VENGA

The VIRUS-P Exploration of Nearby Galaxies (VENGA) is one of the largest and most efficient 2D spectroscopic survey of the inner and outer regions of a large sample of 30 nearby spiral galaxies with the VIRUS-P Integral Field Unit (IFU) on the 2.7m telescope at McDonald Observatory.

Harlan J. Smith Telescope

* Initiated and led by graduate students

  (PI= Guillermo Blanc, current proposal lead= Tim Weinzirl)

* Faculty : Gebhardt, Jogee, Evans

* Funding from McDonald Observatory and NHARP grant (PI=Jogee)

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VENGA

VIRUS-P

- Main VENGA survey is with VIRUS-P IFU
  - large (4") sensitive fibers
  - large field-of-view (1.7'x1.7' or or 3.36 arcmin^2) w.r.t. existing IFUS (e.g., SAURON 0.37 arcmin^2 ; PMAS/PPAK IFU 1.3 arcmin^2)

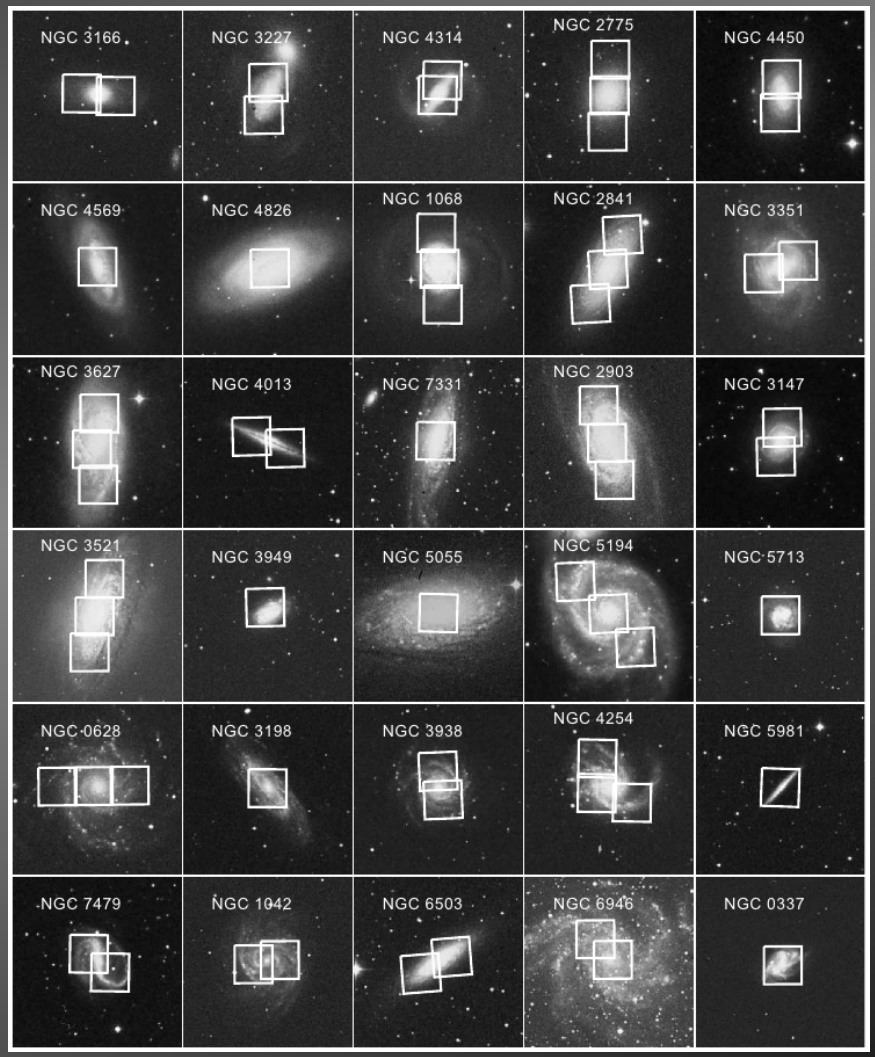
VENGA

- 30 Nearby Spiral Galaxies
- 60 1.7'x1.7' VIRUS-P Pointings
- ~ 44,000 spectra: 3600 Å – 6850 Å
- Blue=3600-5800 Å Red = 4560-6800 Å
- Spectral Resolution: 5 Å (120 km/s)
- Coverage ~ 0.7 R_{25}
- Median S/N=40 per fiber

