

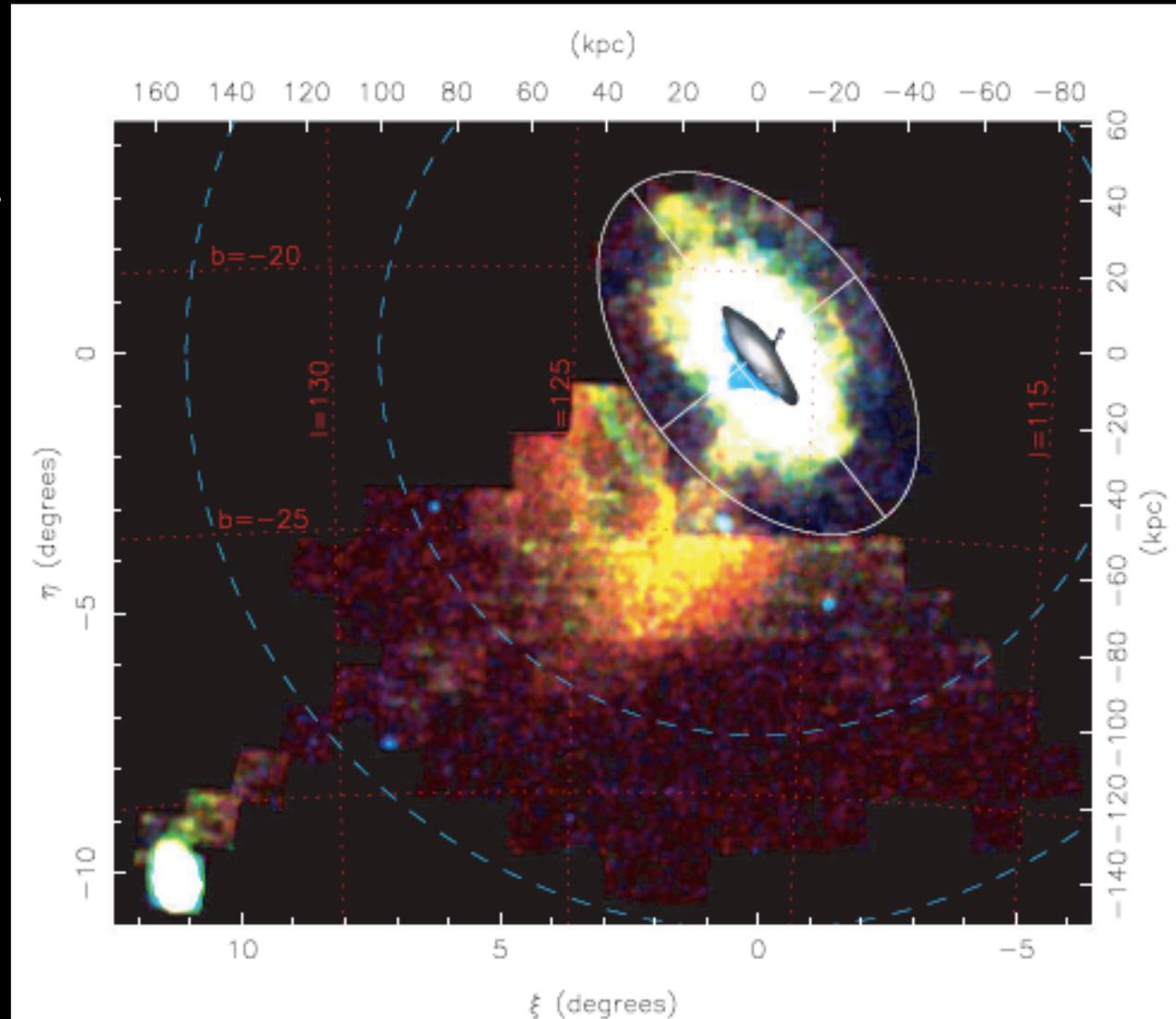
A deep space photograph of a star field. The background is dark with numerous small, distant stars. In the center, there is a very bright, large white star. To the right, there is another bright white star. Several other stars of varying brightness are scattered throughout the field. The overall color palette is dark with some greenish and reddish hues in the background.

(Stellar) metallicity maps of galaxies in
observations and simulations

Duncan Forbes (and Nicola Pastorello)
Swinburne University

Resolved Halos: M31

SPLASH and
PANDAS
surveys of M31
have measured
a metallicity
gradient out to
 ~ 120 kpc from
resolved stars.



Stellar Population Gradients using long-slits within R_e

Sanchez-Blazquez et al. 2007

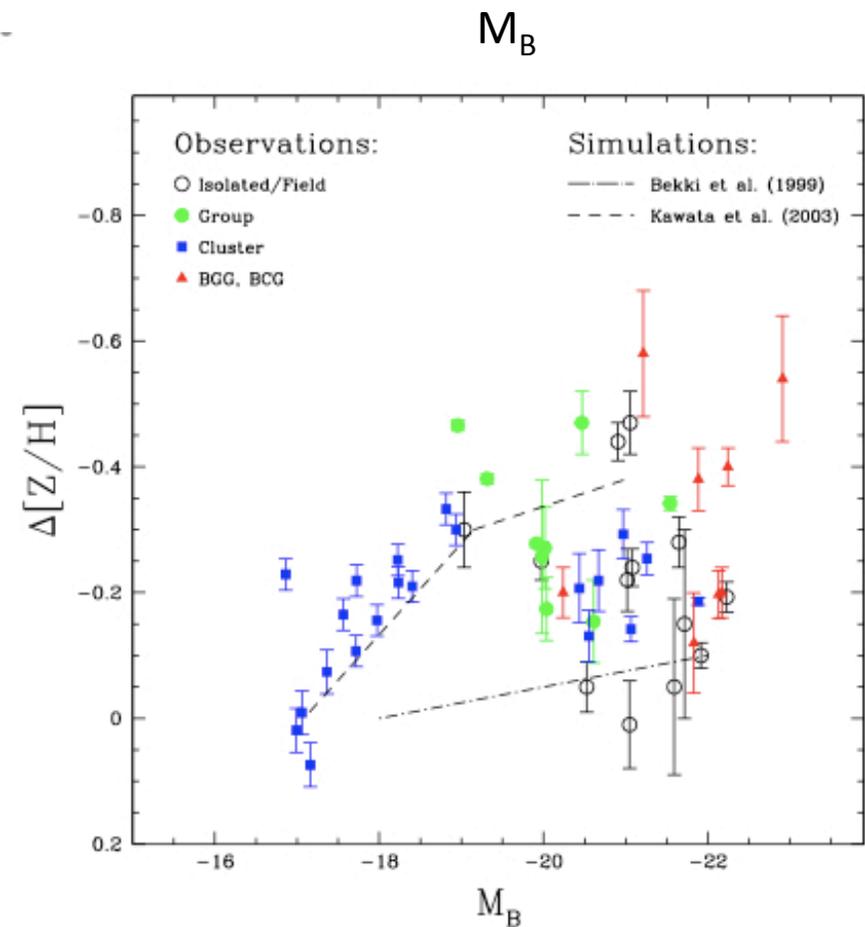
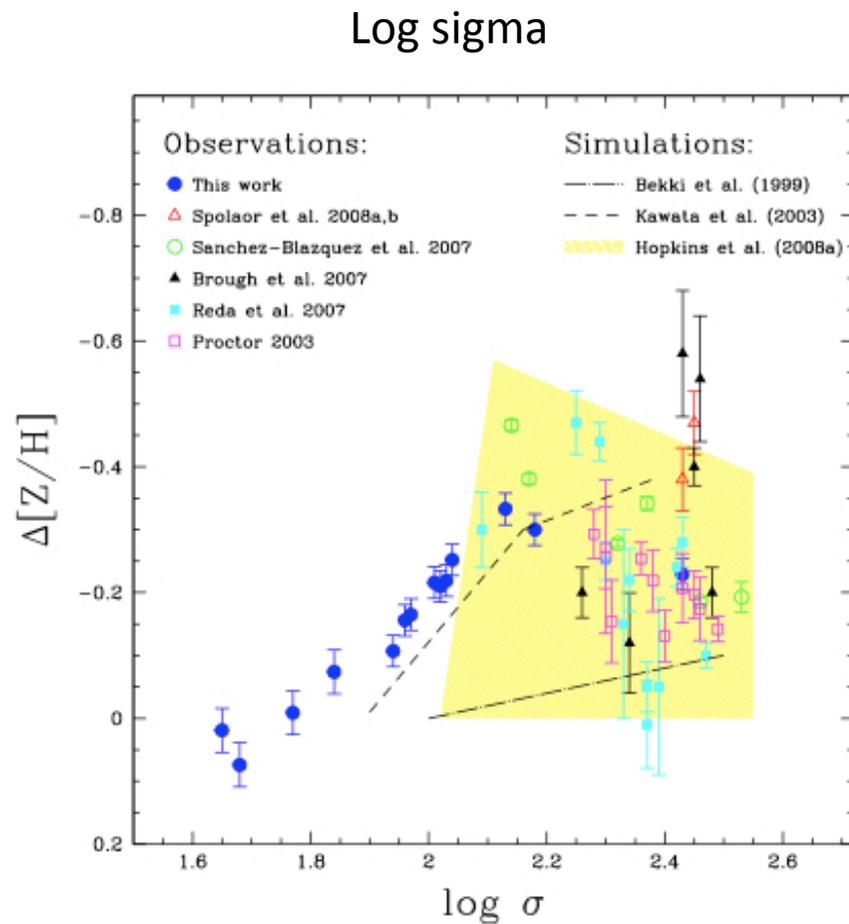
Brough et al. 2007

