C. Cortijo Ferrero

The LIRG galaxy IC1623: the most nearby Lyman Break Analog

We present the analysis of imaging data from Hubble Space Telescope (STIS, ACS and NICMOS) and Spitzer Space Telescope (IRAC bands), and the long-slit spectra from ALFOSC-NOT for the z=0.02 merging system IC1623. IC1623 is a very Luminous Infrared system, log(L_IR/Lsum)=11.65, being too the west component very bright at ultraviolet wavelength too.

The images show that the merging system is composed of two galaxies. The western component is very bright in the UV and optical, while the eastern one is very bright in the infrared. The west galaxy shows properties very similar to the cosmological Lyman Break galaxies, and it can be considered as the nearest Lyman Break Analog. We have identified the stellar clusters in the HST images, and the colours indicate that there are two different types of clusters: those located in the UV bright galaxy which have ages between 1-10 Myr and are little affected by extinction 0-1mag, and those located in the IR bright galaxy much older and extinguished. The masses of the clusters span a range between 10^6 and 10^8 Msum.

The long-slit optical spectra through IC1623 are also analyzed with Starlight code to estimate the properties (age, extinction and metallicity) of the nucleus, some of the brightest clusters and the underlying galaxy.

The LIRG galaxy IC1623: the most nearby Lyman Break Analog

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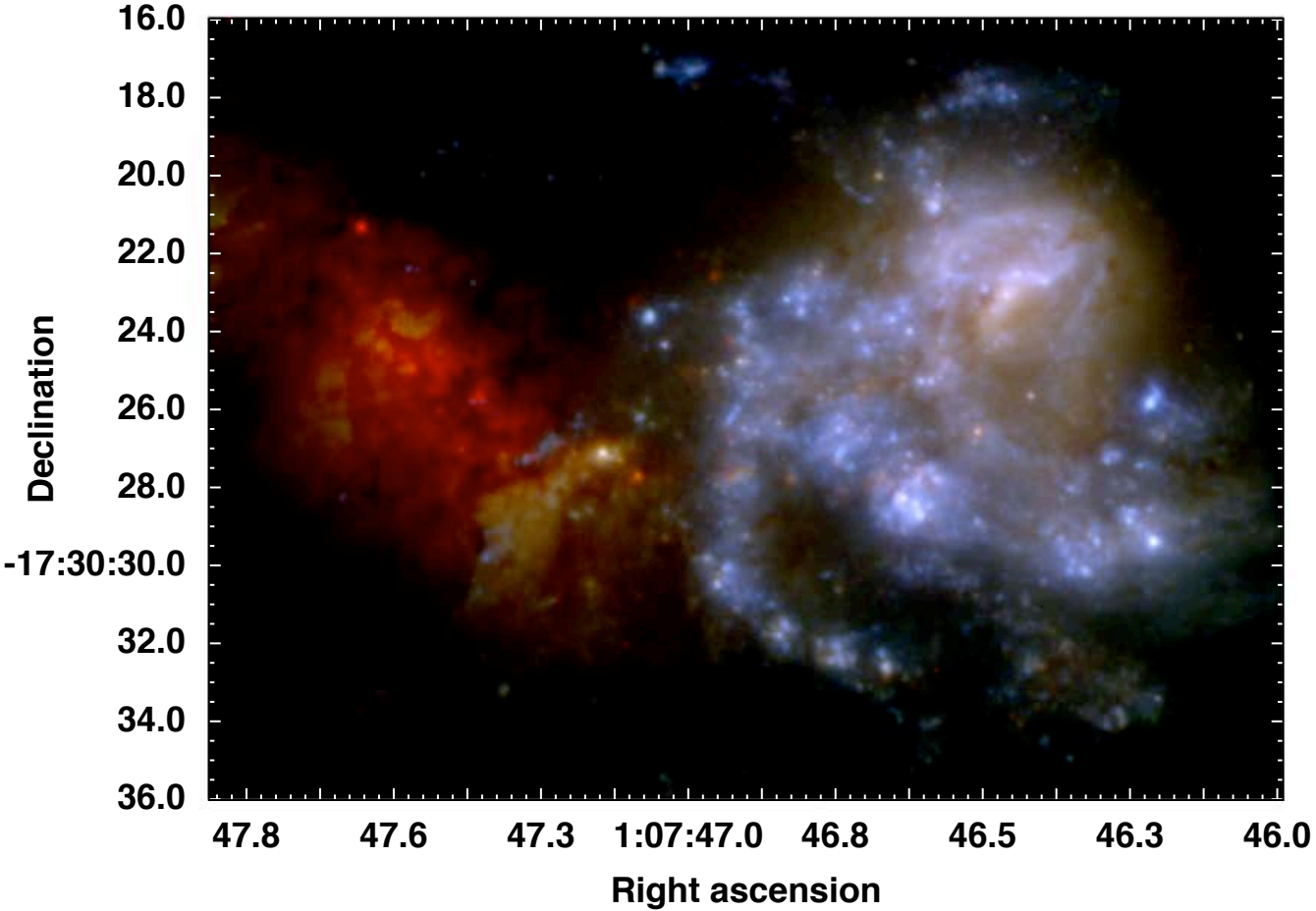
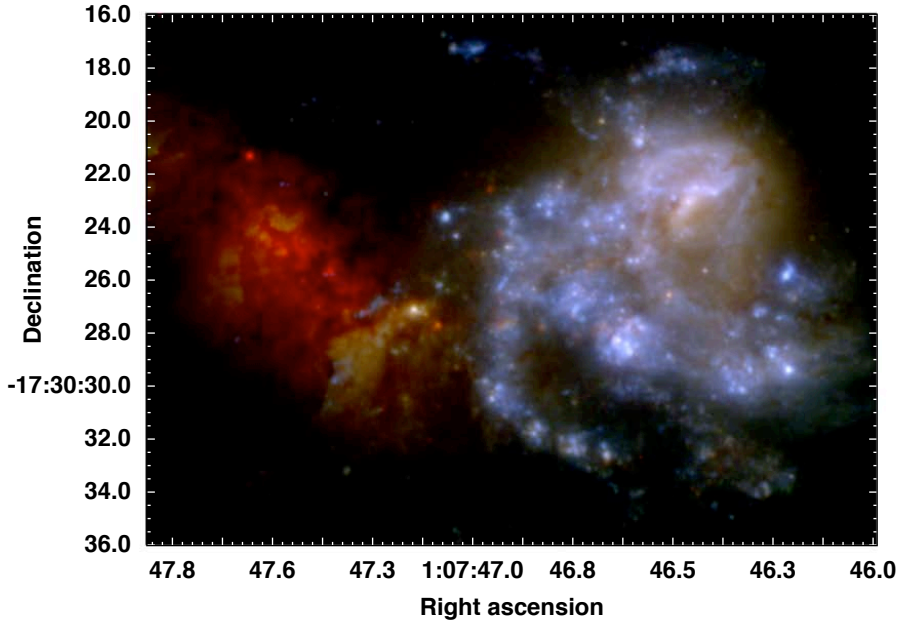
EXTREME STARBURSTS IN THE LOCAL UNIVERSE
IAA (CSIC) GRANADA, 21-25 June 2010



Introduction

- IC1623 local (z=0.020) gas-rich merging system
- IIIb Pre-merger close binary. Nuclei separated by 6kpc. Tidal tails and bridge. Veilleux et al. (2002)
- IC 1623 E = IR-bright, LIRG (*log* $L_{IR}/L_{\odot}$*=11.65* ; Soifer et al. 1987), Scoville et al. (2000)
- IC 1623 W = UV bright, nearest LBG Analog, Goldader et al. (2002)



RGB color-image:

