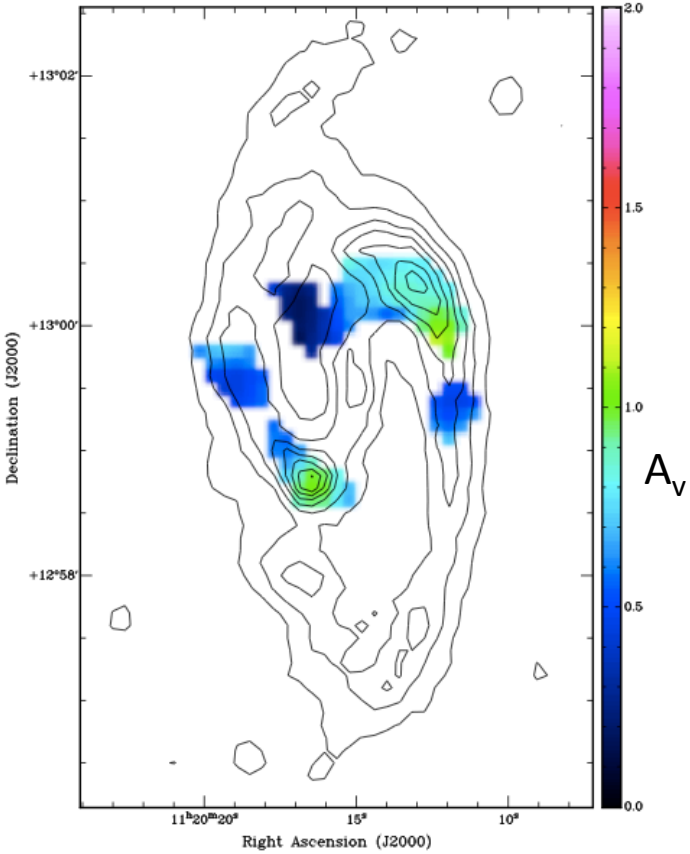
Dust mass surface density
ΣM_d



A_V



A_V (convolved)