Spolaor et al. 2010

- Null, or positive, age gradients
- Null alpha/Fe gradients
- Strong negative Fe/H gradients

=> Inner regions of early-type galaxies
consistent with formation in a dissipative
process

Metallicity gradients ($<1R_e$) vs mass

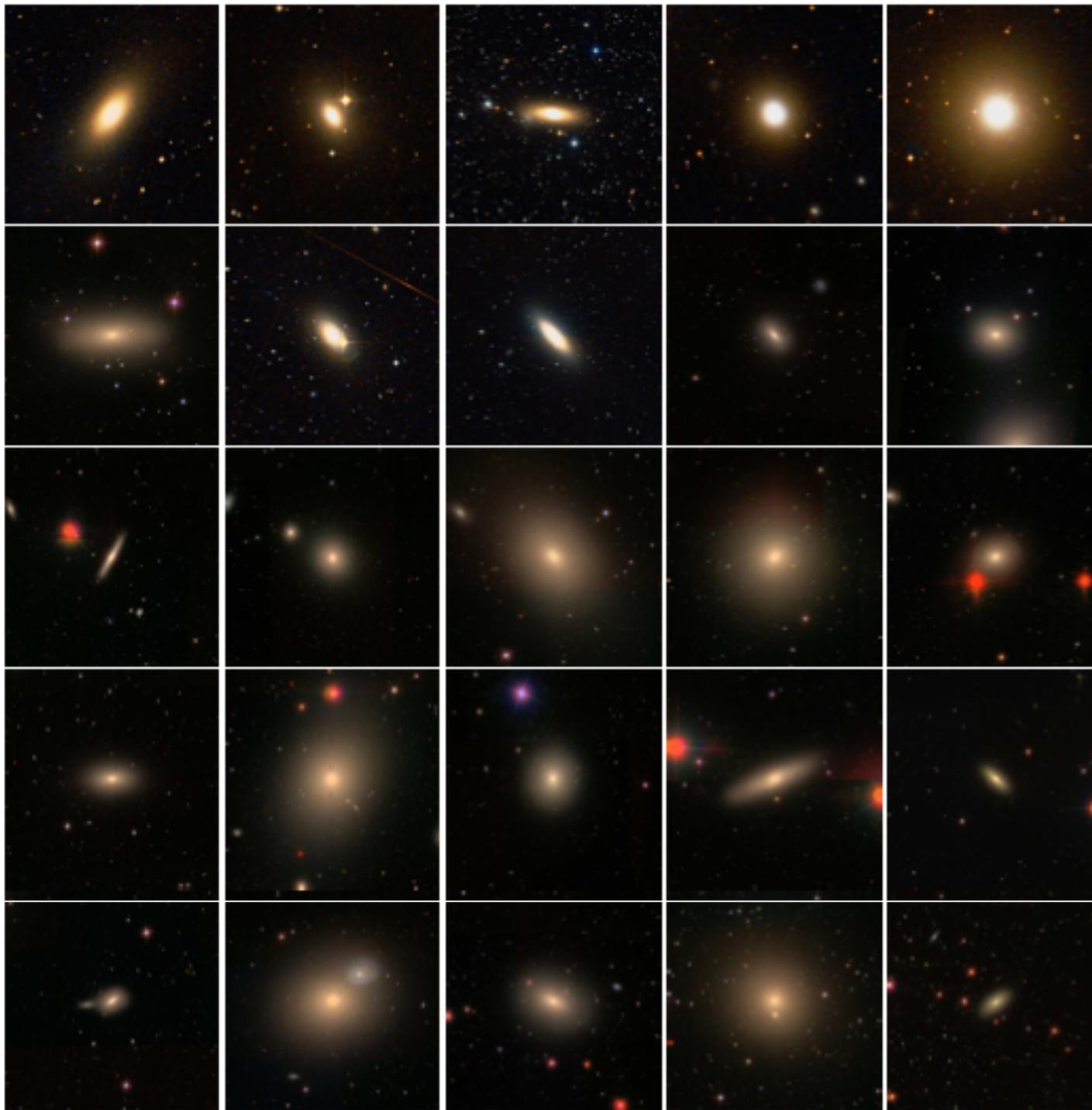


Spolaor et al. 2009

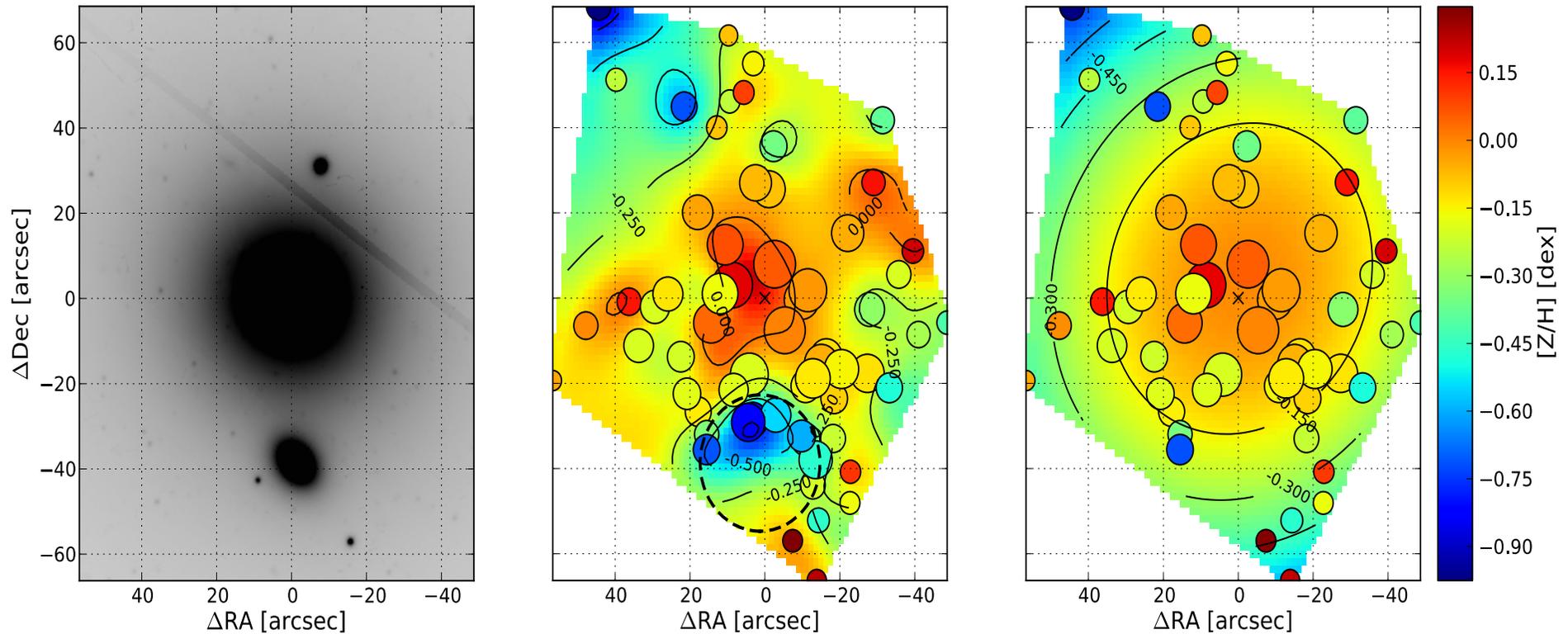
The SLUGGS Survey

- 25 ellipticals drawn to match the K-band luminosity function
- $-22 > M_K > -26$ ($\sim 50x$ in stellar mass)
- Inner regions IFU-probed by ATLAS^{3D}
- $D < 30$ Mpc
- Ellipticals ($T < -4$)
- $|b| > 15^\circ$