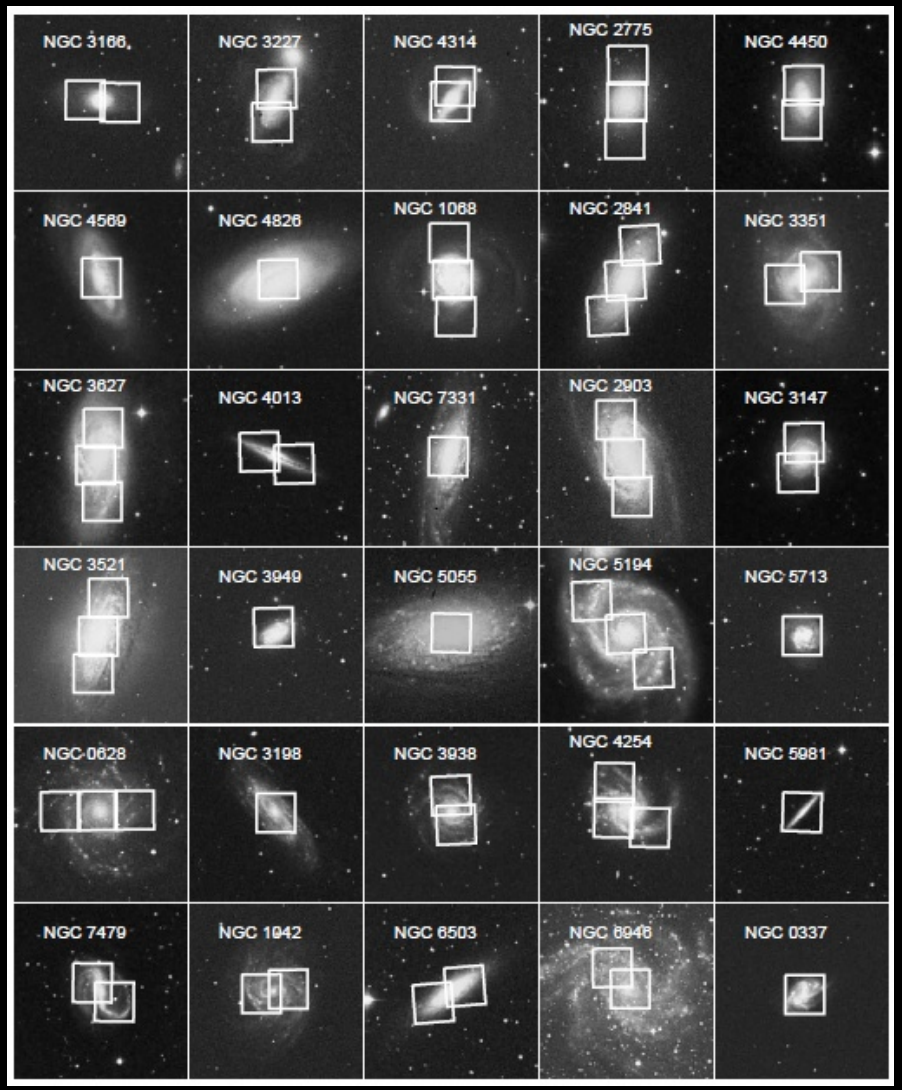
- Extension = VIRUS-W (high resolution =25 kms)

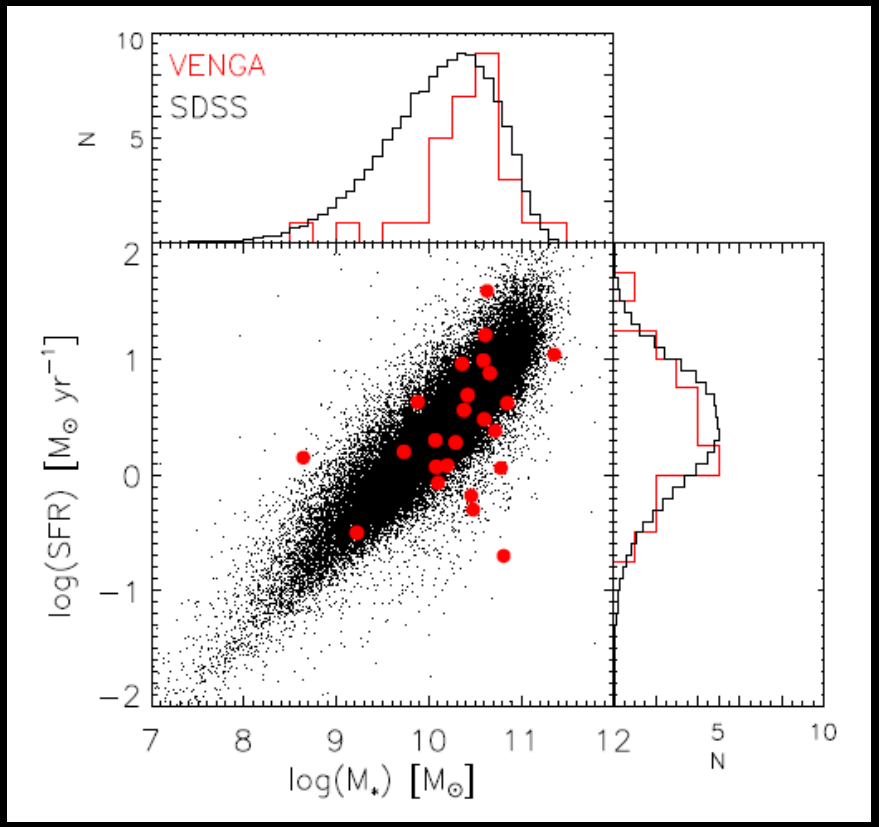
Venga Sample

- The VENGA sample includes 30 nearby spiral galaxies
- Galaxies have a wide range in morphology, structure, SFR
- Complementary data : CO, GALEX, Spitzer, 2MASS, SDSS



The VENGA Sample





30 nearby spiral galaxies showing a wide range in morphology.