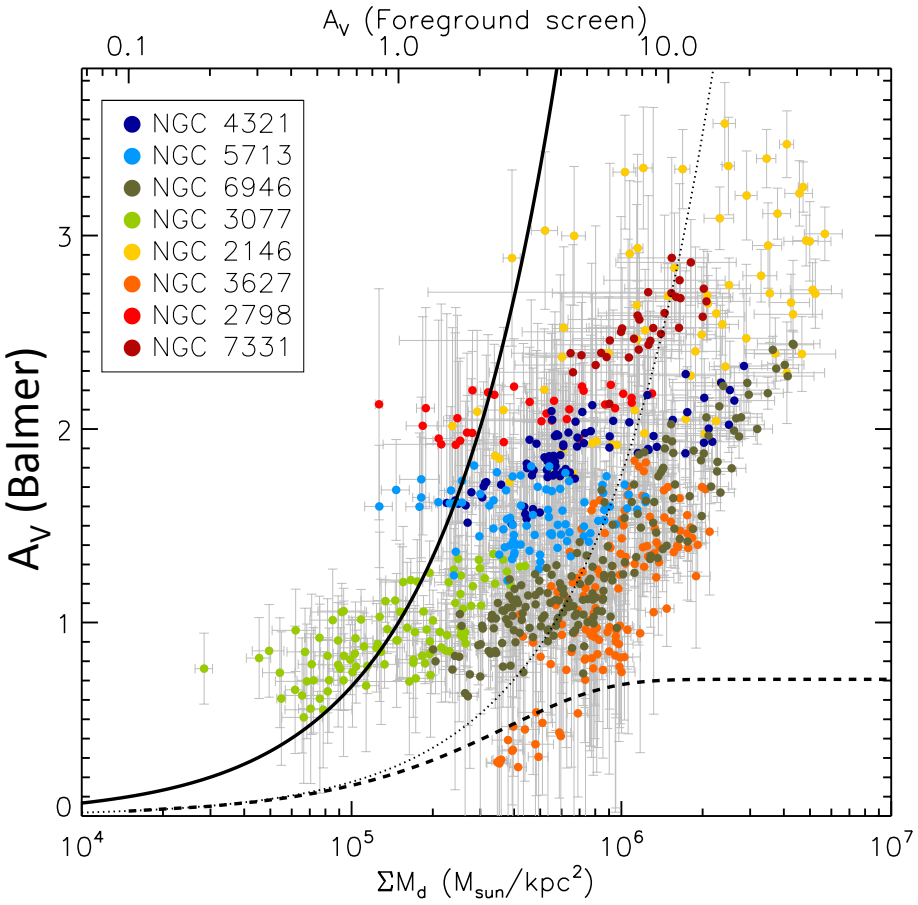


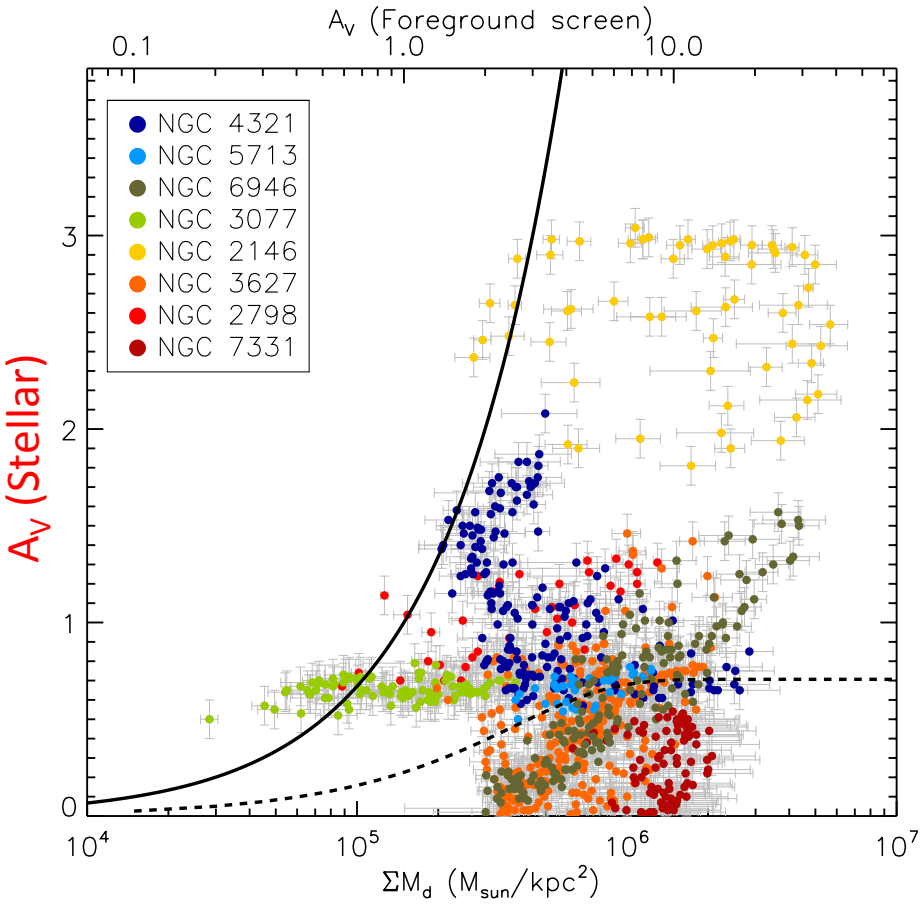
Draine & Li (2007) dust SED modeling
(see Aniano et al. 2012)