Probe stellar metallicity to $2.5R_e$ and GCs to $10R_e$

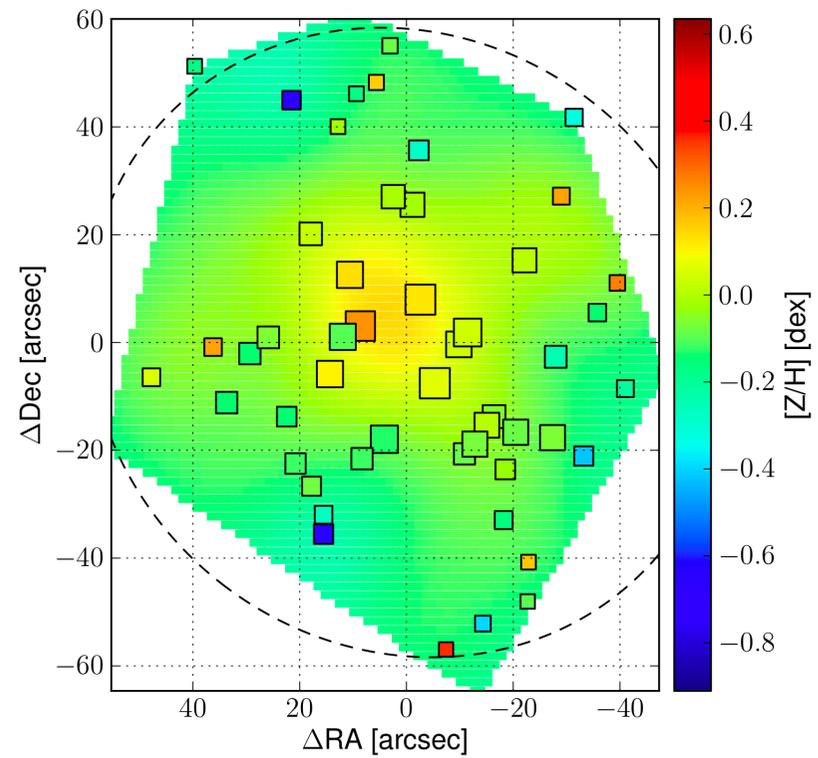
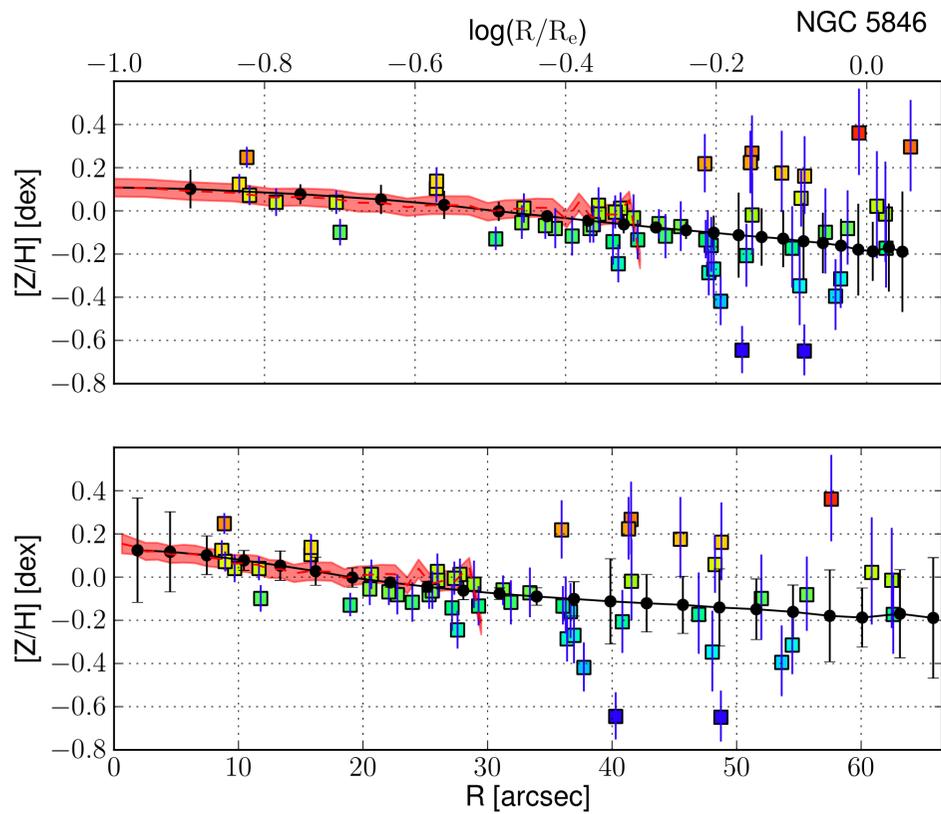


Stellar Metallicity maps

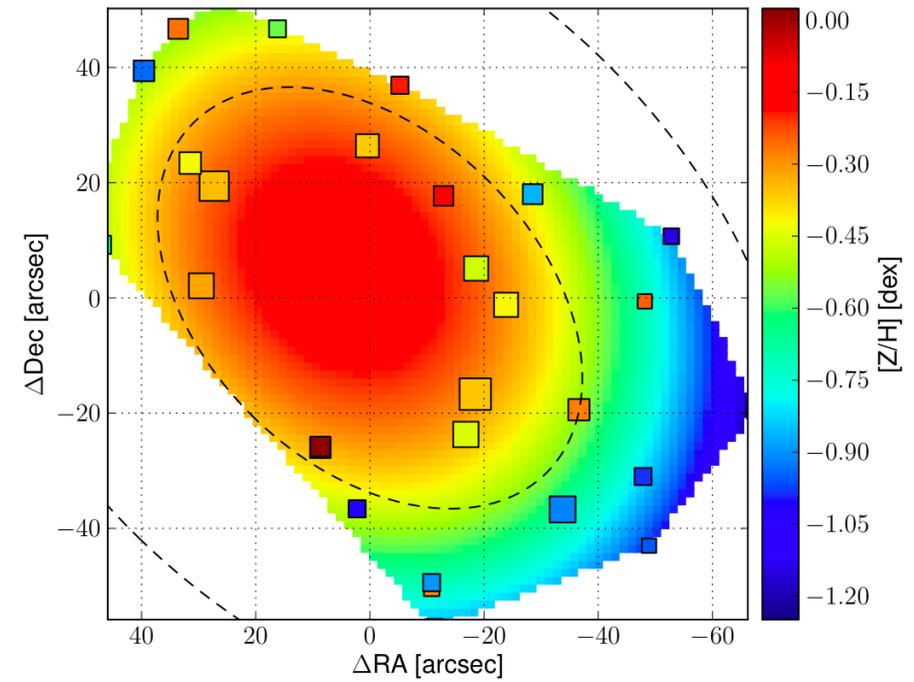
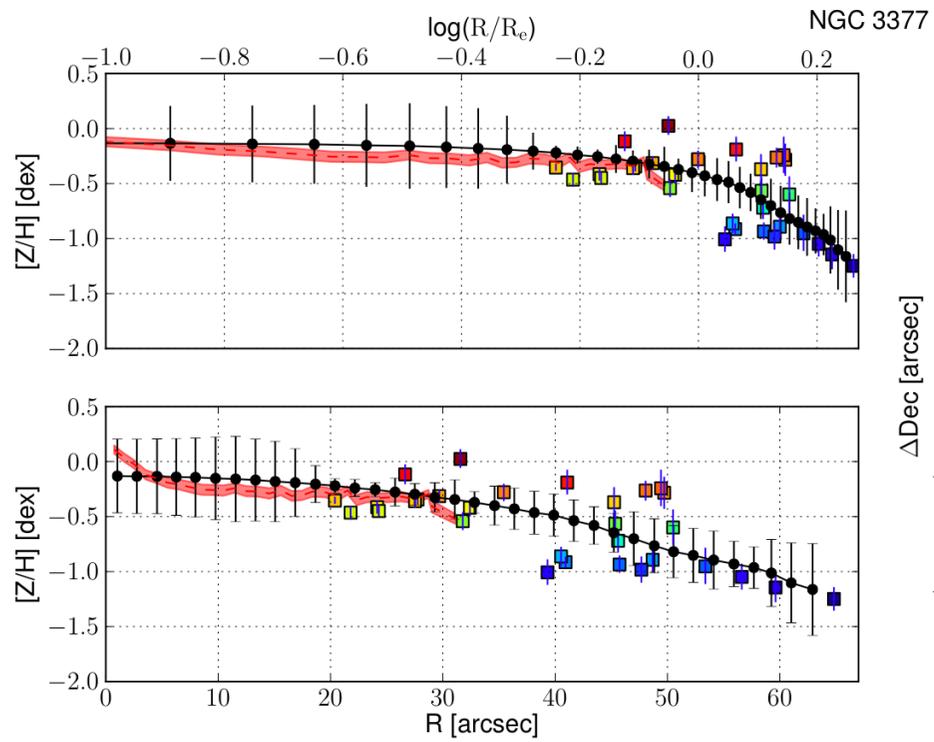