Survey Status

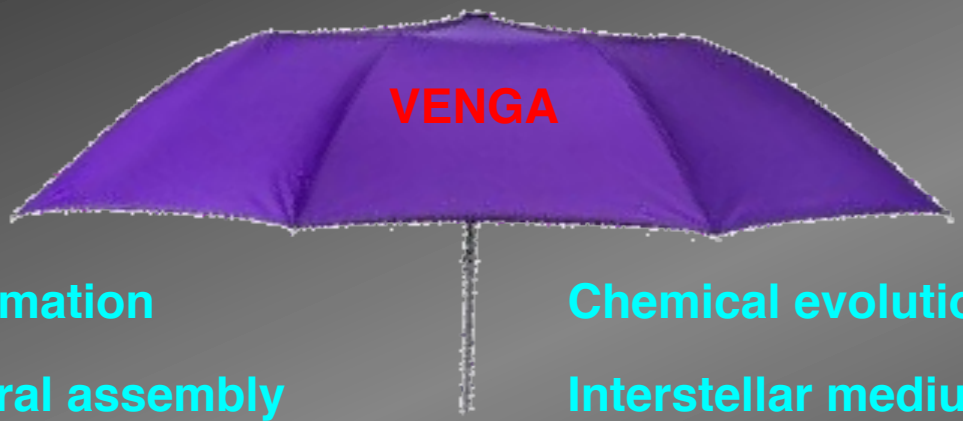
- VENGA has been awarded 149 nights, a lot of time!
  - So far, we have 102 nights of usable data
  - About 1/3 of the time (47 nights) was lost to various circumstances (weather, technical problems, dome painting, and even a wildfire)

Observation Phase	Dates	Galaxies Completed
Red VIRUS-P (460-680 nm)	April 2009 – July 2010	26
Blue VIRUS-P (360-580 nm)	September 2010 – July 2011	25
VIRUS-W (485-545 nm)	November 2010, July 2011	6

- Data collection is almost completed
- Funding from NHARP grant (PI=Jogee) till 2013 + McDonald Observatory

Science Goals

- VENGA allows a large number of researchers to explore a variety of topics relevant to galaxy formation:



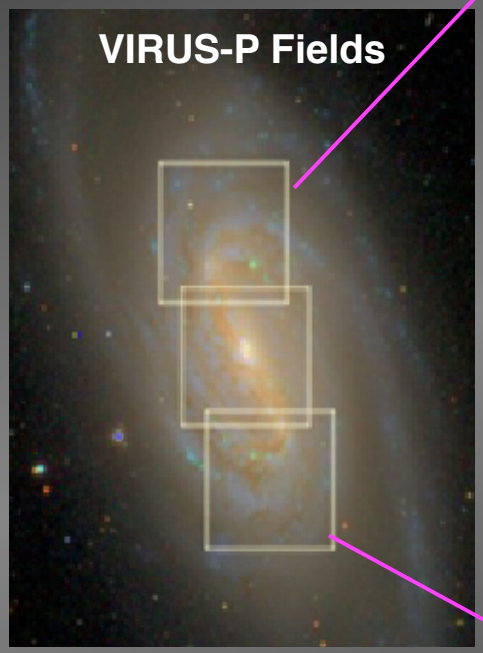
- VIRUS-P versus VIRUS-W:
  - VIRUS-P is efficient for studies of star formation, stellar populations, and chemical abundances, etc.
  - VIRUS-W is specifically designed for studying gas/stellar motions

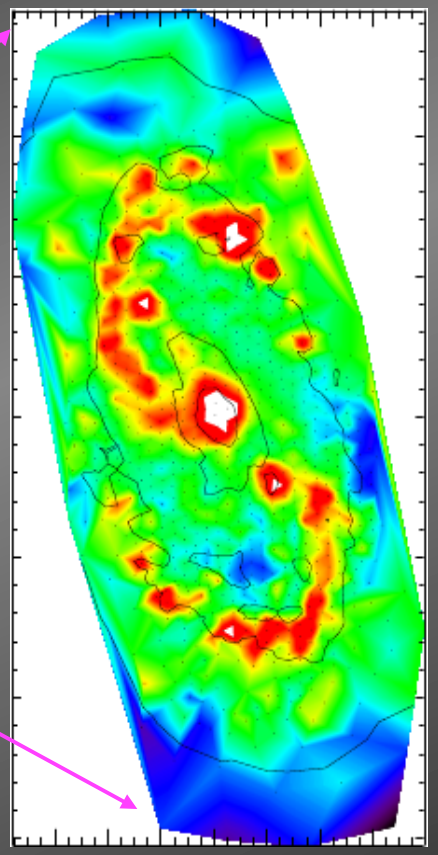
- VENGA:
  - 44,000 independent regions (~10^2 pc) over 30 nearby spirals
  - Mapping the structure, dynamics, and chemistry of both stars and gas in disks out to > 0.75 R_{25}

- ADVANTAGES FOR STAR FORMATION STUDIES:
  - E(B-V) : Hα, Hβ
  - AGN shocked and photo-ionized regions: [OIII], [SII], Hα, Hβ
  - Separate DIG from HII regions: [SII], Hα
  - Balmer Absorption from stellar continuum fitting
  - No [NII] contamination in Hα fluxes
  - Reliable SFR from spectrocopically measured Hα