Blue = STIS-NUV
Green = ACS435W
Red = ACS814W

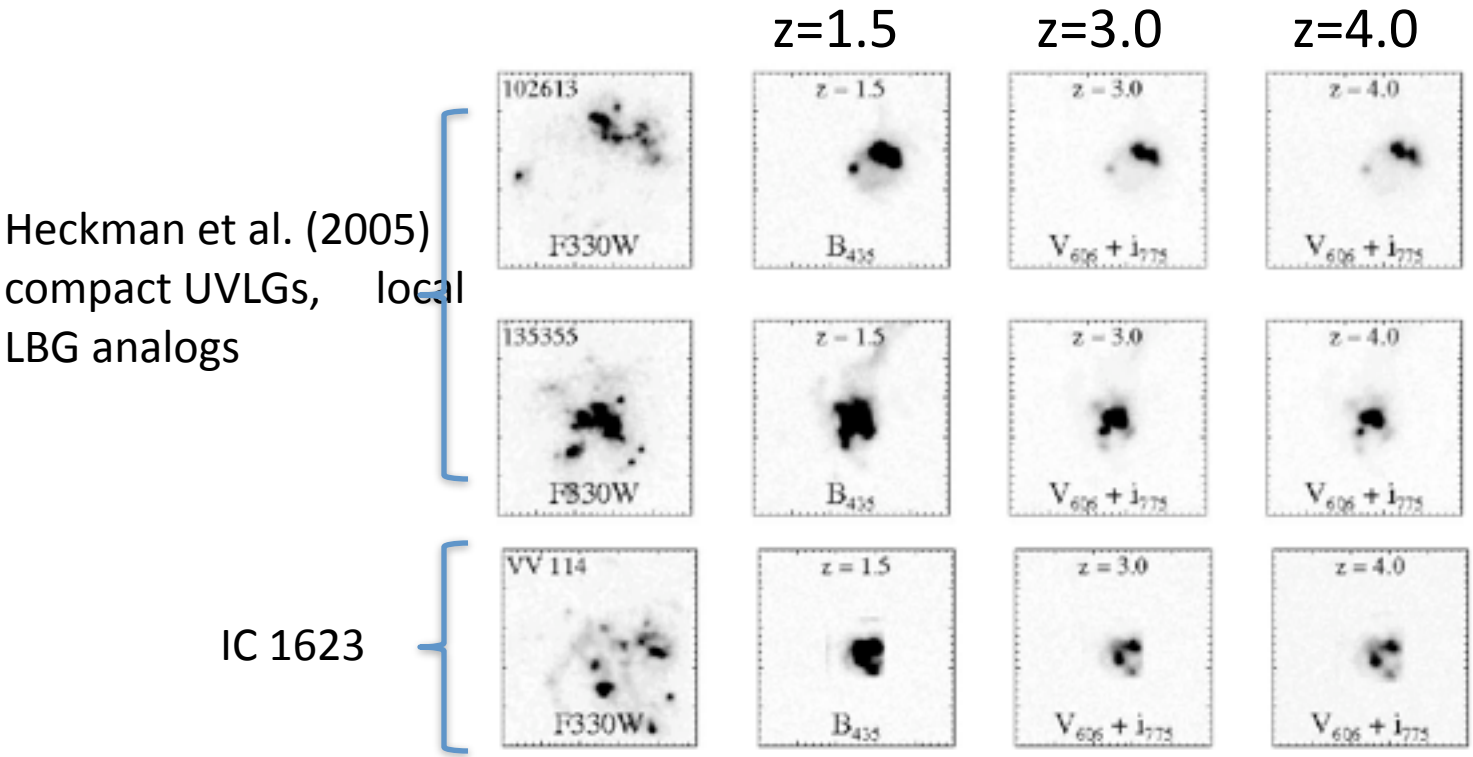
Introduction

- Compact UV knots morphologies at high z:
  - merger result??
  - clumpy distribution of star formation in a single system??

- Heckman et al. (2005) → local compact UVLG ≈ LBGs Analogs

Introduction

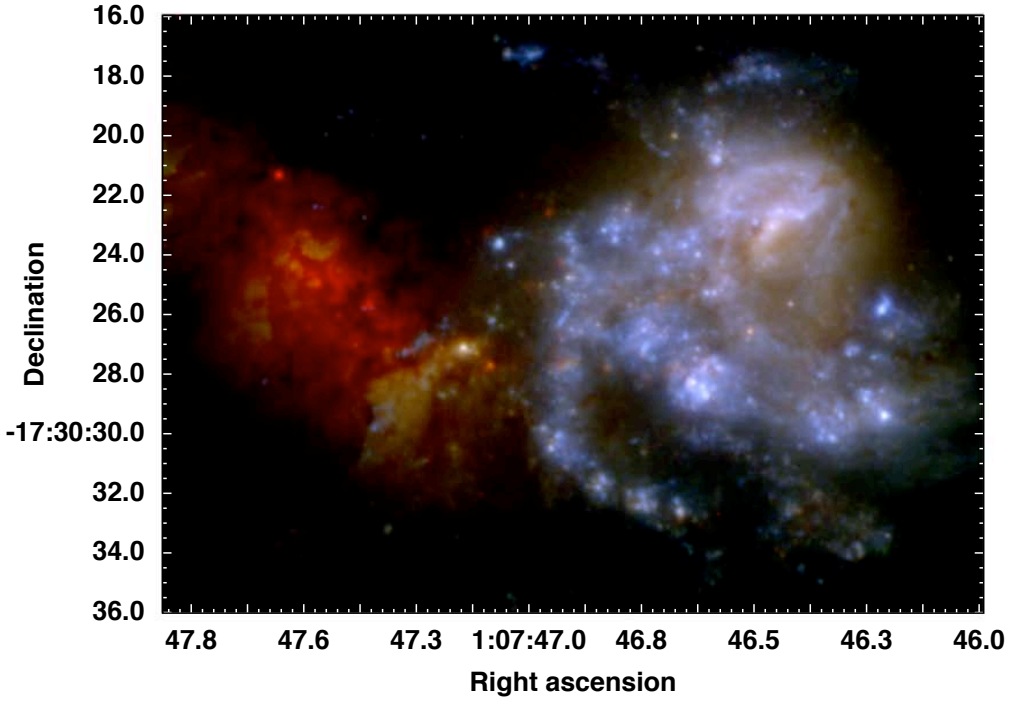
- Overzier et al. (2008) → LBG Analogs merger like morphologies



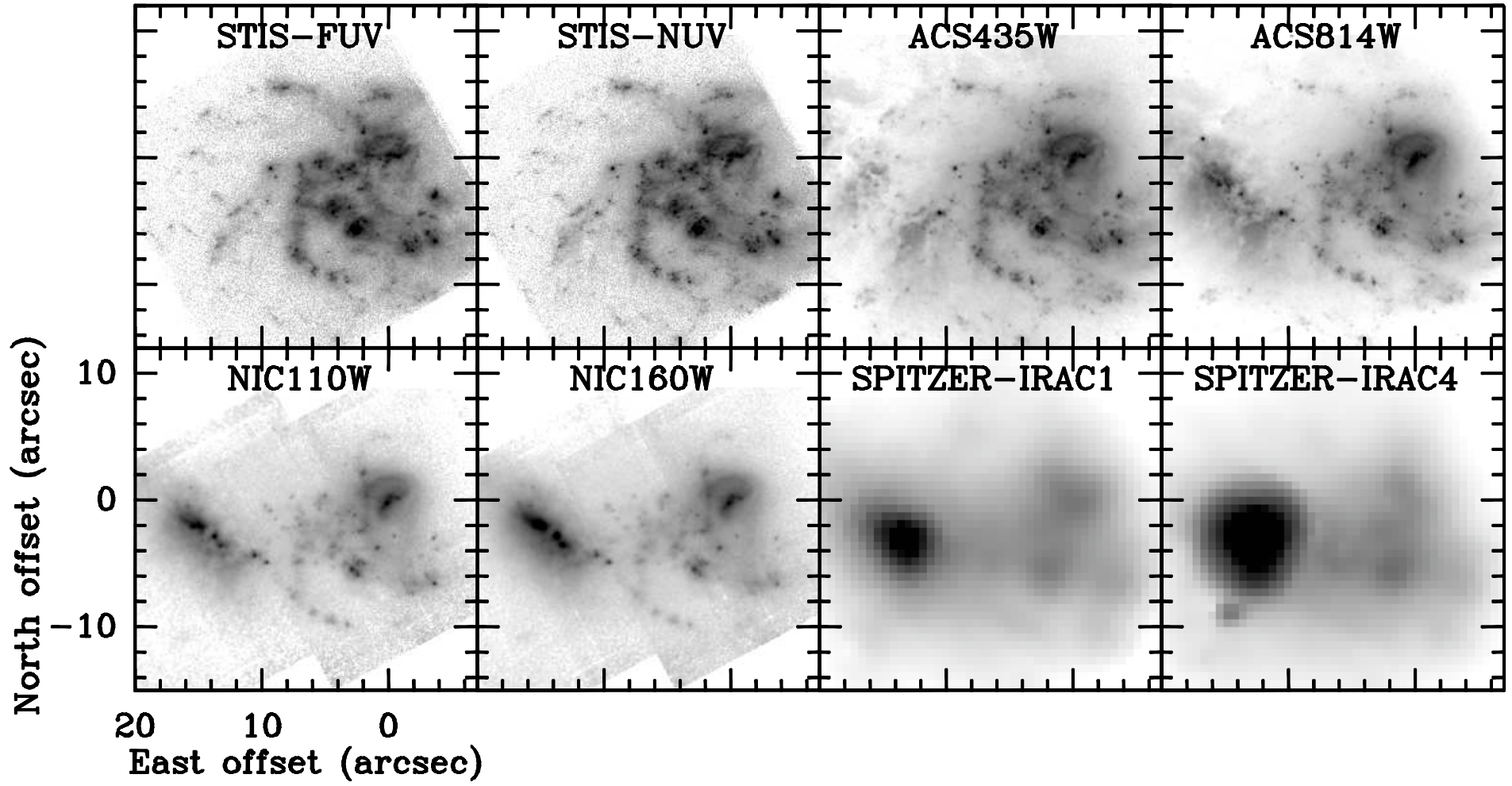
LBGs low mass gas-rich mergers. Induced super starburst regions.