eg NGC 5846, Pastorello et al. 2013

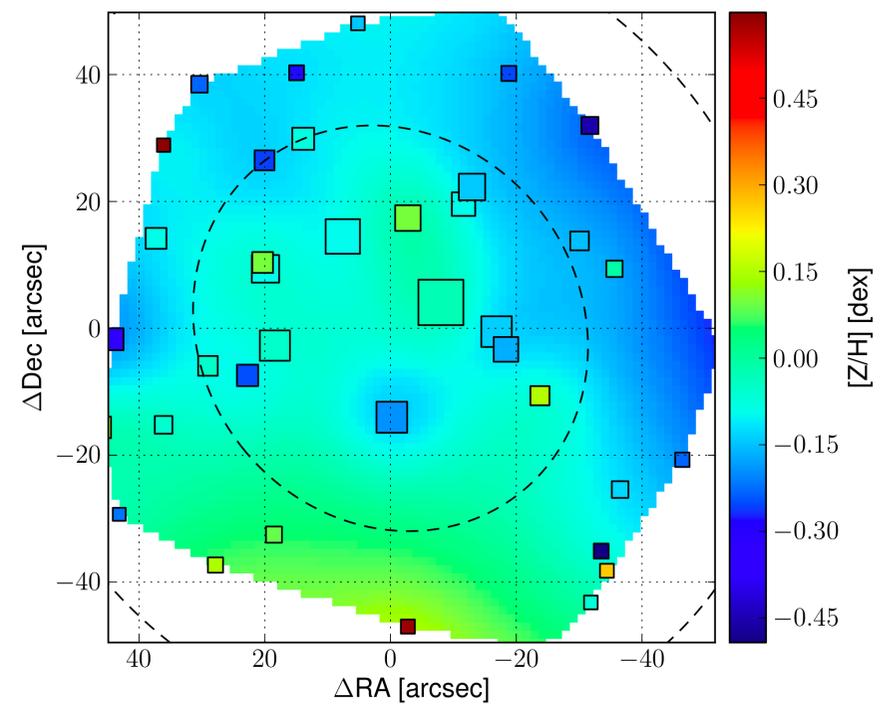
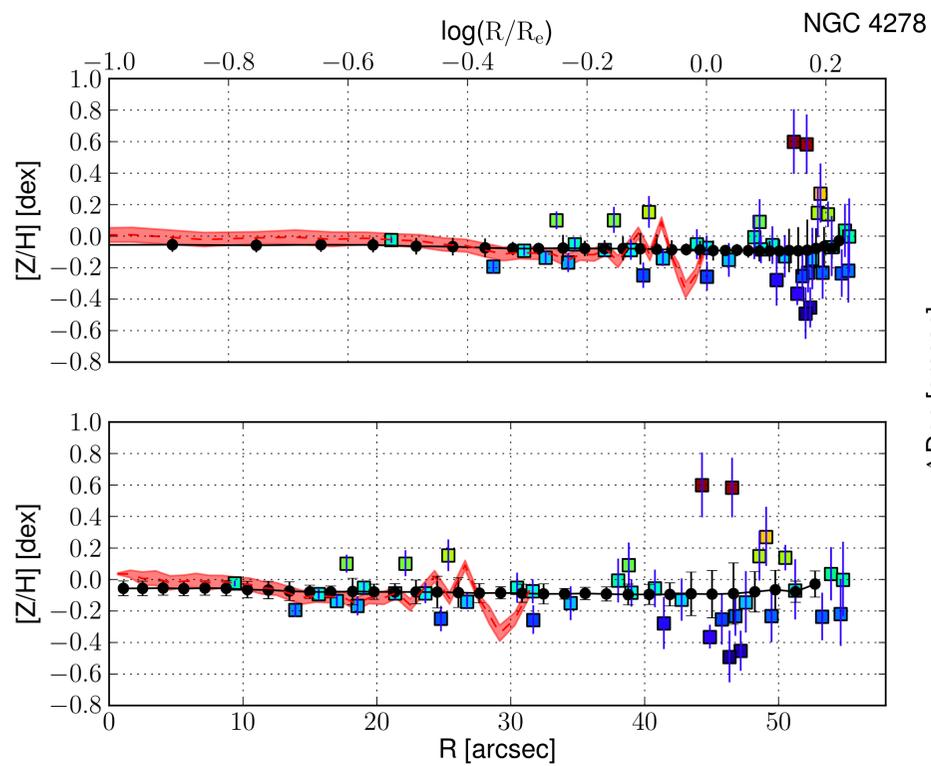
NGC 5846