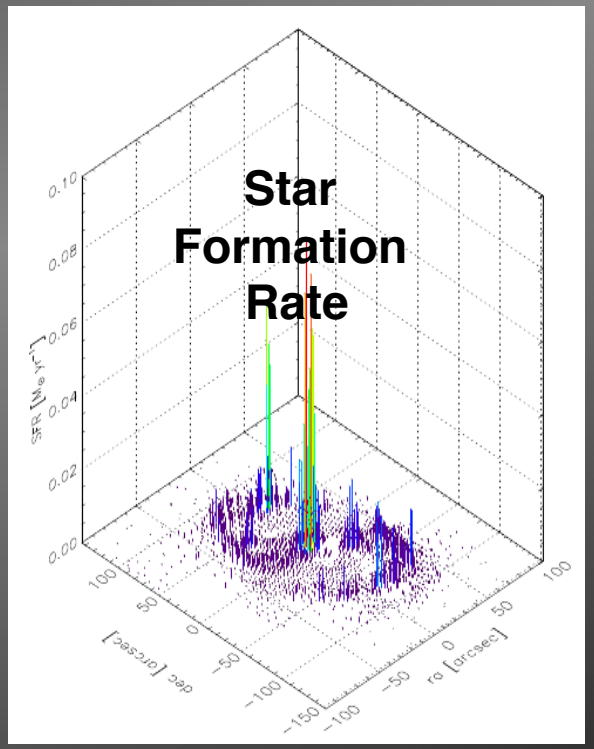
Example: NGC 2903 (VIRUS-P)

- NGC 2903 observations :VIRUS-P: January 2009, December 2010

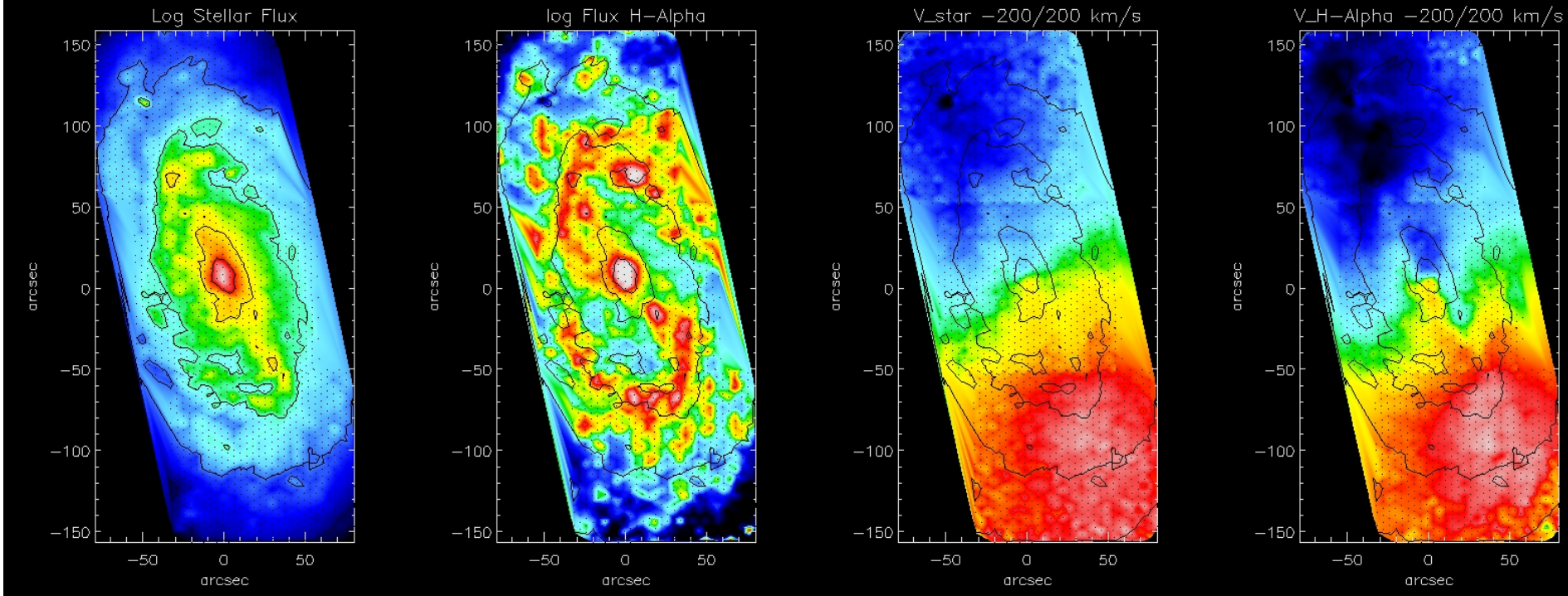




Hα (6563 A)

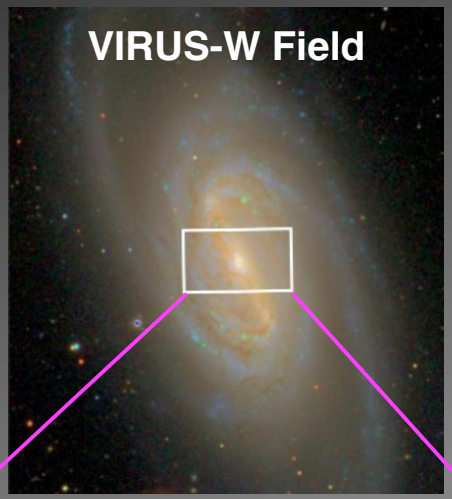


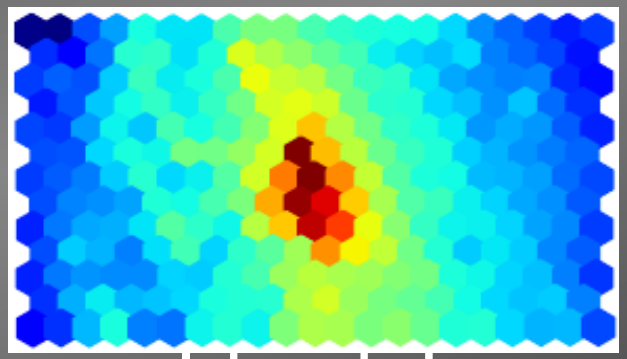
Example: NGC 2903 (VIRUS-P)