Objectives

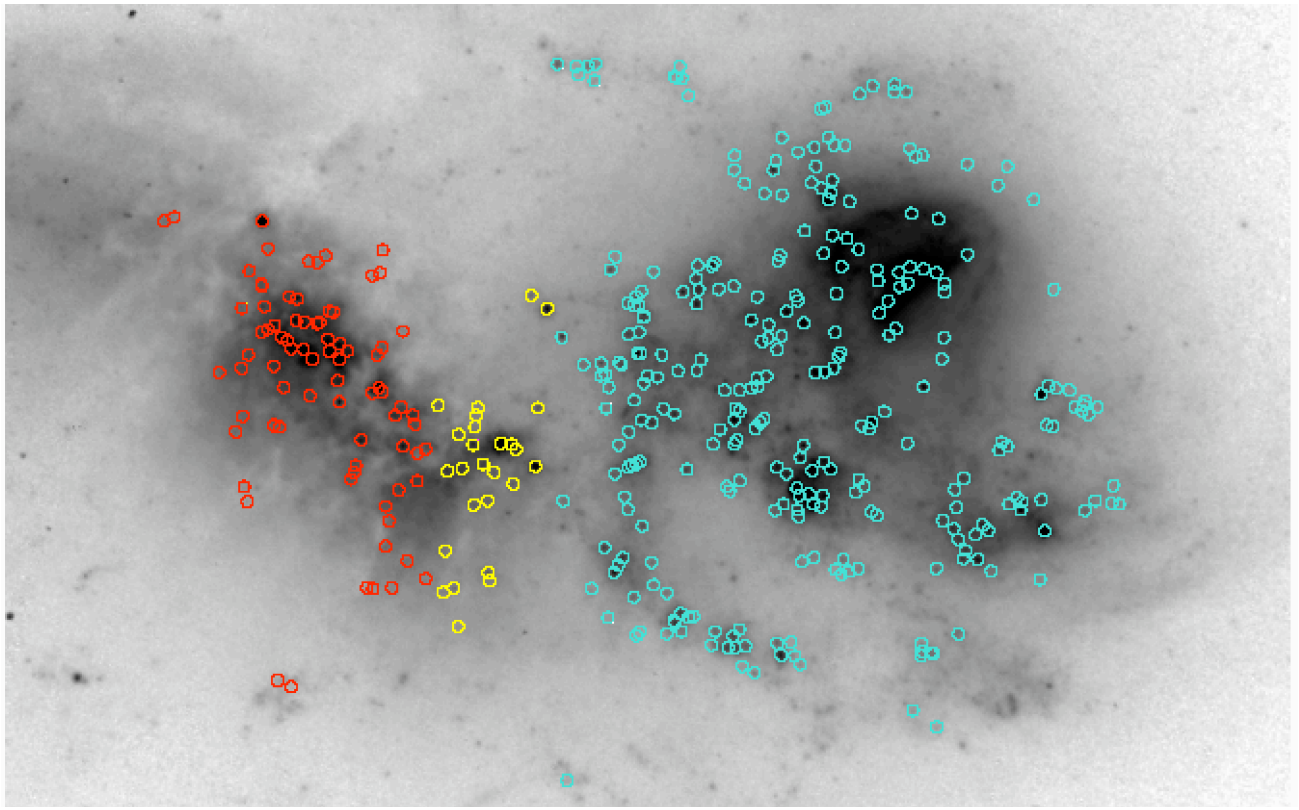
- Analysis of the stellar cluster population properties in IC1623 as it can trace the merger process and star formation history of this system.
- UV-MIR Imaging data and long-slit optical spectroscopy



Data. Imaging



Method. Cluster photometry



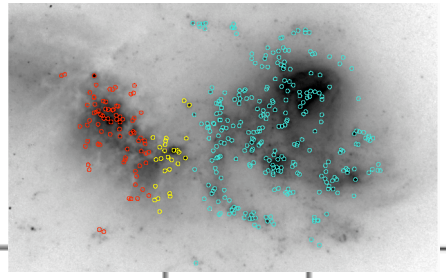
Detection: IRAF DAOPHOT.DAOFIND task

Cleaning: S/N > 40 in ACS images → 400 clusters

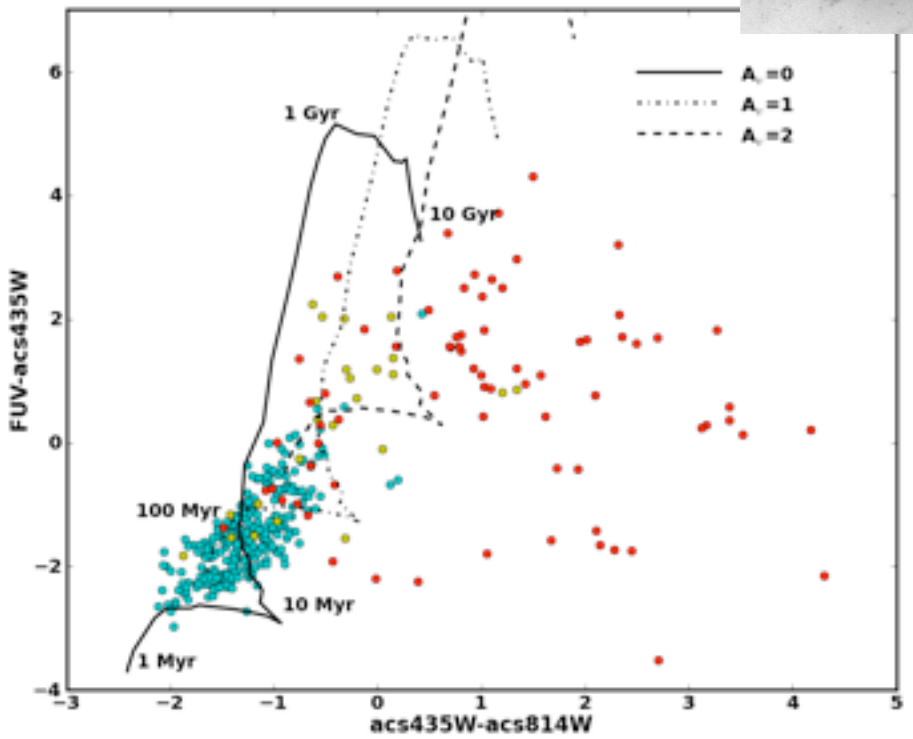
Aperture photometry: IRAF DAOPHOT.PHOT task