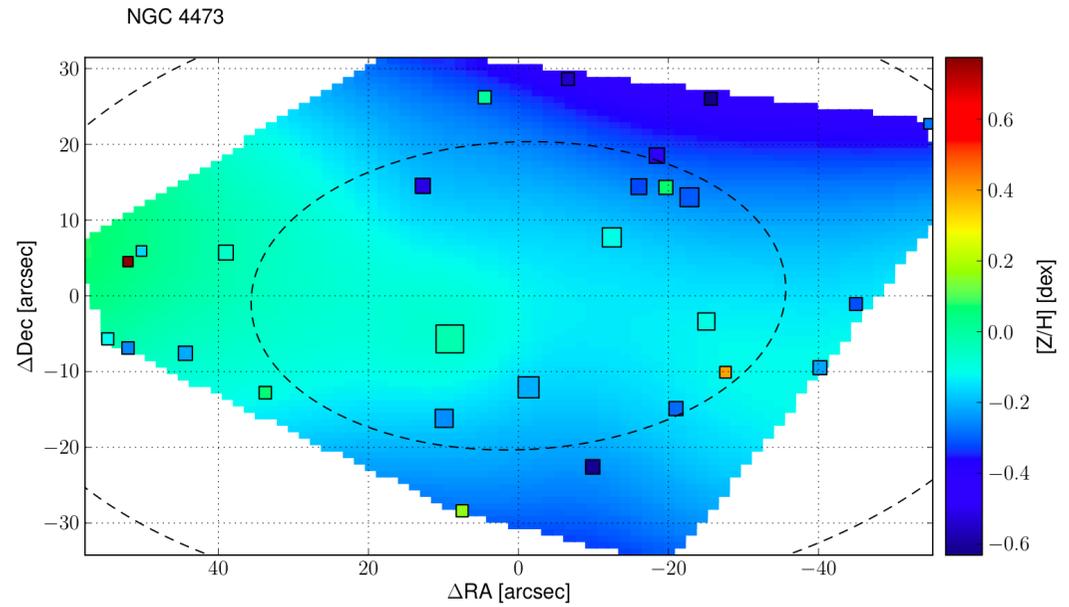
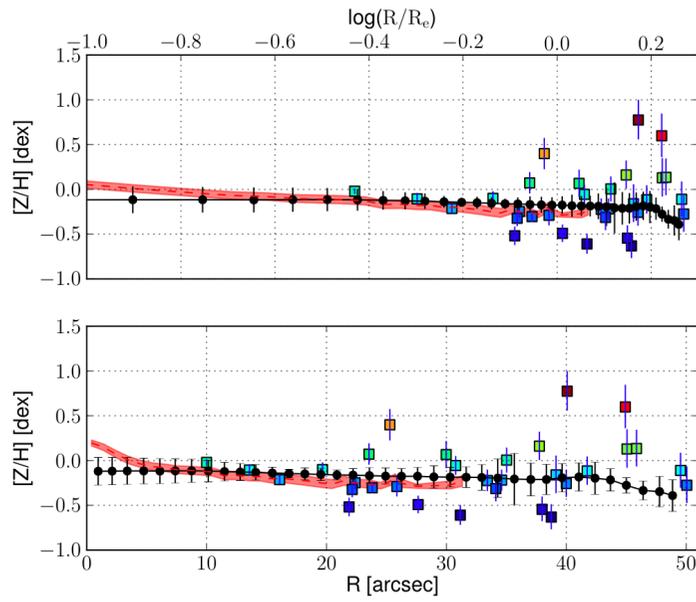
NGC 3377



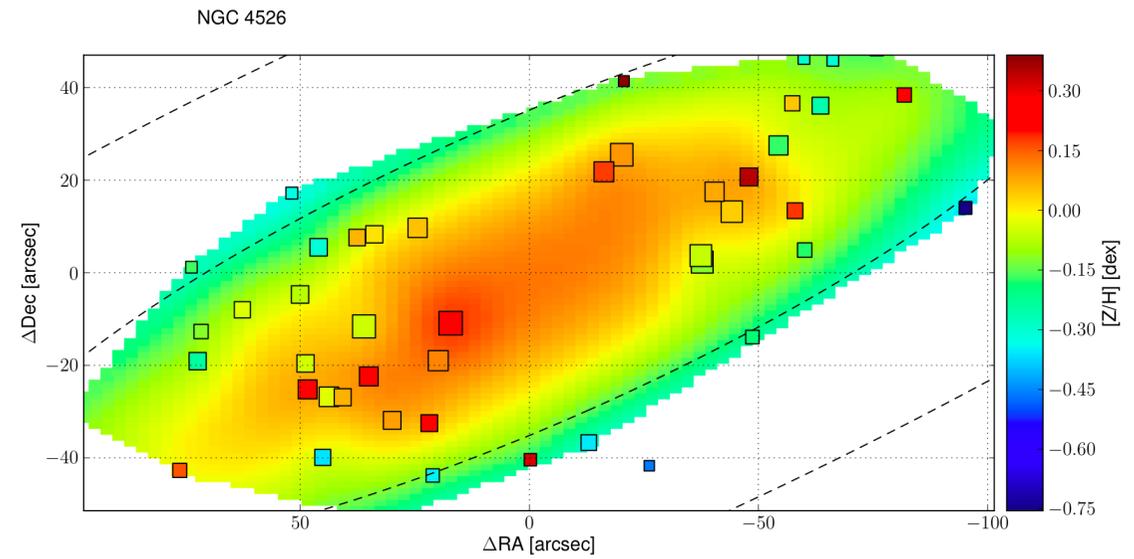
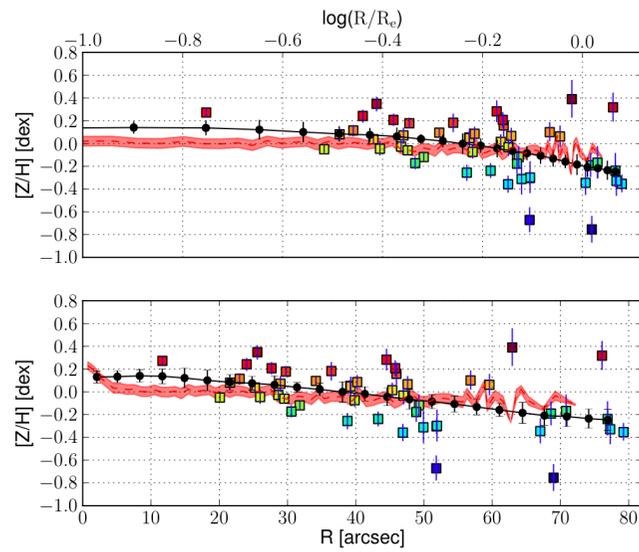
NGC 4278