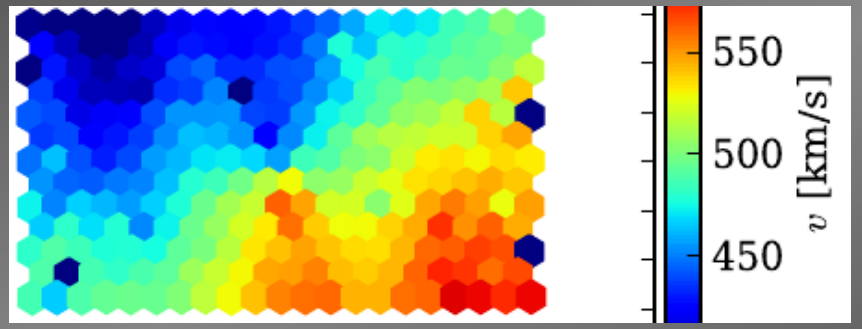
Example: NGC 2903 (VIRUS-W)

- NGC 2903 :VIRUS-W: November 2010

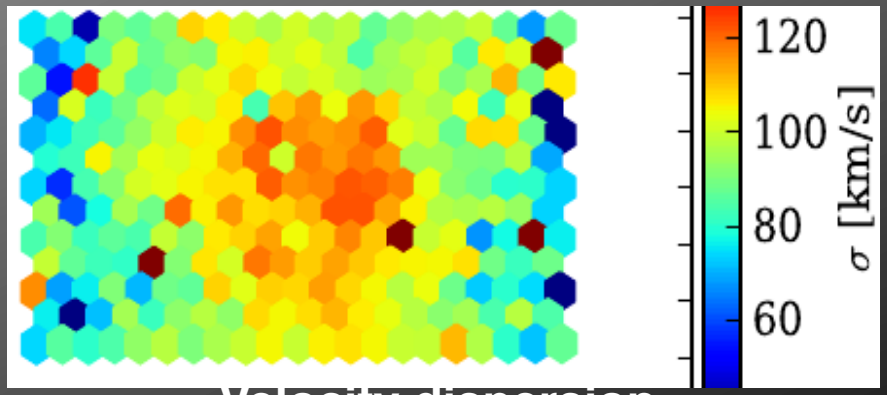