NGC 3627

foreground screen model
mixed media model
best fit scaling of screen model

Trends between galaxies



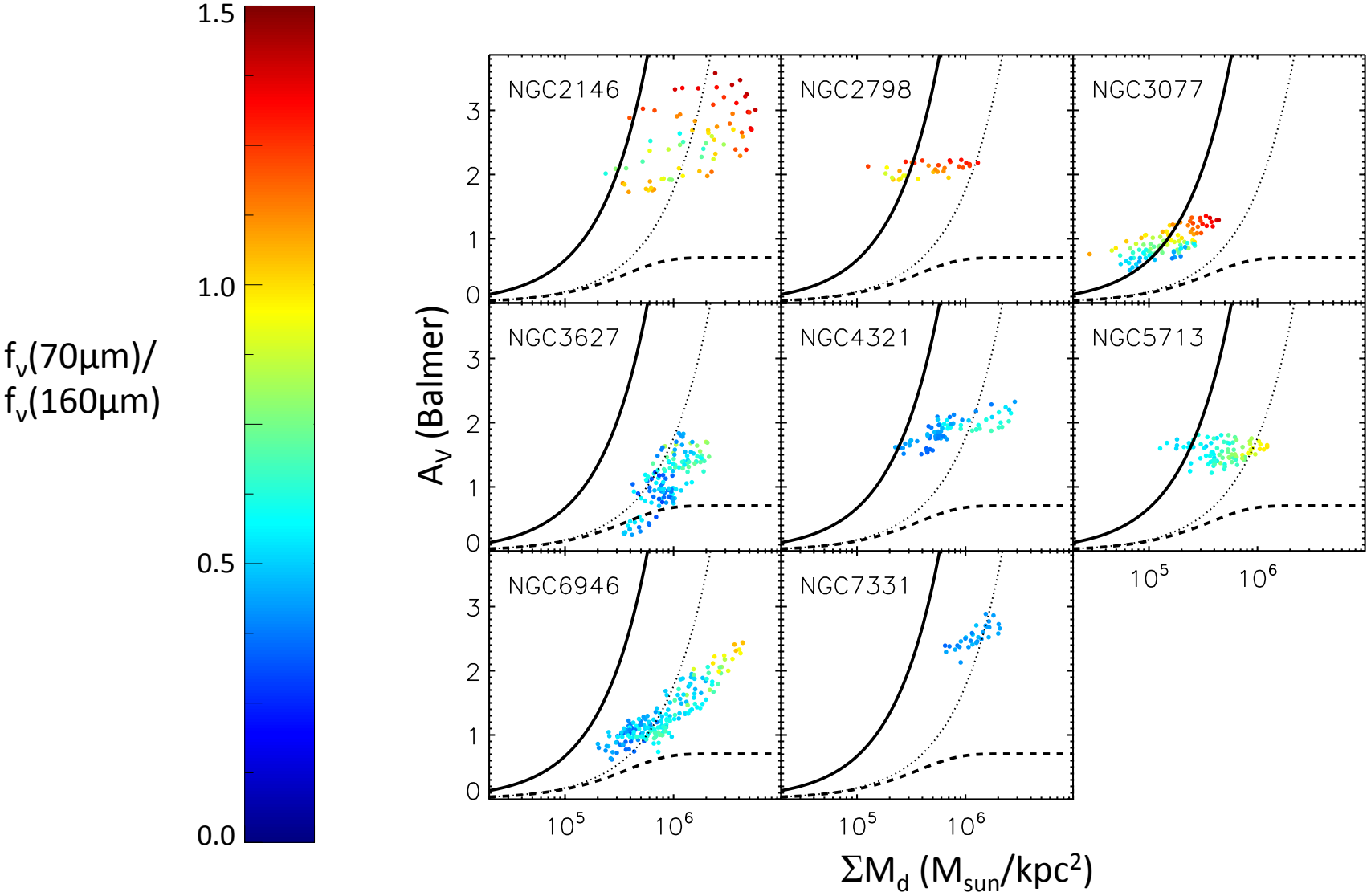


A_V (Balmer) = A_V (Foreground screen) / 3.8

No clear correlation

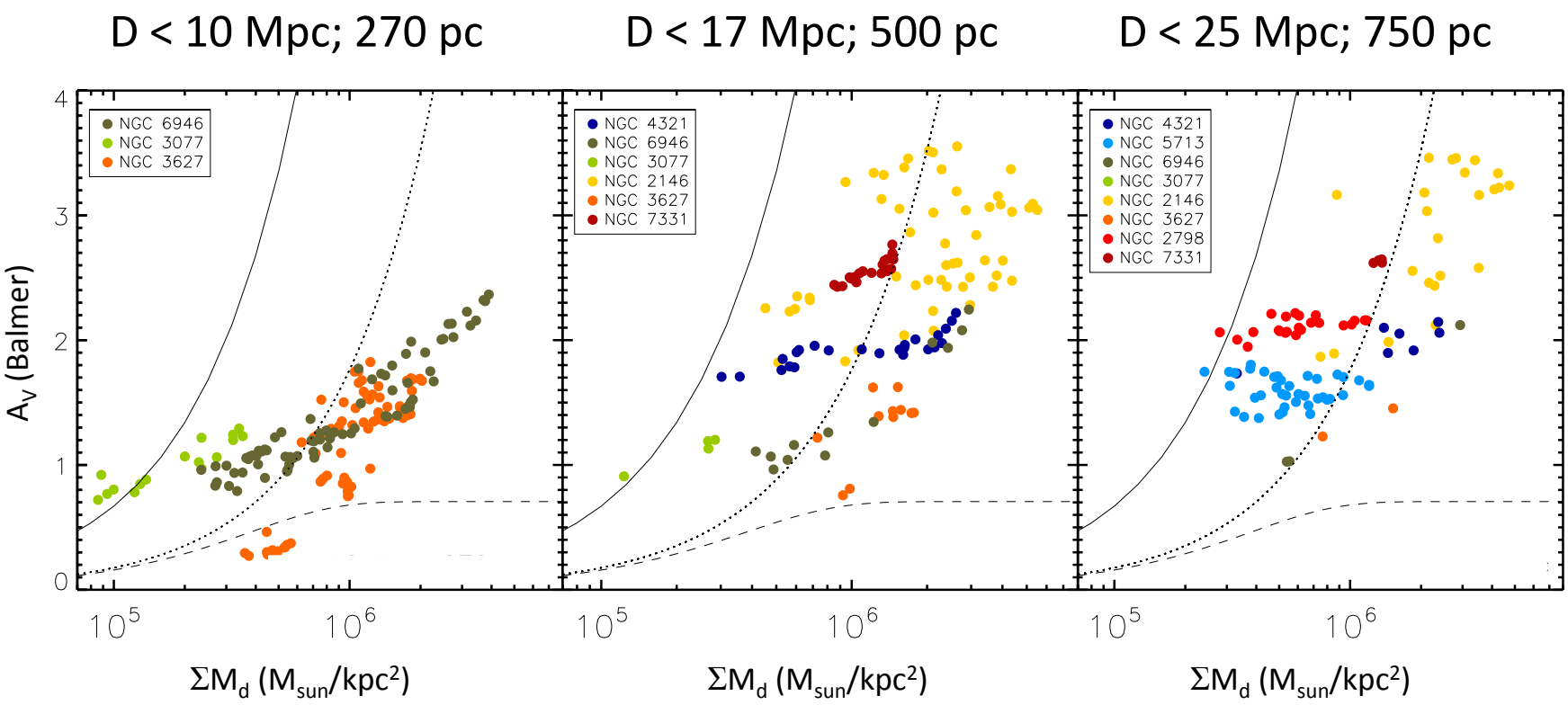