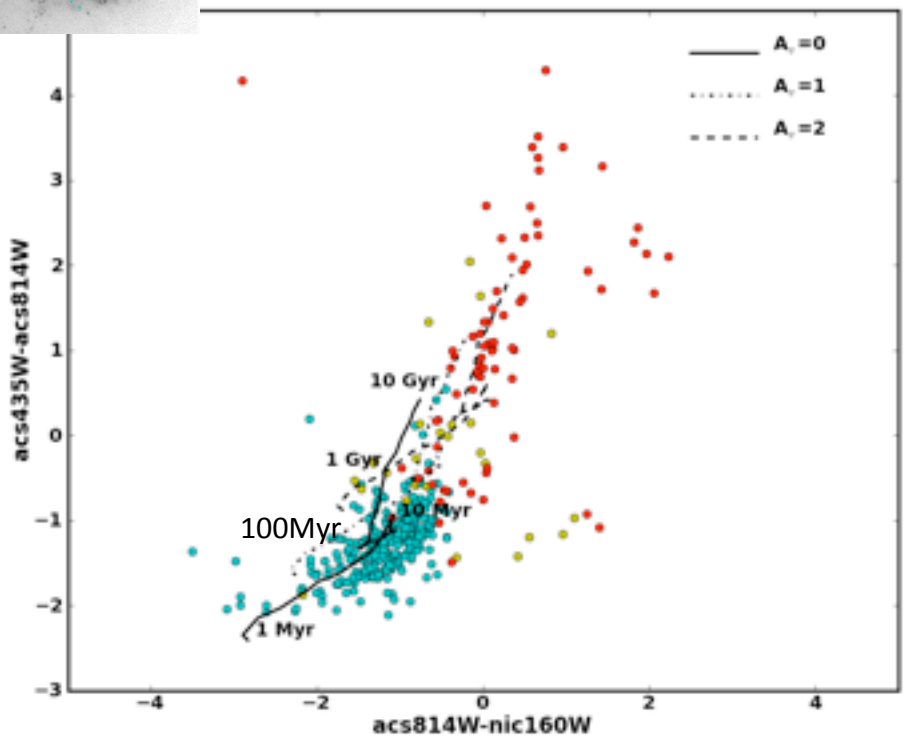
Method. Cluster photometry

FUV-Optical



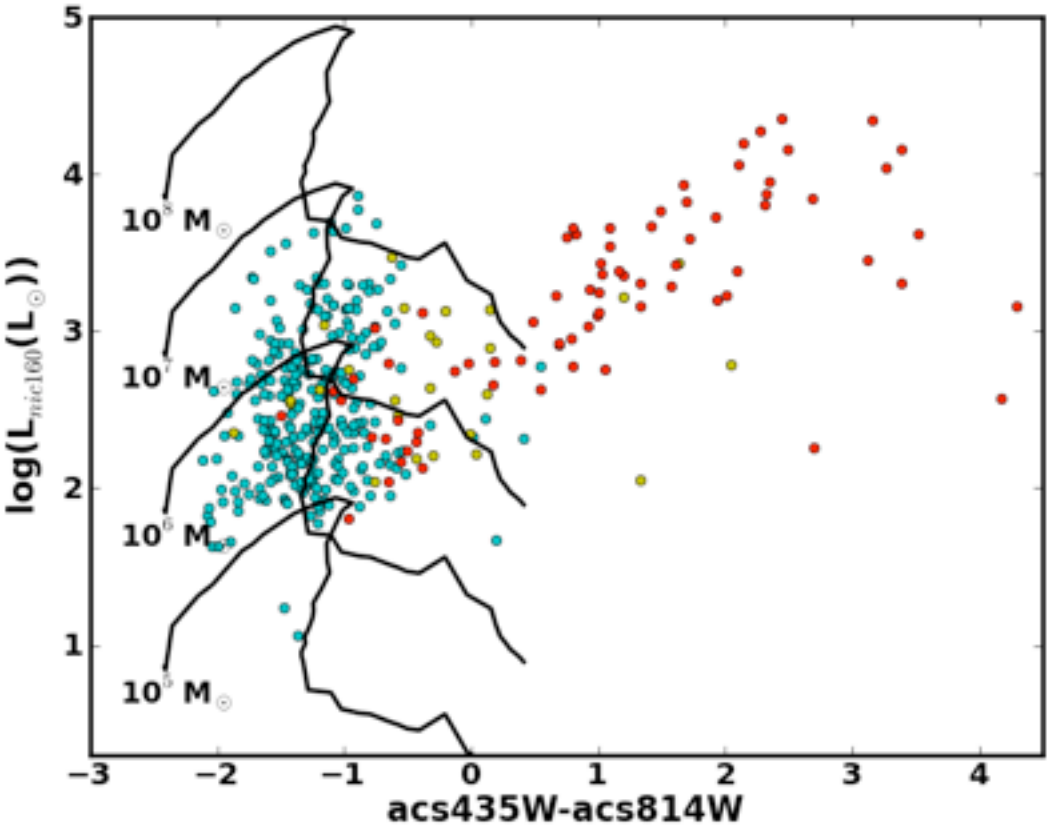
NIC160-Optical





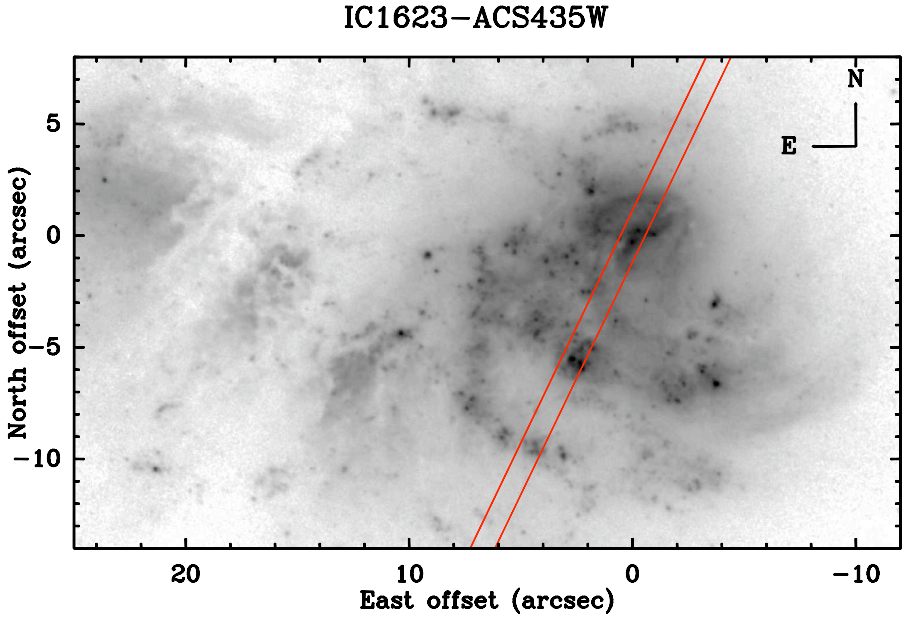
- IC 1623 W: young clusters 1-10 Myr , extinction 0-1 mag
- IC1623 E: intermediate age clusters 40 Myr- 1Gyr, extincion 2-4 mag

Method. Cluster photometry



- Masses between 10^5 -10^7 $M_\odot$

Data. Long-slit spectra

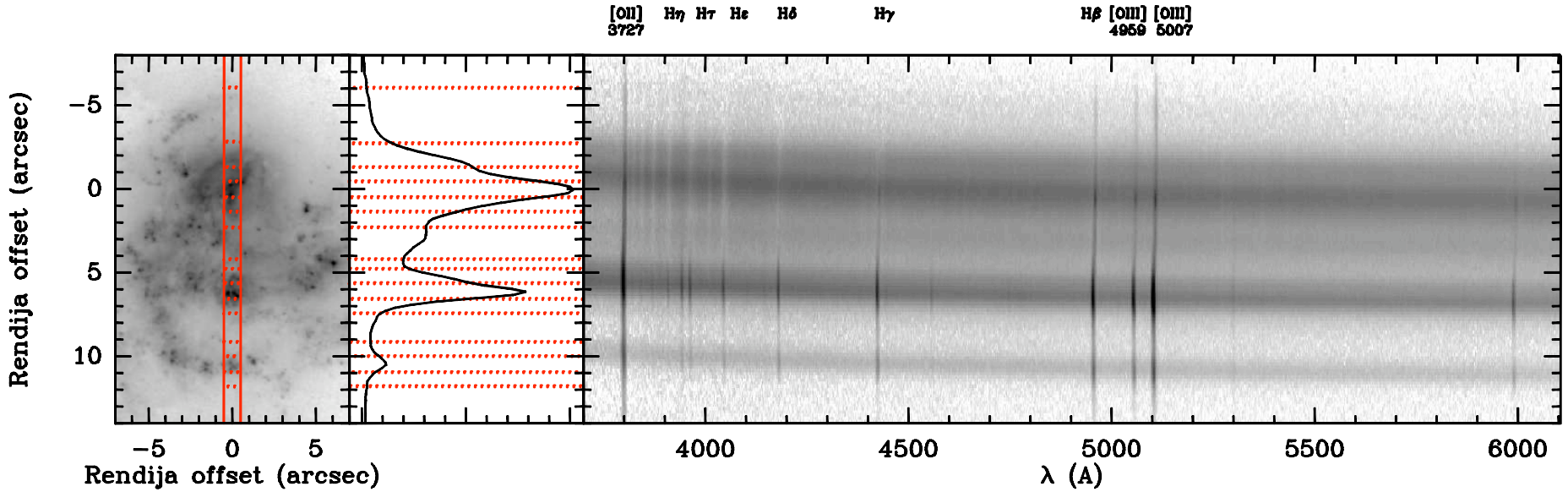


STARLIGHT SPECTRAL FITTING CODE (Cid Fernandes et al. 2005)

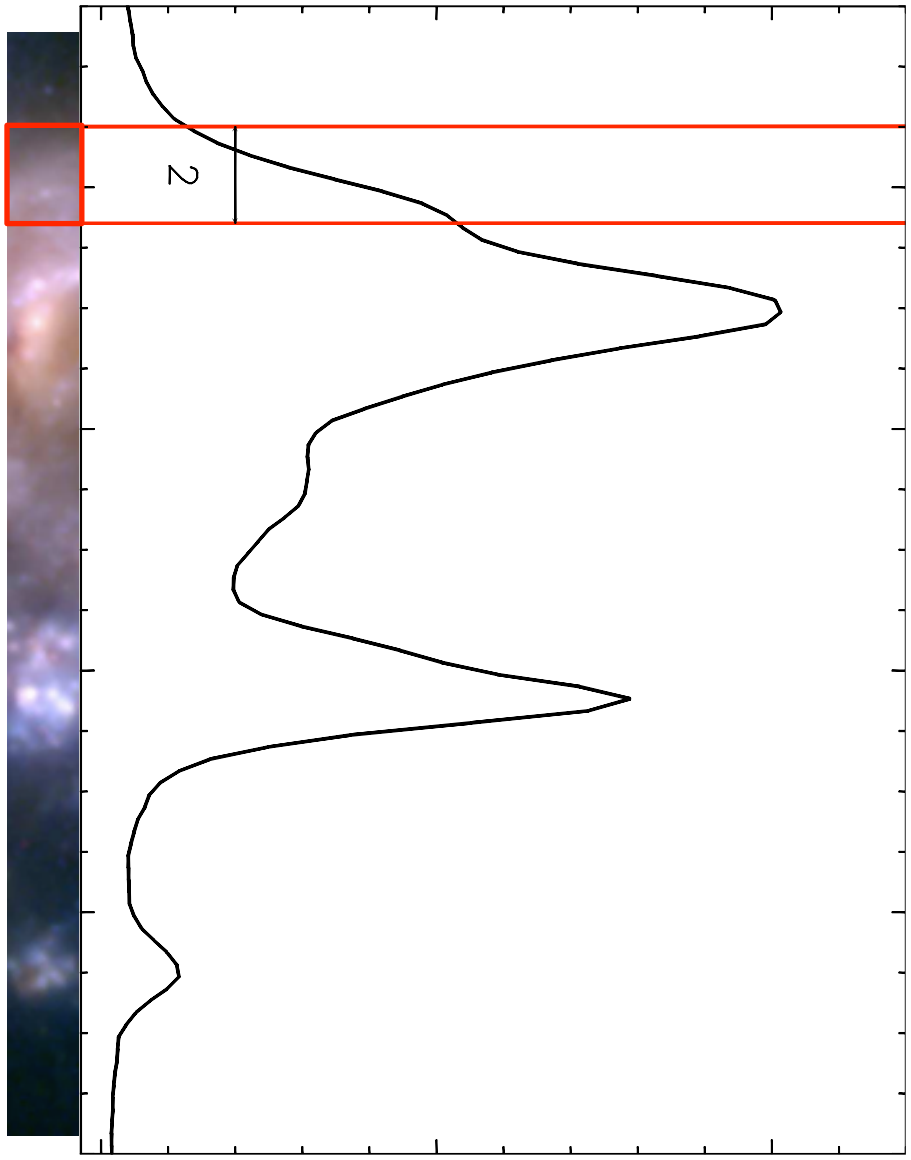
SSP Models from Bruzual and Charlot 2007:

12 Ages from 1 Myr-14 Gyr

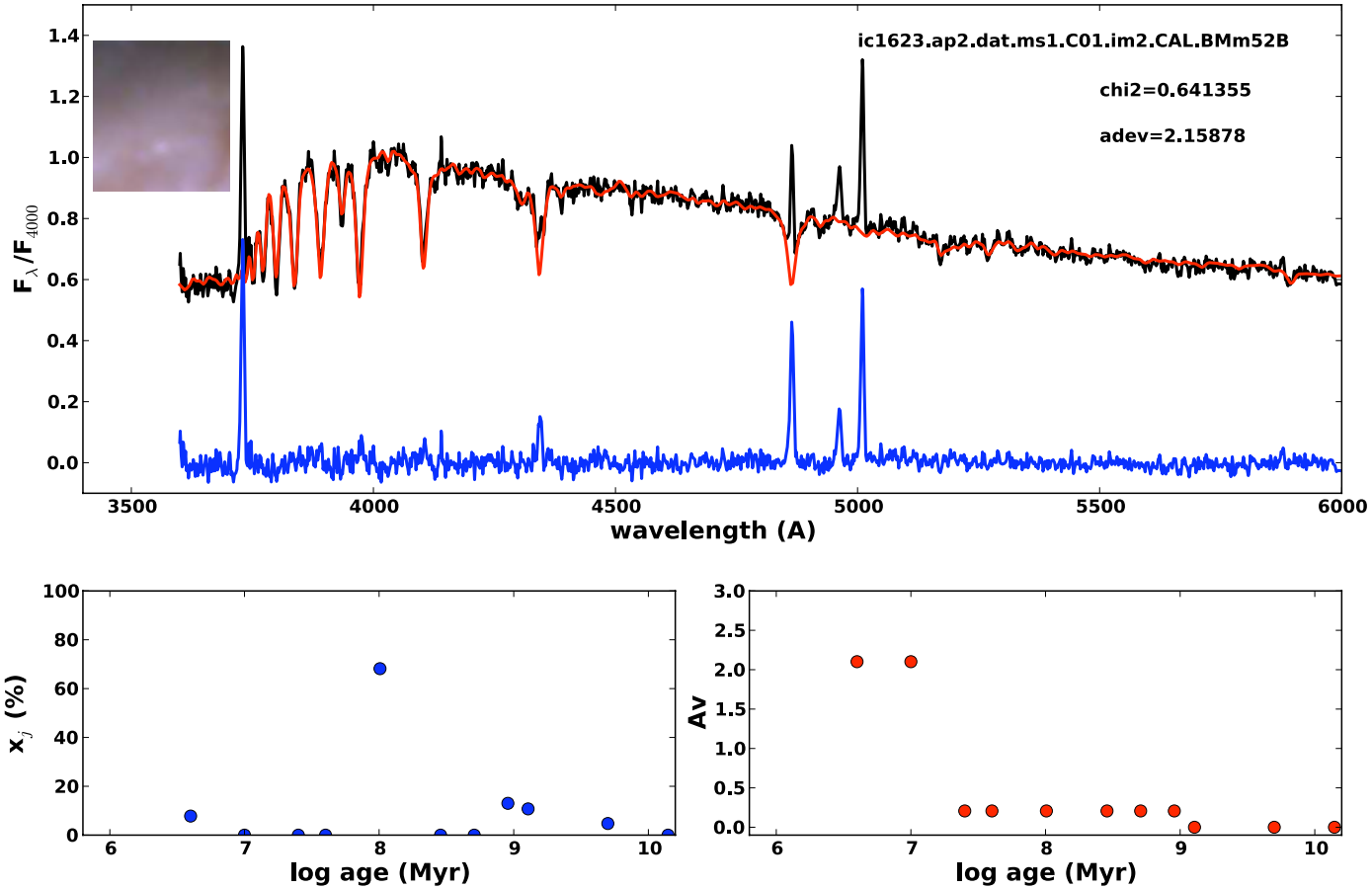
3 Metallicities $Z_{\odot}/2$, $Z_{\odot}$, $2Z_{\odot}$



Spectral fitting. Aperture 2

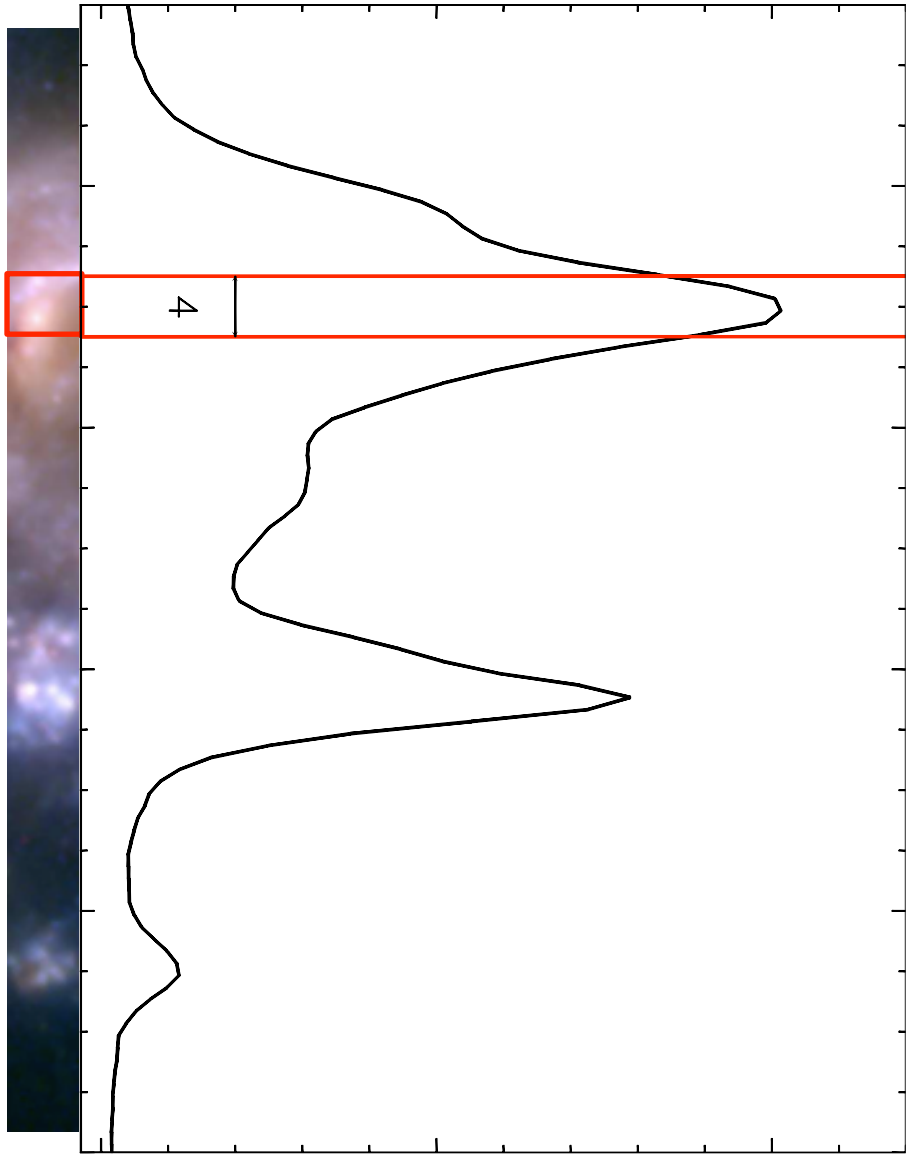


Spectral fitting. Aperture 2

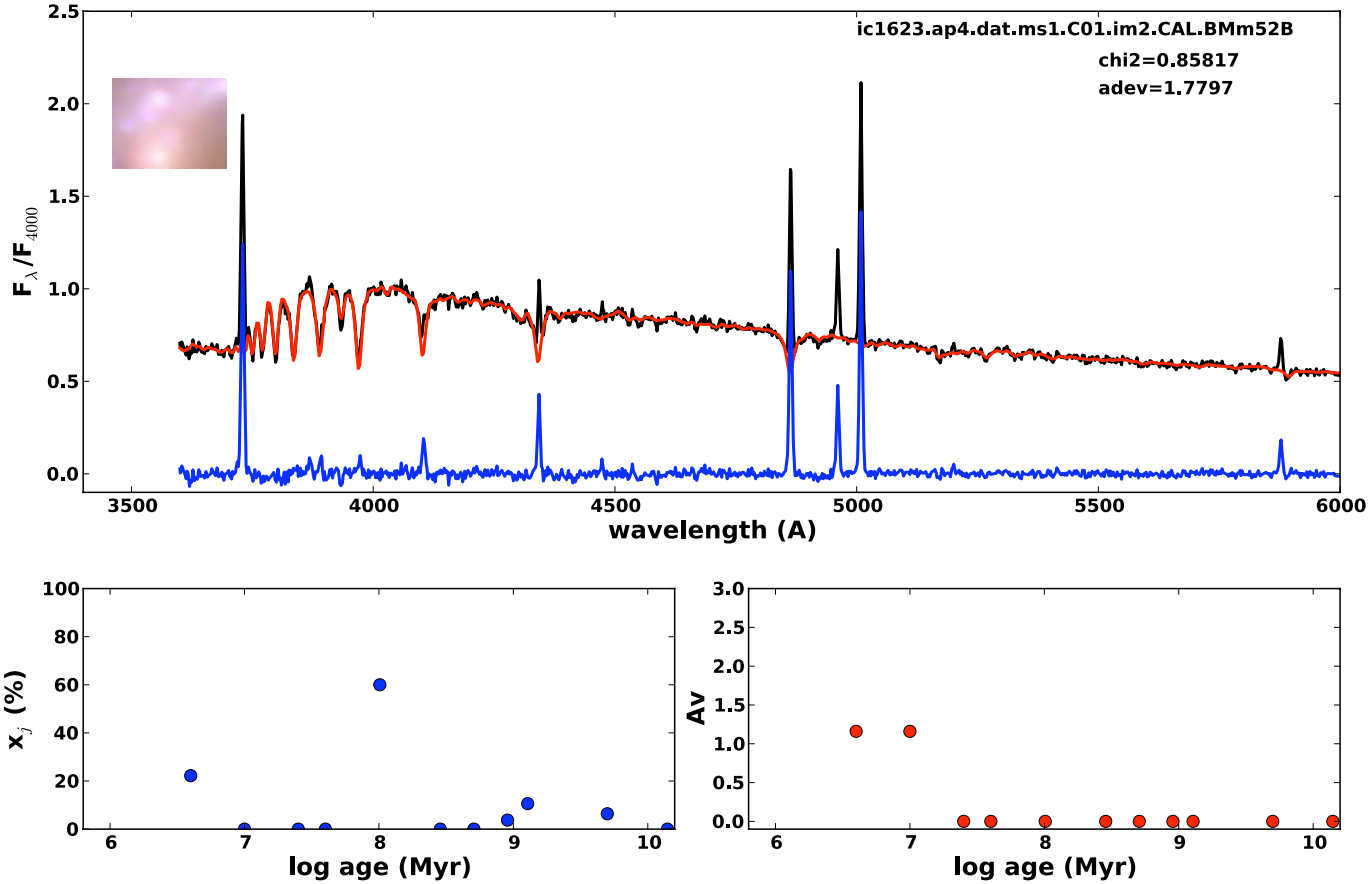


- 70%(20%) Intermediate age population 100 Myr(1Gyr) + 10% very young 4 Myr
- $Z=Z_\odot/2$
- Extinction: 0.2 mag intermediate/ 2mag young