Integrated light



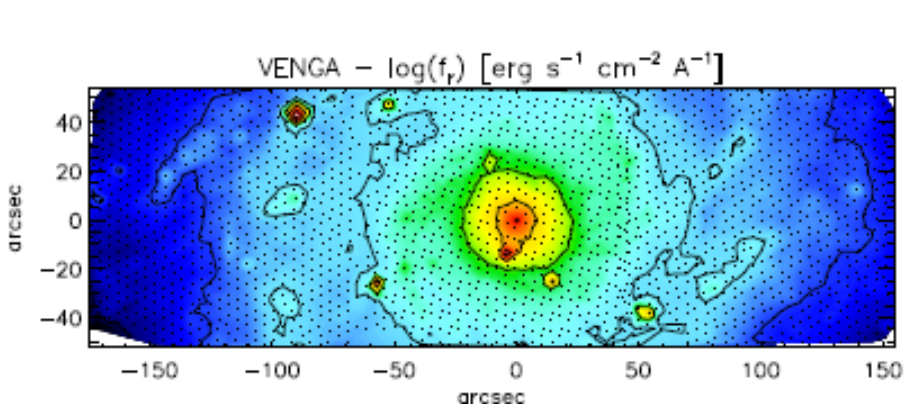
Stellar velocity

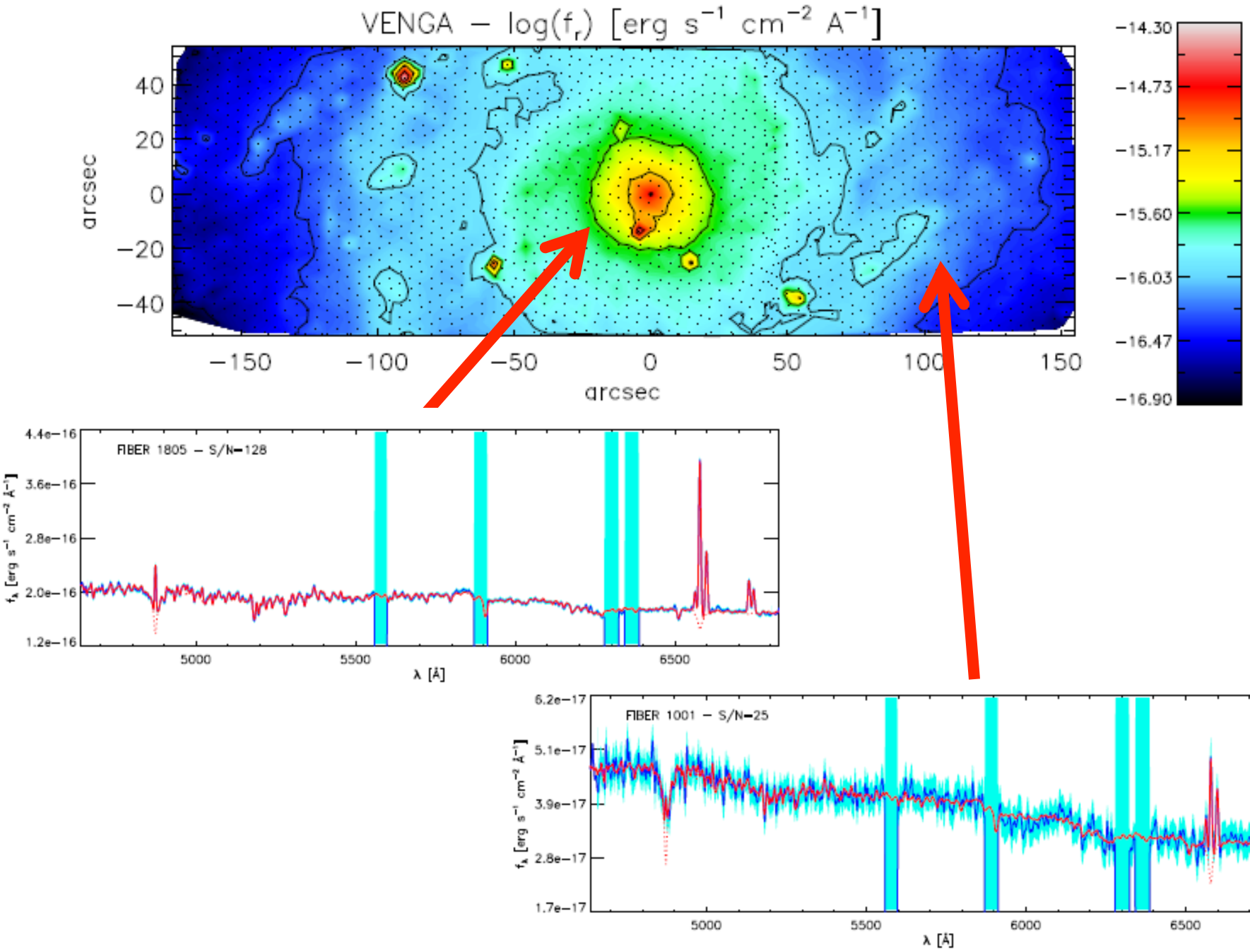