Kreckel et al. 2013

Trends within and between galaxies



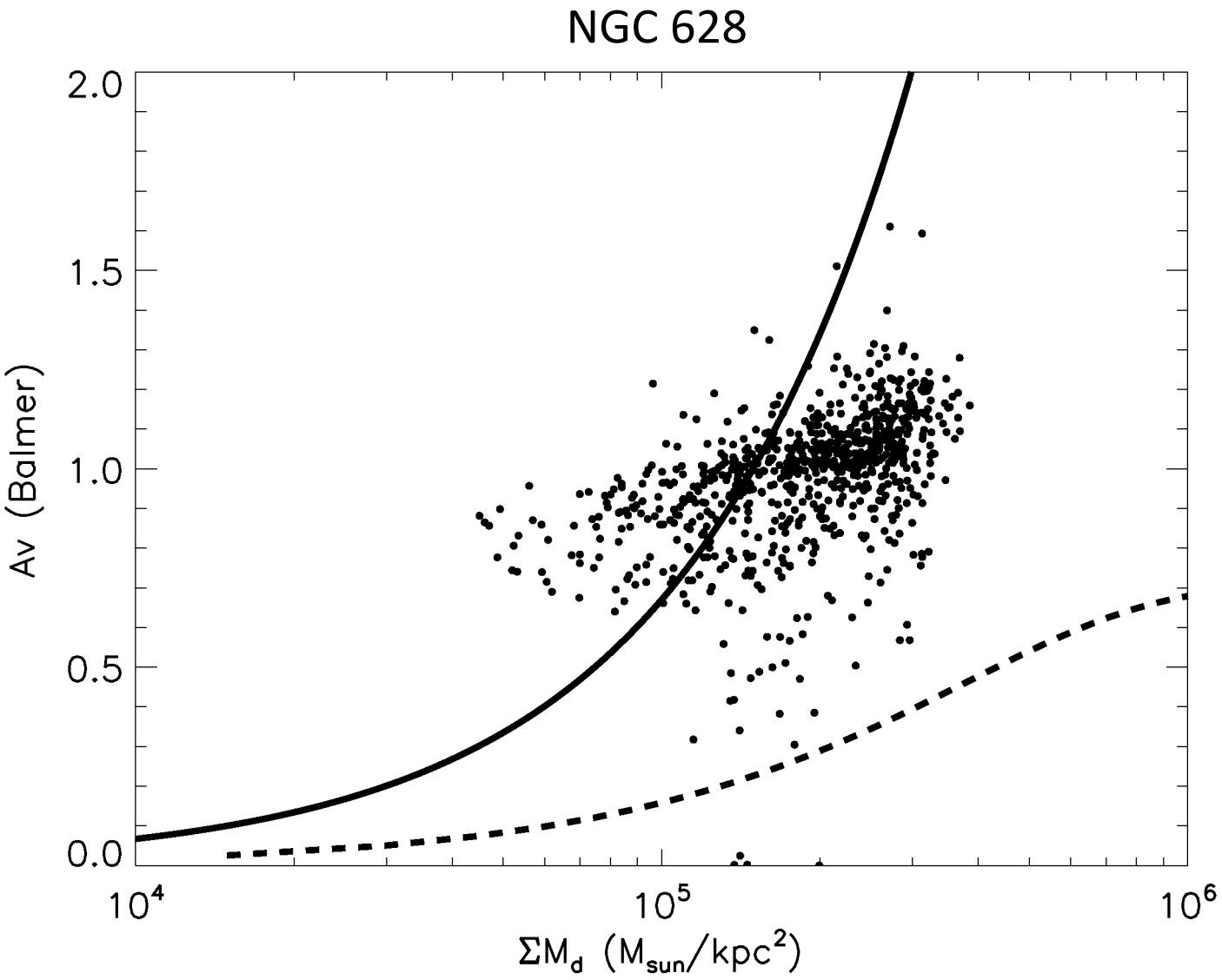
Kreckel et al. 2013

Effect of physical scales



Kreckel et al. 2013

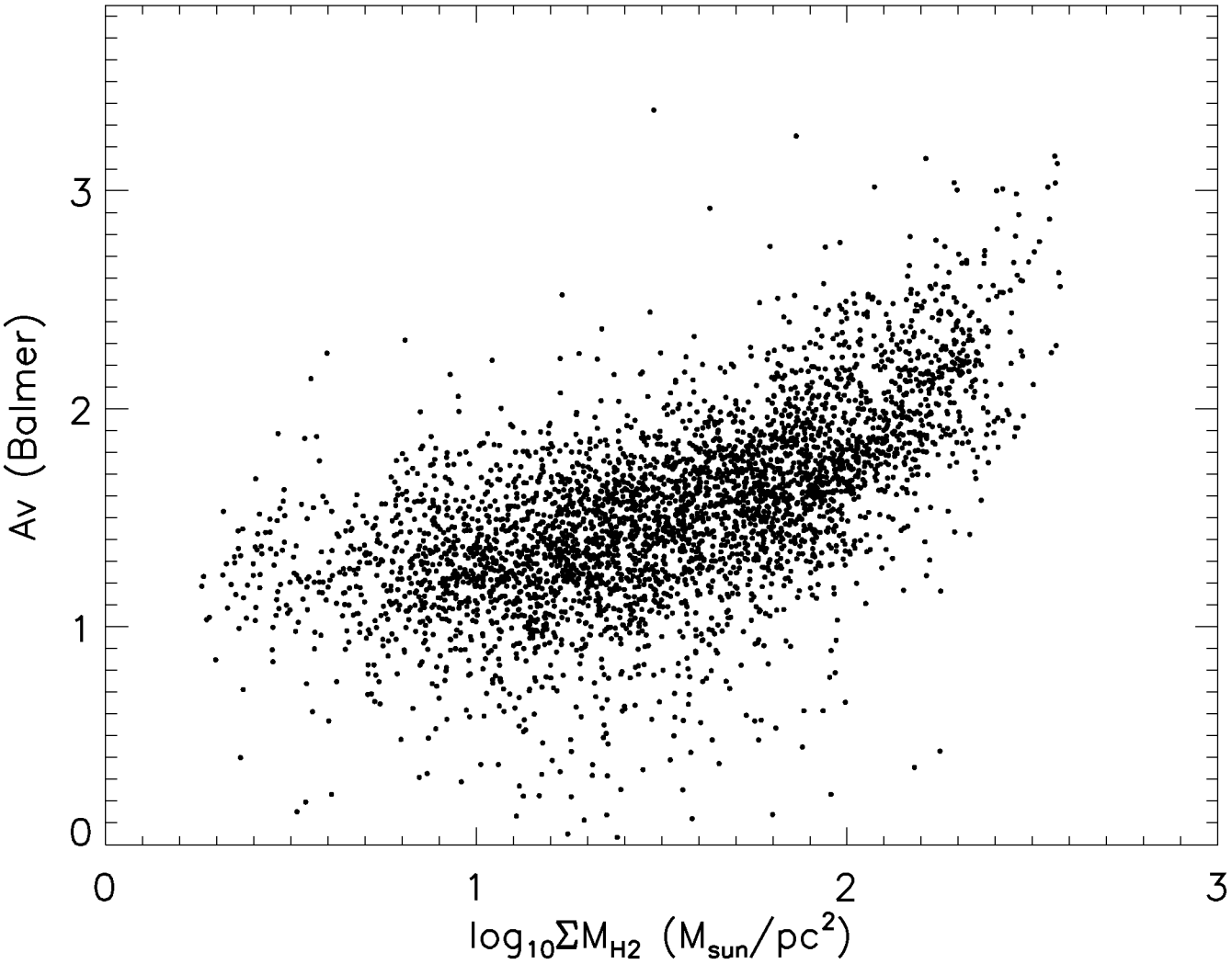
Future work – 200 pc resolution



using VENGA (Blanc et al. 2013)
and KINGFISH data

Future work – A_v vs CO

M 51 at 75 pc resolution



using VENGA (Blanc et al. 2013)
and PAWS (Schinnerer et al. 2013) data

Conclusions

- Balmer line reddening traces the dust distribution, particularly on ~200 pc scales

A_V (Balmer) = A_V (Foreground screen) / 3.8

- Stellar reddening is a poor tracer of the overall dust content

- HII regions are preferentially located within dusty environments

A_V (Stellar) = 0.47 x A_V (Balmer)
for HII regions

~ 0.7 x A_V (Balmer)
for DIG dominated regions