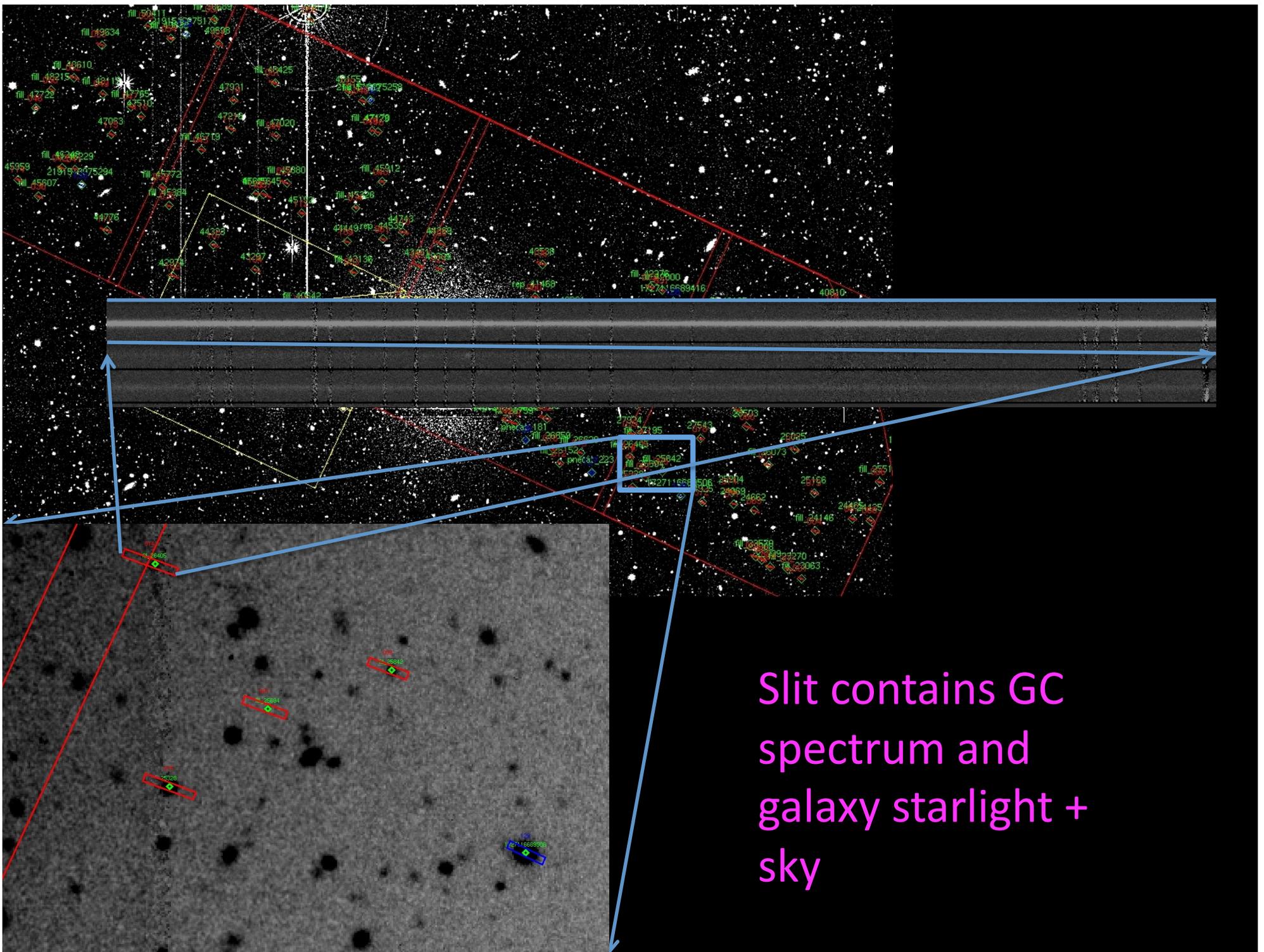


NGC 4473

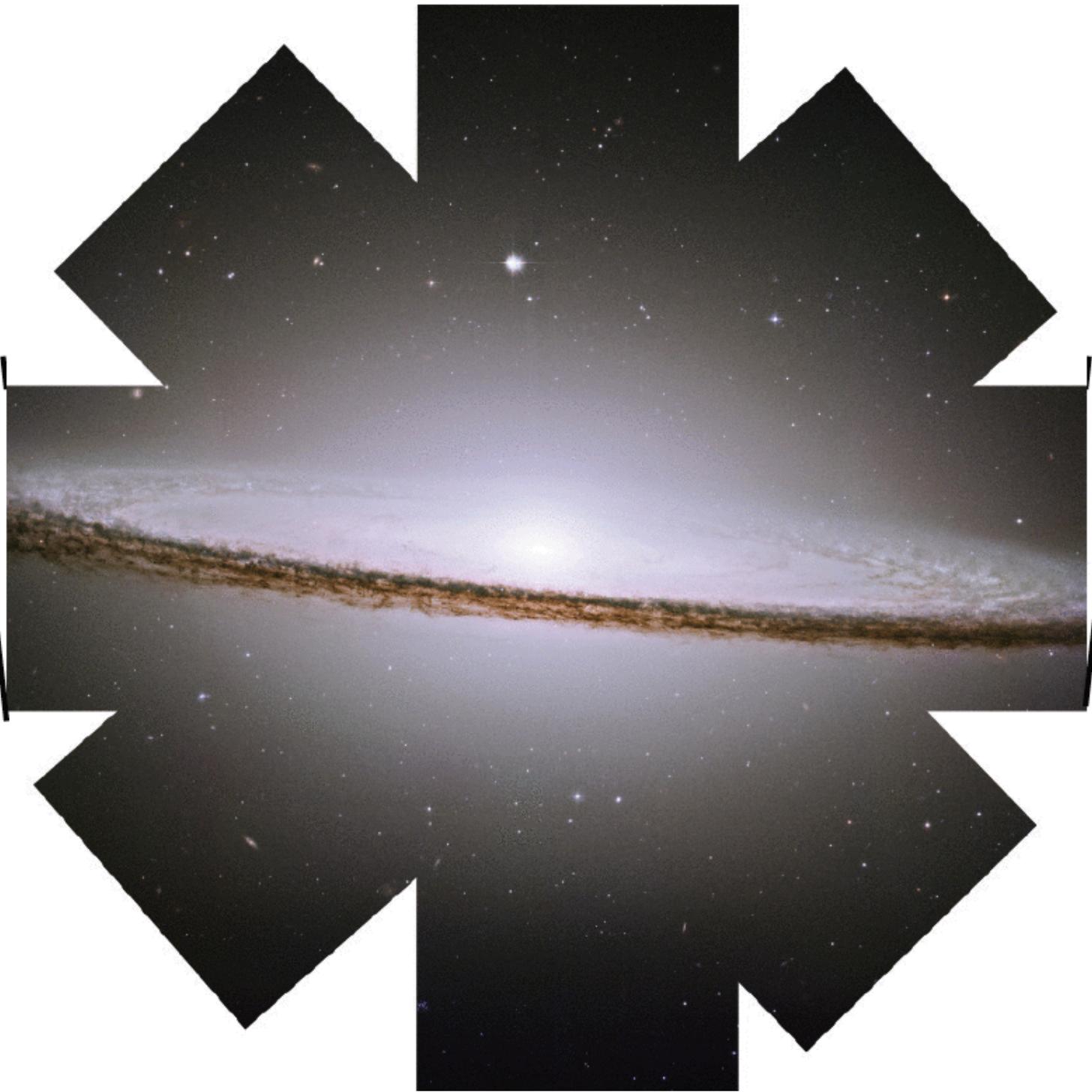


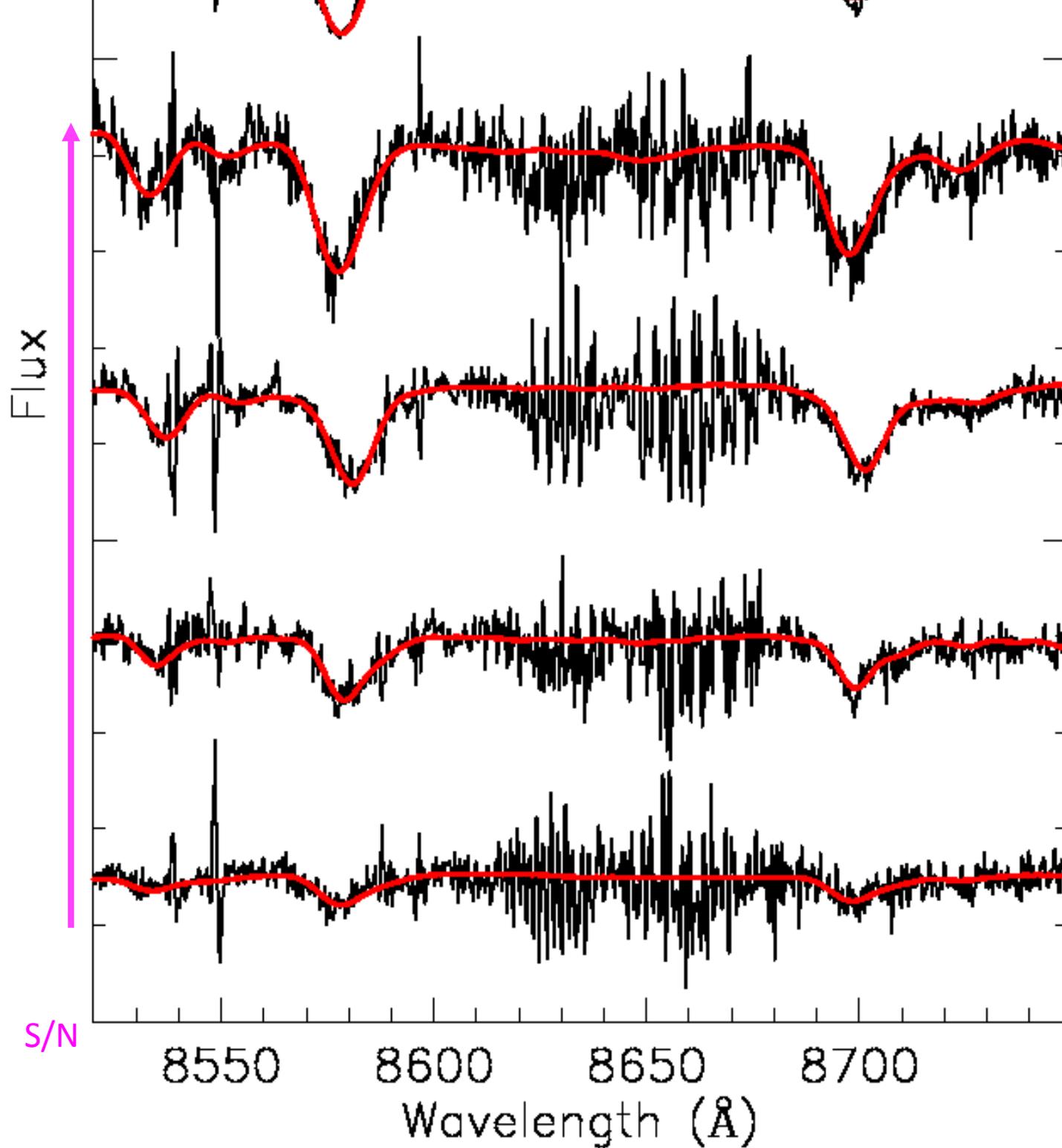
NGC 4526