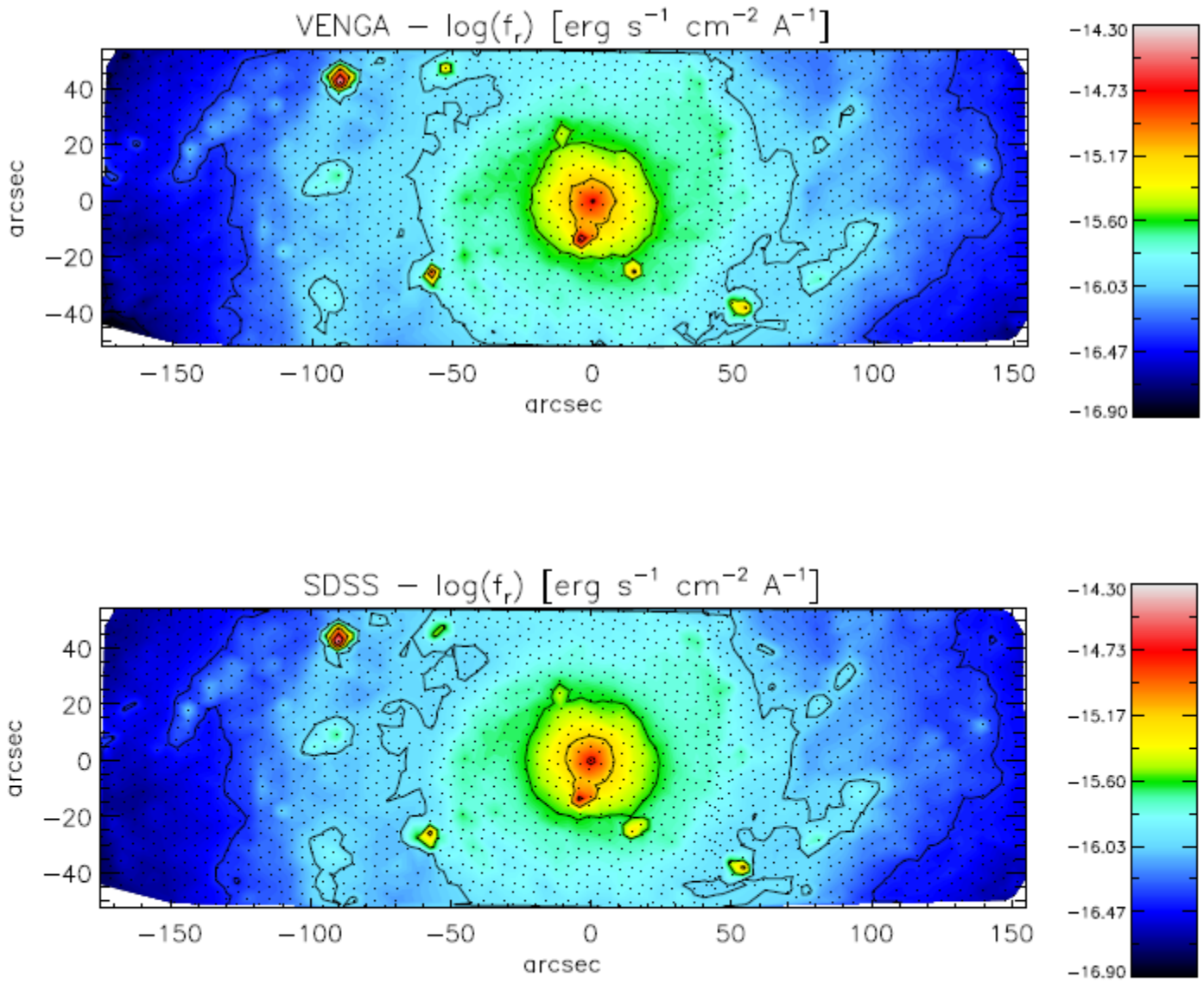
Velocity dispersion

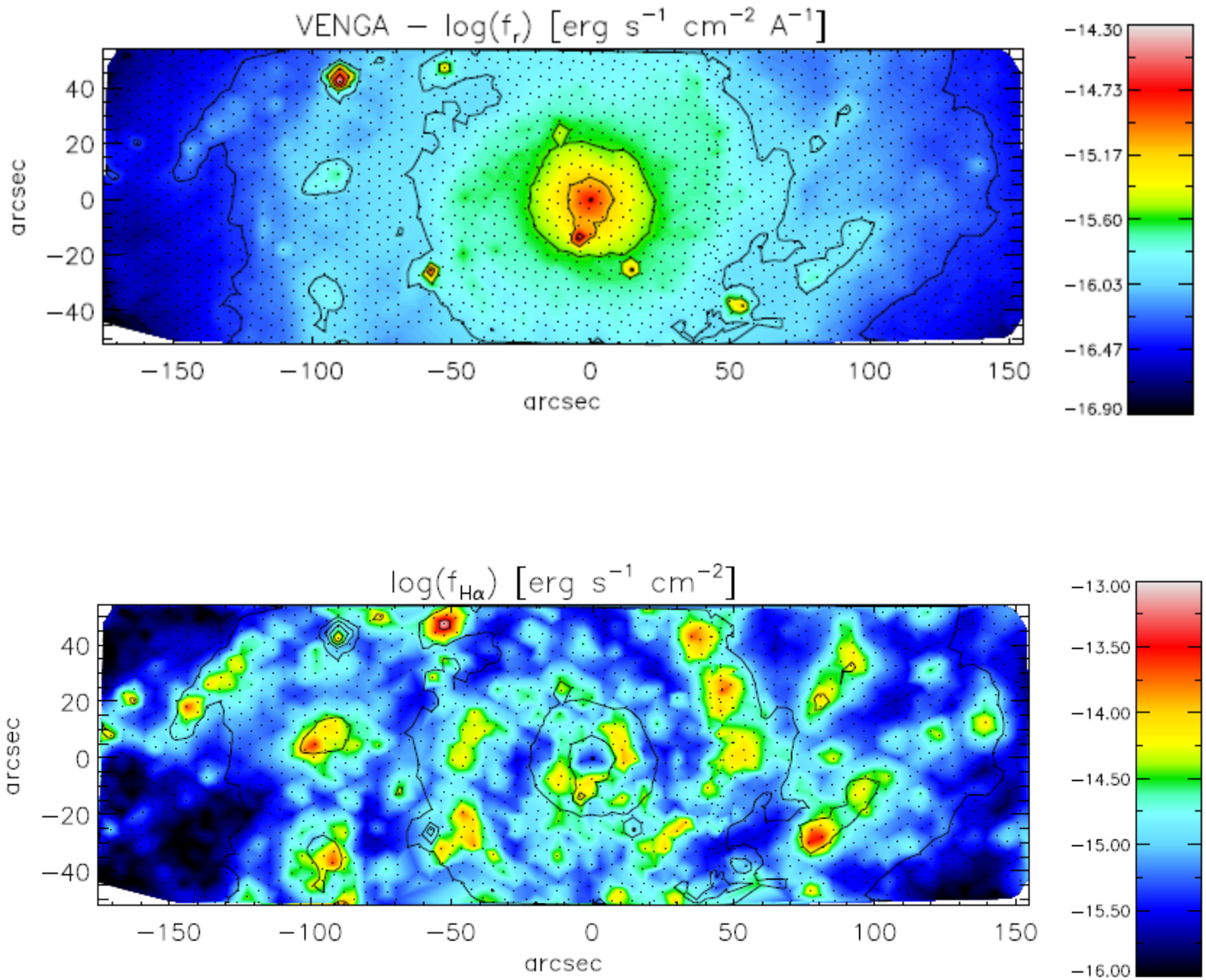
(i.e., spread in velocities)