Spectral fitting. Aperture 4

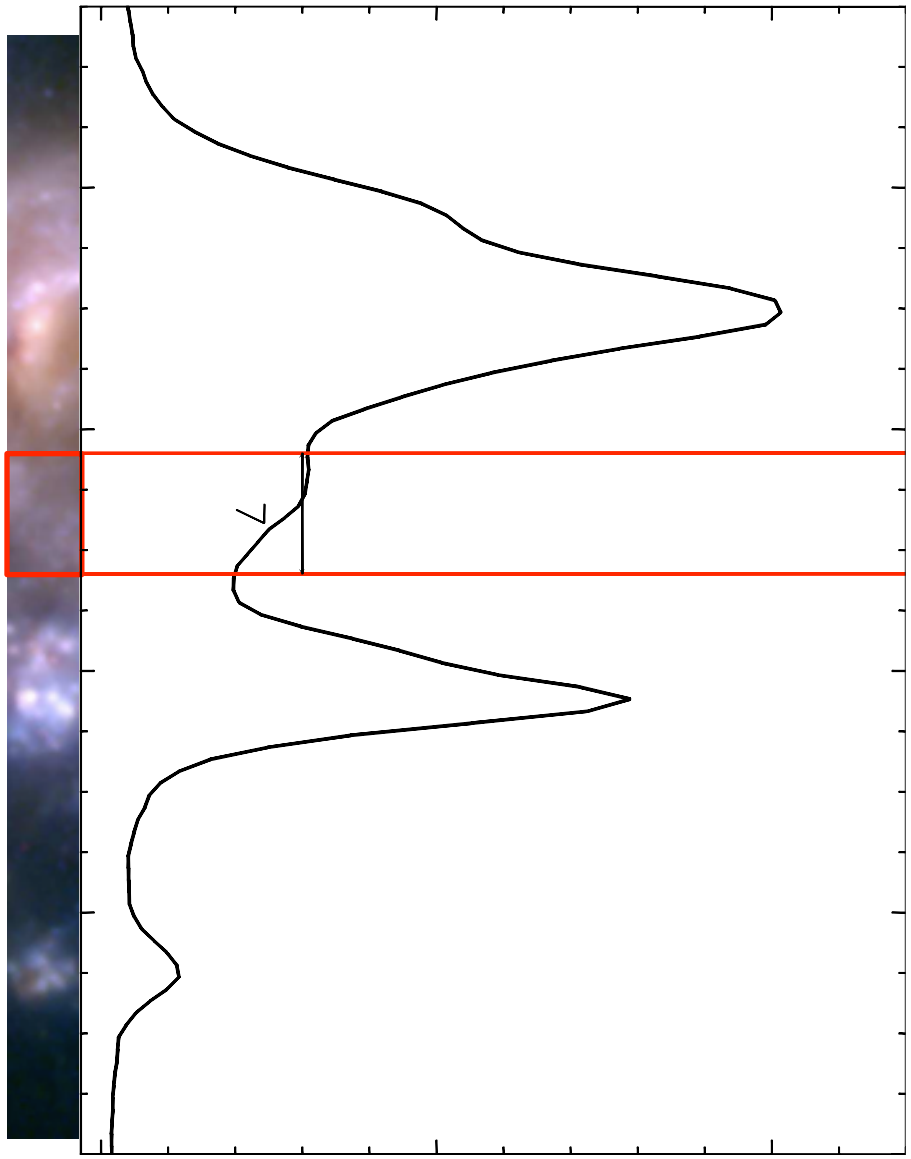


Spectral fitting. Aperture 4

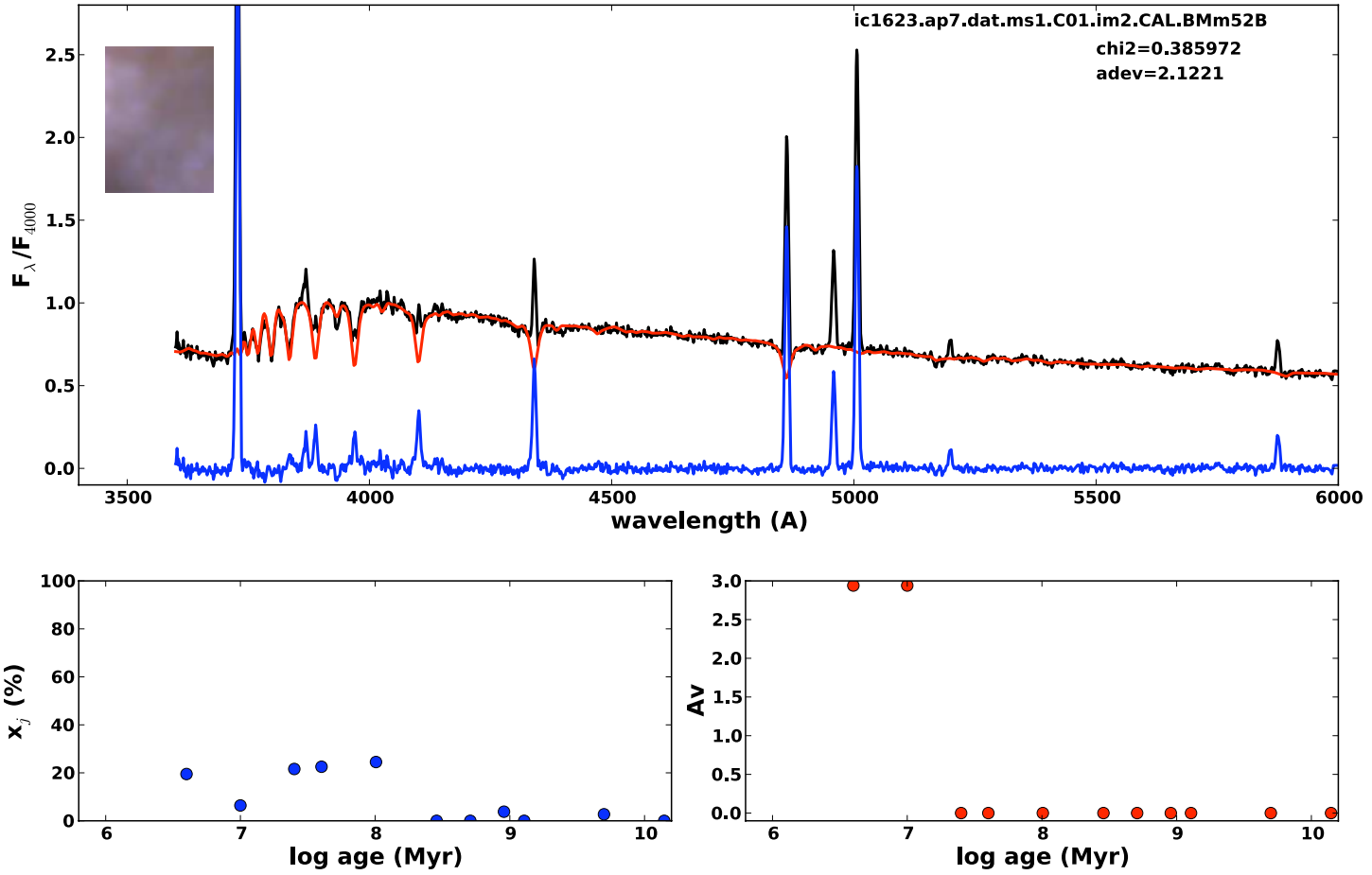


- 60%(20%) Intermediate 100 Myr(1Gyr)
  +20% very young (4 Myr)
- $Z=Z_\odot/2$

Spectral fitting. Aperture 7