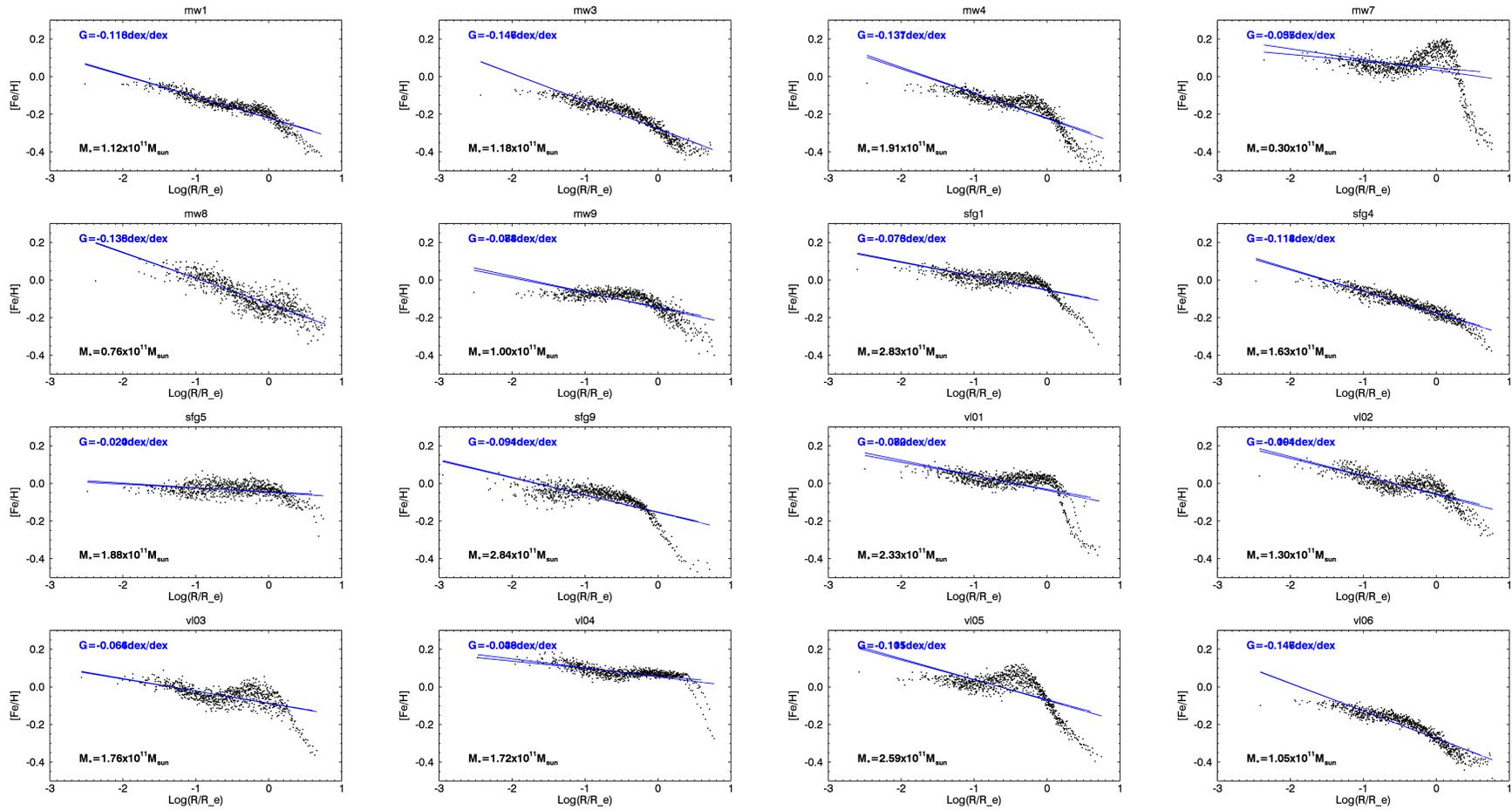




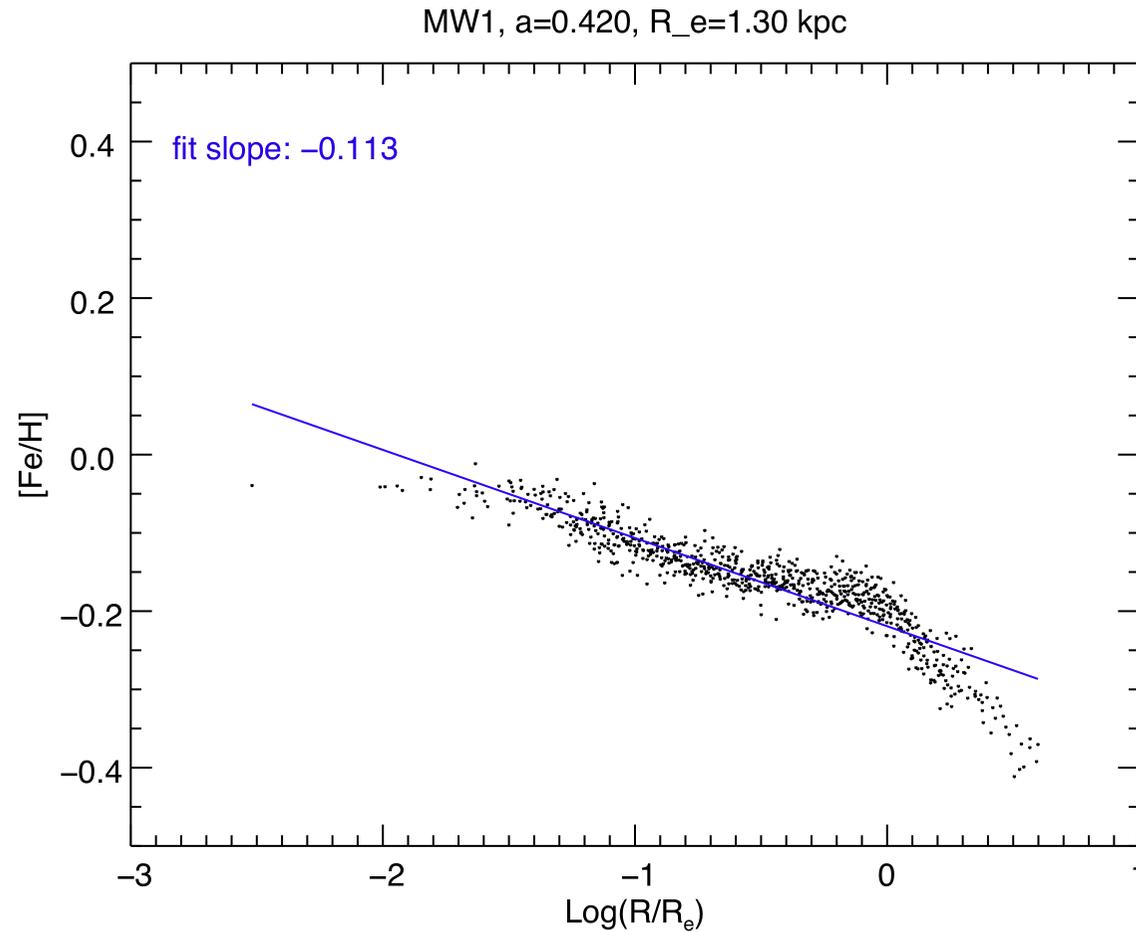


DEIMOS
spectra
and fits to
the galaxy
halo light
in the 3
Calcium
Triplet
regions