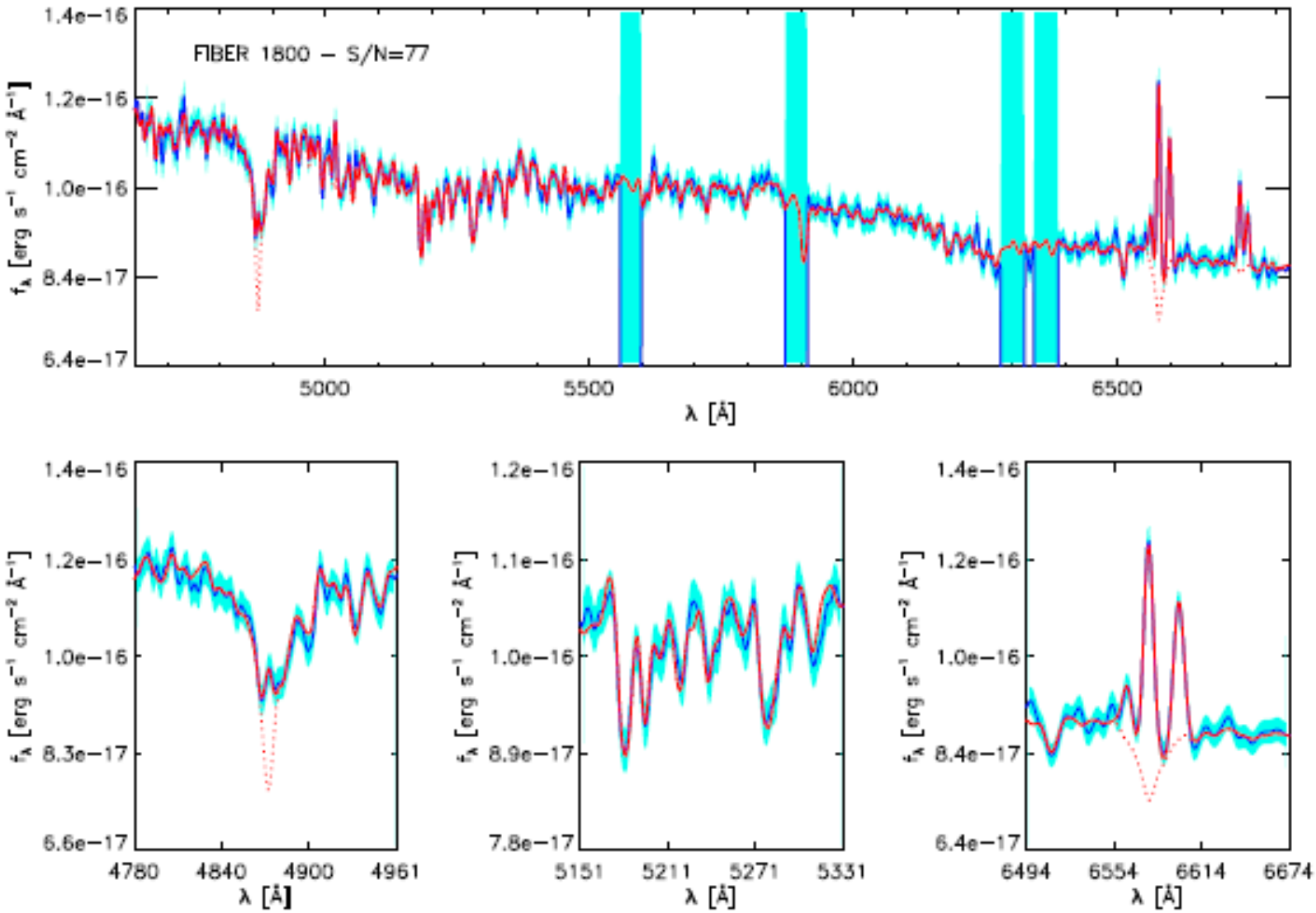
The VENGA Pipeline




VENGA – log(f_r) [erg s^-1 cm^-2 A^-1]
arcsec
arcsec
40
20
0
−20
−40
−150
−100
−50
0
50
100
150
−14.30
−14.73
−15.17
−15.60
−16.03
−16.47
−16.90
FIBER 1805 – S/N=128
f_λ [erg s^-1 cm^-2 Å^-1]
λ [Å]
4.4e−16
3.6e−16
2.8e−16
2.0e−16
1.2e−16
5000
5500
6000
6500
FIBER 1001 – S/N=25
f_λ [erg s^-1 cm^-2 Å^-1]
λ [Å]
6.2e−17
5.1e−17
3.9e−17
2.8e−17
1.7e−17
5000
5500
6000
6500


VENGA – log(f_r) [erg s^-1 cm^-2 A^-1]
SDSS – log(f_r) [erg s^-1 cm^-2 A^-1]
arcsec
40
20
0
−20
−40
−150
−100
−50
0
50
100
150
−14.30
−14.73
−15.17
−15.60
−16.03
−16.47
−16.90


VENGA – log(f_r) [erg s^-1 cm^-2 A^-1]
arcsec
40
20
0
−20
−40
−150
−100
−50
0
50
100
150
arcsec
−14.30
−14.73
−15.17
−15.60
−16.03
−16.47
−16.90
log(f_Hα) [erg s^-1 cm^-2]
arcsec
40
20
0
−20
−40
−150
−100
−50
0
50
100
150
arcsec
−13.00
−13.50
−14.00
−14.50
−15.00
−15.50
−16.00



Spectral Fitting using pPXF/GANDALF
(Cappellari et al. 2004, Sarzi et al. 2006)