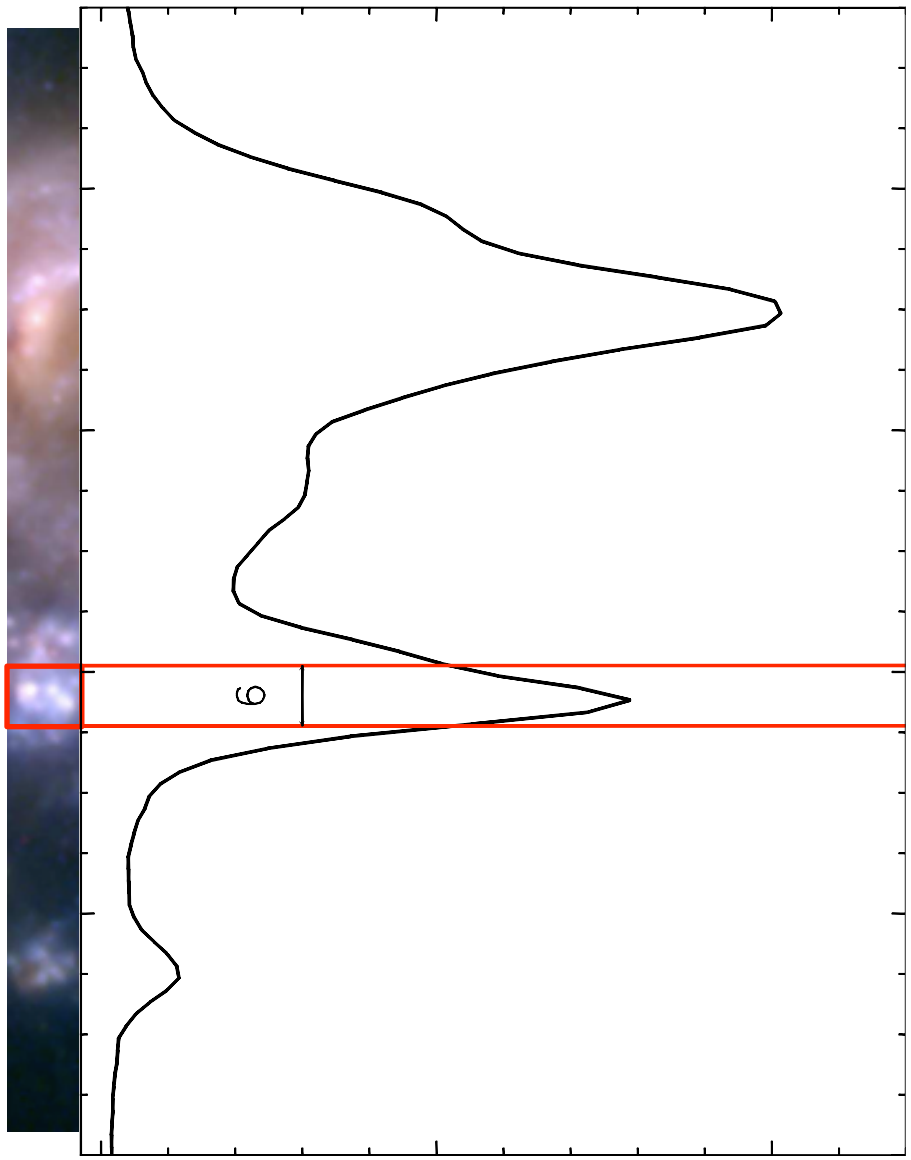


Spectral fitting. Aperture 7

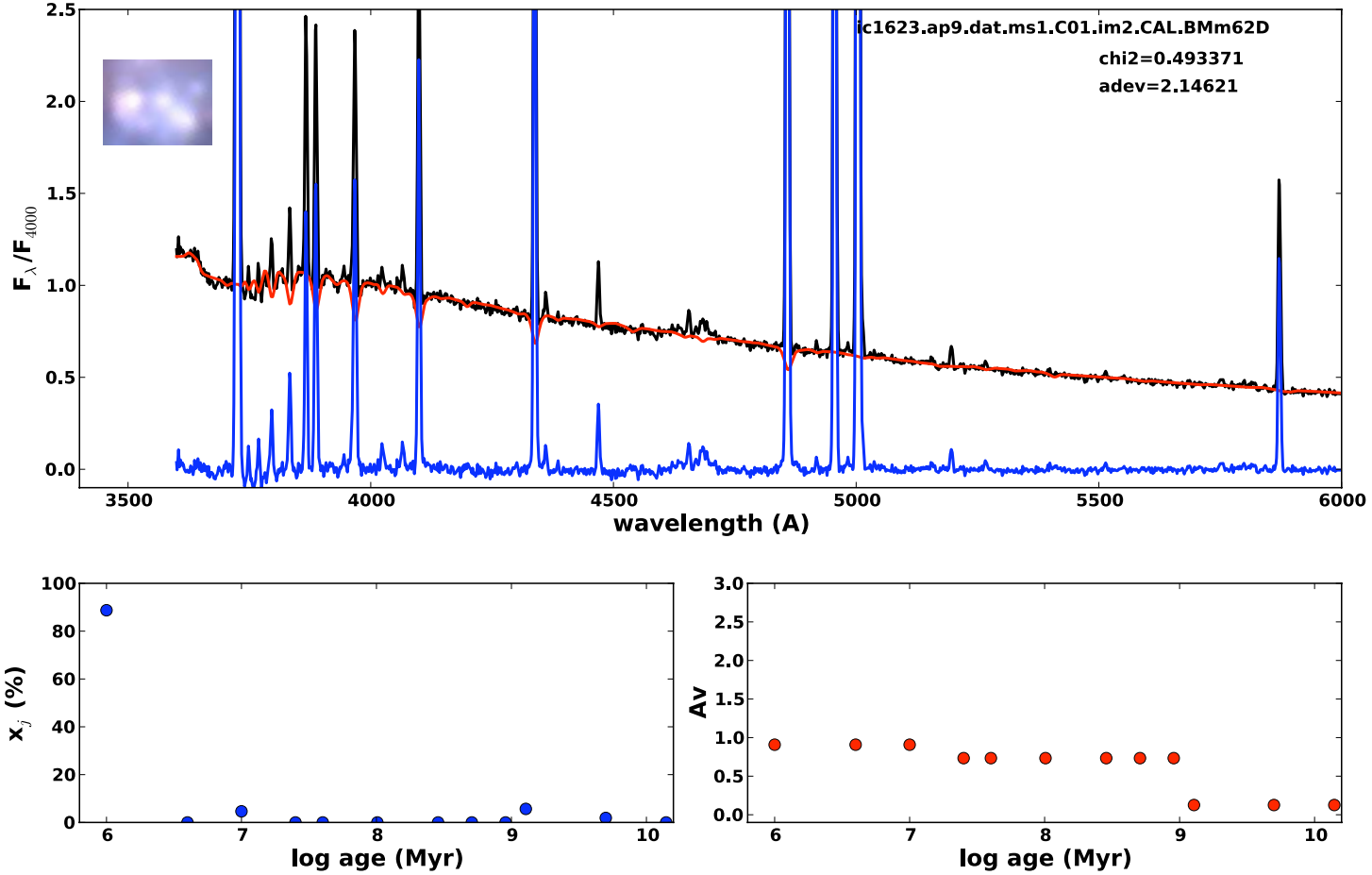


- 75% Intermediate 40-100 Myr + 25% very young 4-10 Myr
- $Z=Z_\odot/2$
- Extinction: 0 mag intermediate / 3 mag young