Violent disk simulations

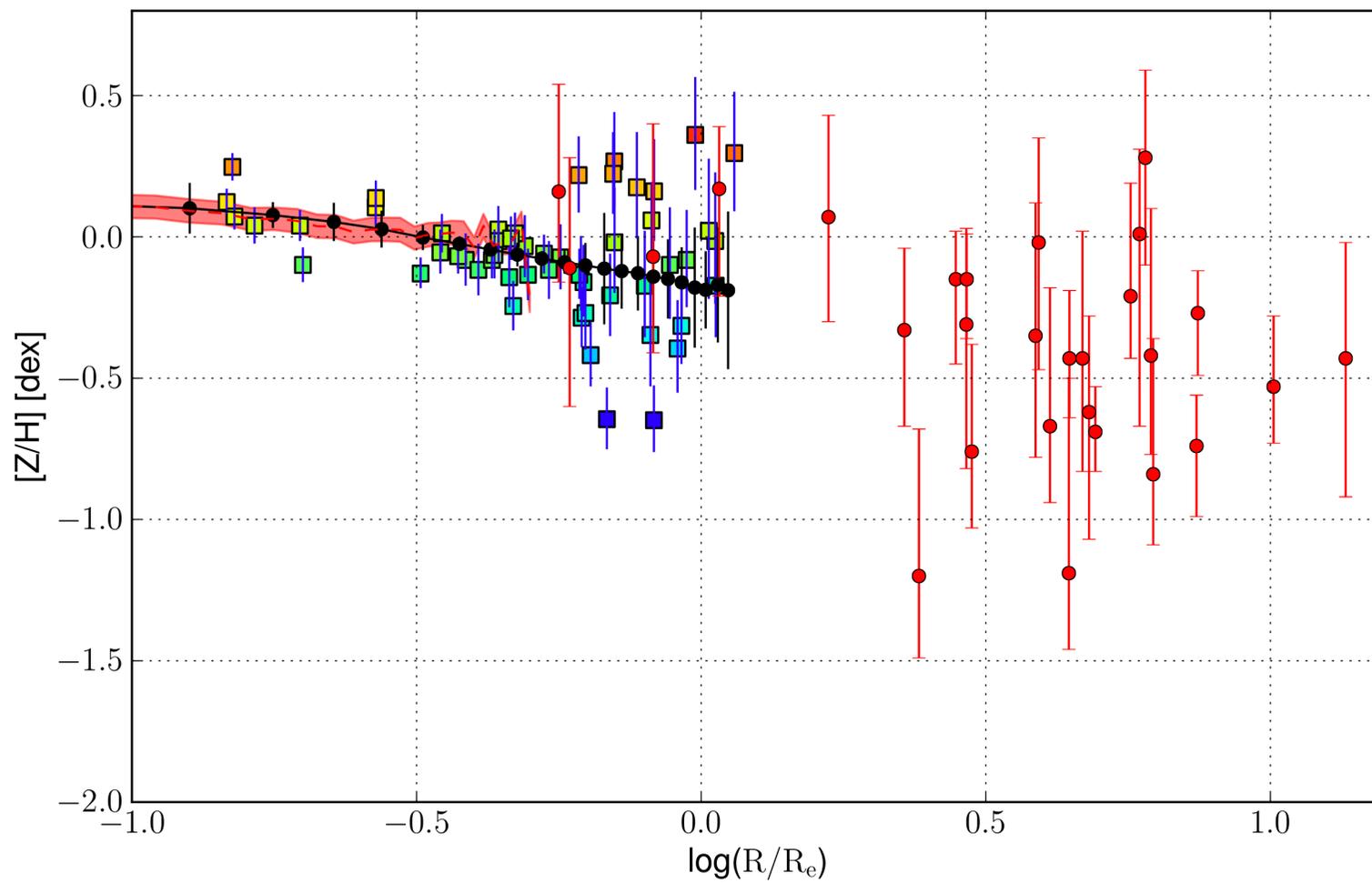


Violent Disk Simulation

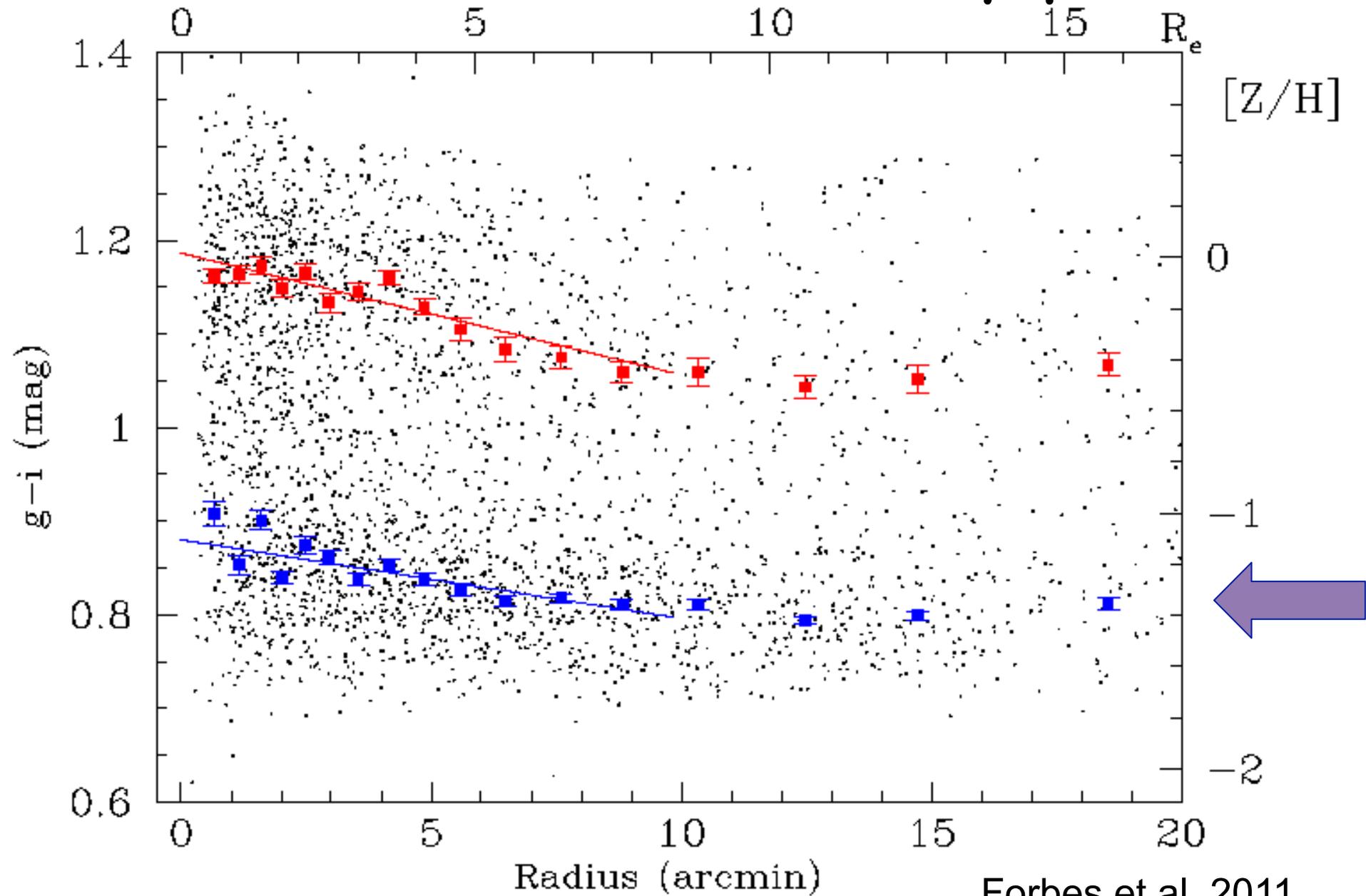


Kader & Romanowsky based on Ceverino simulation

NGC 5846 + red GCs



NGC 1407 GC metallicity profile



Forbes et al. 2011

Preliminary Conclusions

- Difficult to probe stellar populations to large radii in galaxies but necessary if galaxies have an in-situ core (red nugget) and accreted halo structure.
- SLUGGS is producing 2D stellar metallicity maps to $2.5R_e$ (extending to $10R_e$ with GCs)
- Find wide range of metallicity gradients at large radii, and a possible correlation with galaxy mass