Spectral fitting. Aperture 9

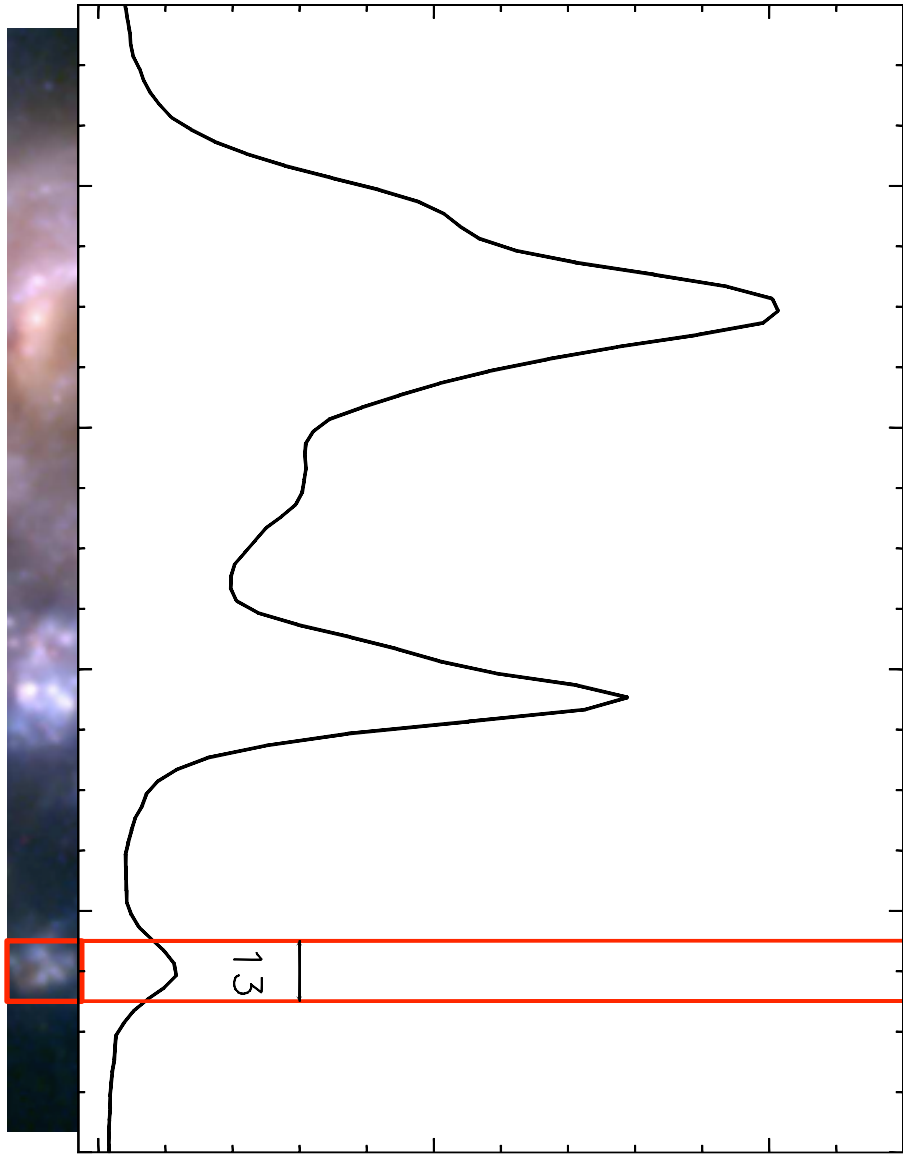


Spectral fitting. Aperture 9

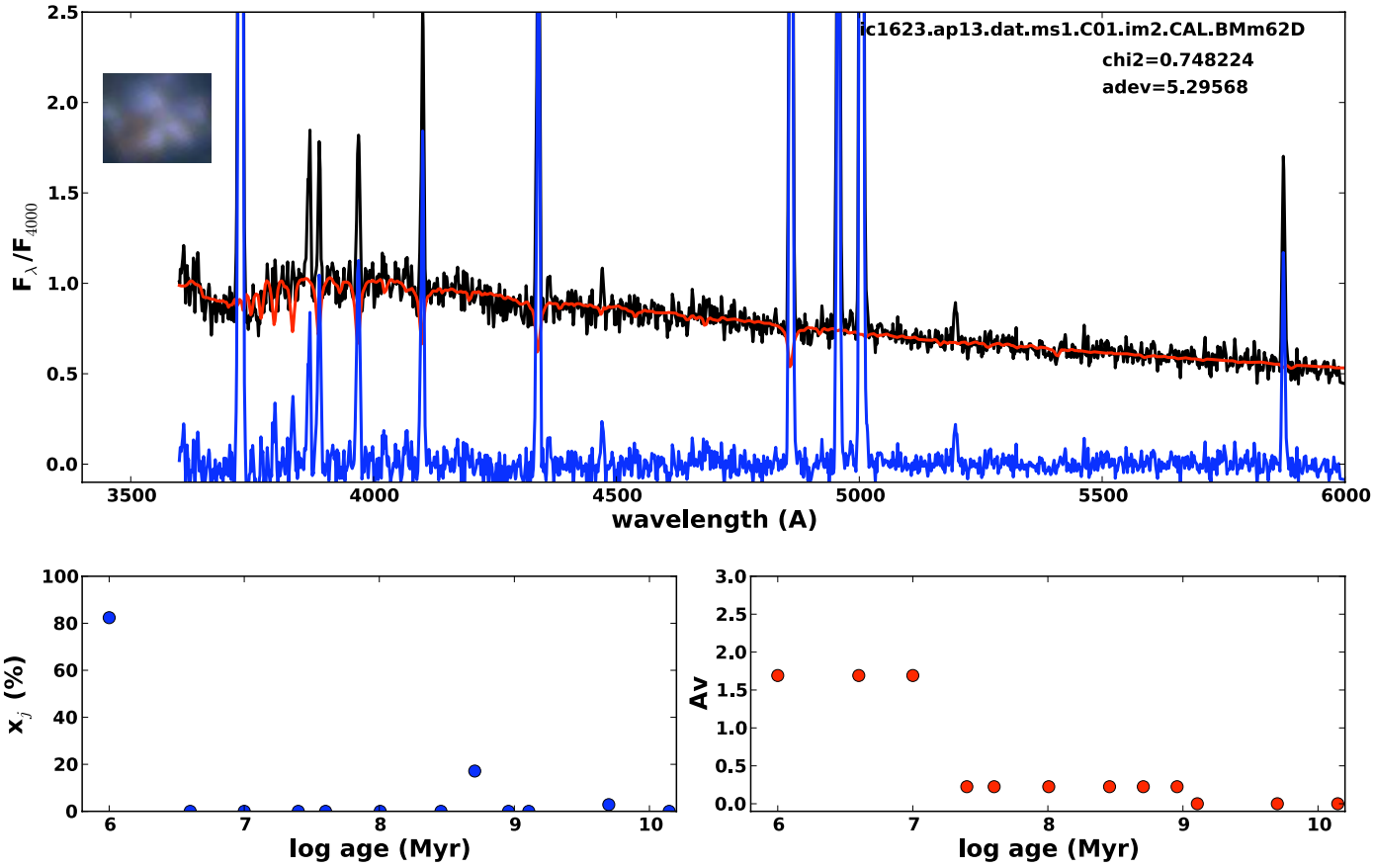


- 90%(5%) Very young 1 Myr(10Myr) +5% intermediate 1 Gyr
- $Z=Z_\odot$
- Extinction: 0.9 mag young population/ 0.7 mag intermediate

Spectral fitting. Aperture 13



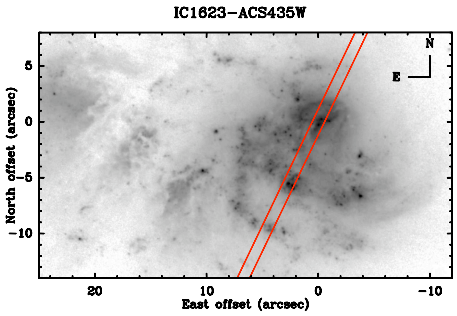
Spectral fitting. Aperture 13



- 80% Very young 1 Myr +20% intermediate 500 Myr
- $Z=Z_\odot$
- Extinction: 1.7 mag young population/ 0.2 mag intermediate

Spectral fitting. Summary

Less contribution of young SSPs

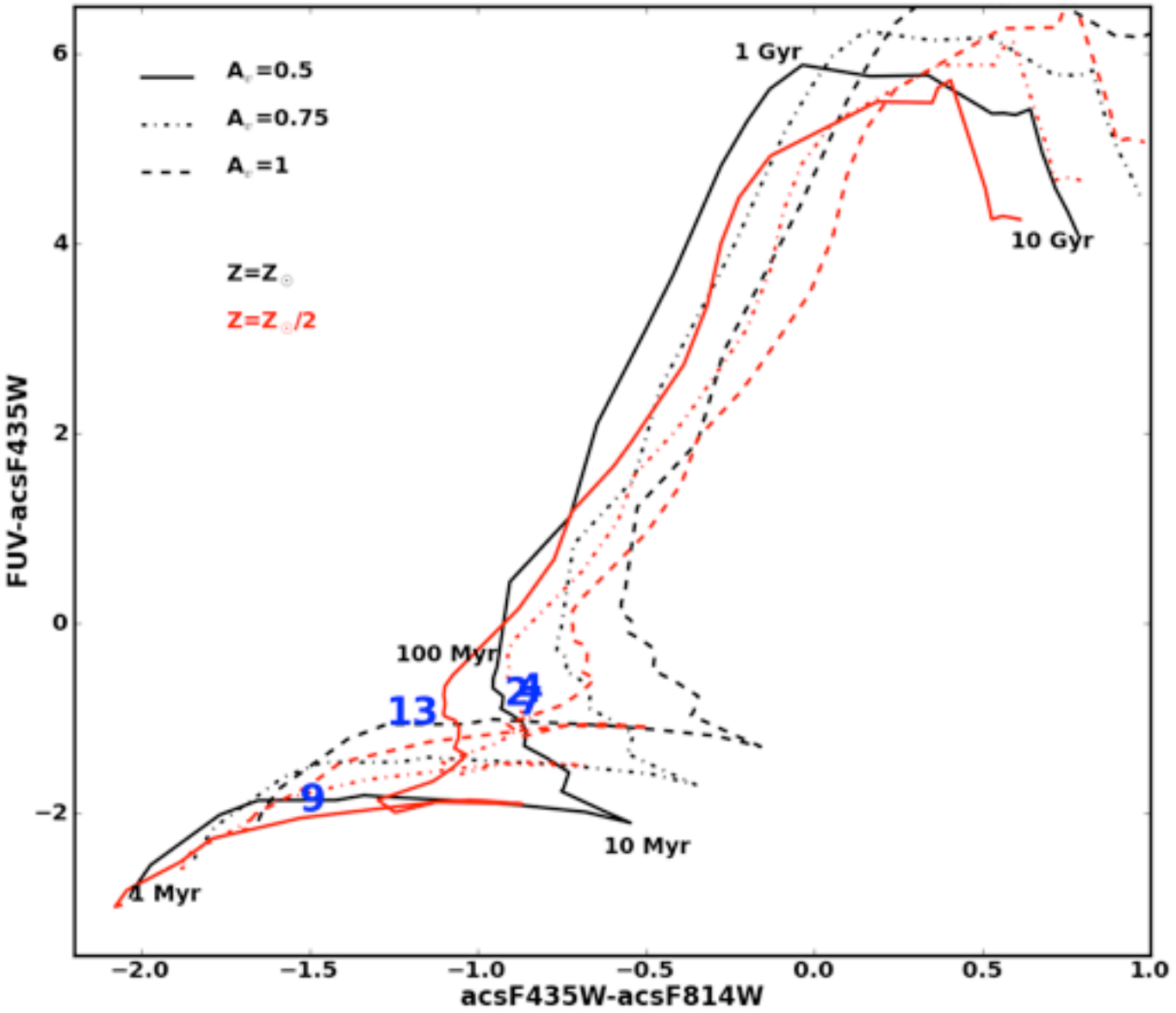


More contribution of young SSPs

- 80-90 % Intermediate (100 Myr- 1 Gyr) + 10-20 % Young (4-10 Myr)
- A_v low 0-0.2 mag for intermediate, high 1-3mag for young
- $Z=Z_{\odot}/2$

- 80-90 % Young (1-10 Myr)+10-20% intermediate (500Myr-1Gyr)
- A_v high 0.9-1.7 mag young, medium 0.2-0.7 intermediate
- $Z=Z_{\odot}$

Methods. Comparison



Summary

- PHOTOMETRY
  - IC1623W: young 1-10 Myr, low extinction 0-1mag
  - IC1623E: intermediate ages 40 Myr-1 Gyr, higher extinctions 2-4 mag
  - Cluster masses between 10^5 -10^7 $M_\odot$
- LONG-SLIT SPECTRUM (only IC 1623 W)
  - Clusters (regions 9,13) compatible with colors: young ages 1-10 Myr and extinctions 1 mag
  - Nucleus and intercluster regions (2,4,7), intermediate ages , lower extinctions
  - Ages gradient?? Older nucleus than star forming regions in spiral arms.

FIRST CONCLUSIONS

- Stellar population content in IC 1623: explained with young and intermediate populations
- Very young (1-10 Myr) clusters consistent with the SF enhanced during first encounter.