



***WIDE FIELD CAMERA 3
EARLY RELEASE
SCIENCE PROGRAM***

WFC3 Scientific Oversight Committee

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B. C. Whitmore (STScI)

R. A. Windhorst (Arizona State)

E. T. Young (Arizona)

Design of ERS Program

- Demonstrate new capabilities/verify performance
 - Wide-field UV/NIR imaging
 - Large filter complement
 - Grisms
 - Parallel imaging operations (WFC3 + ACS)
- Provide baseline complementary data for GO proposals (no proprietary period)
- Do not preclude large GO programs
- First publications SM4 + 4-6 mo
- Nominal 200 Orbits of Director's Discretionary Time

ERS Program: Themes

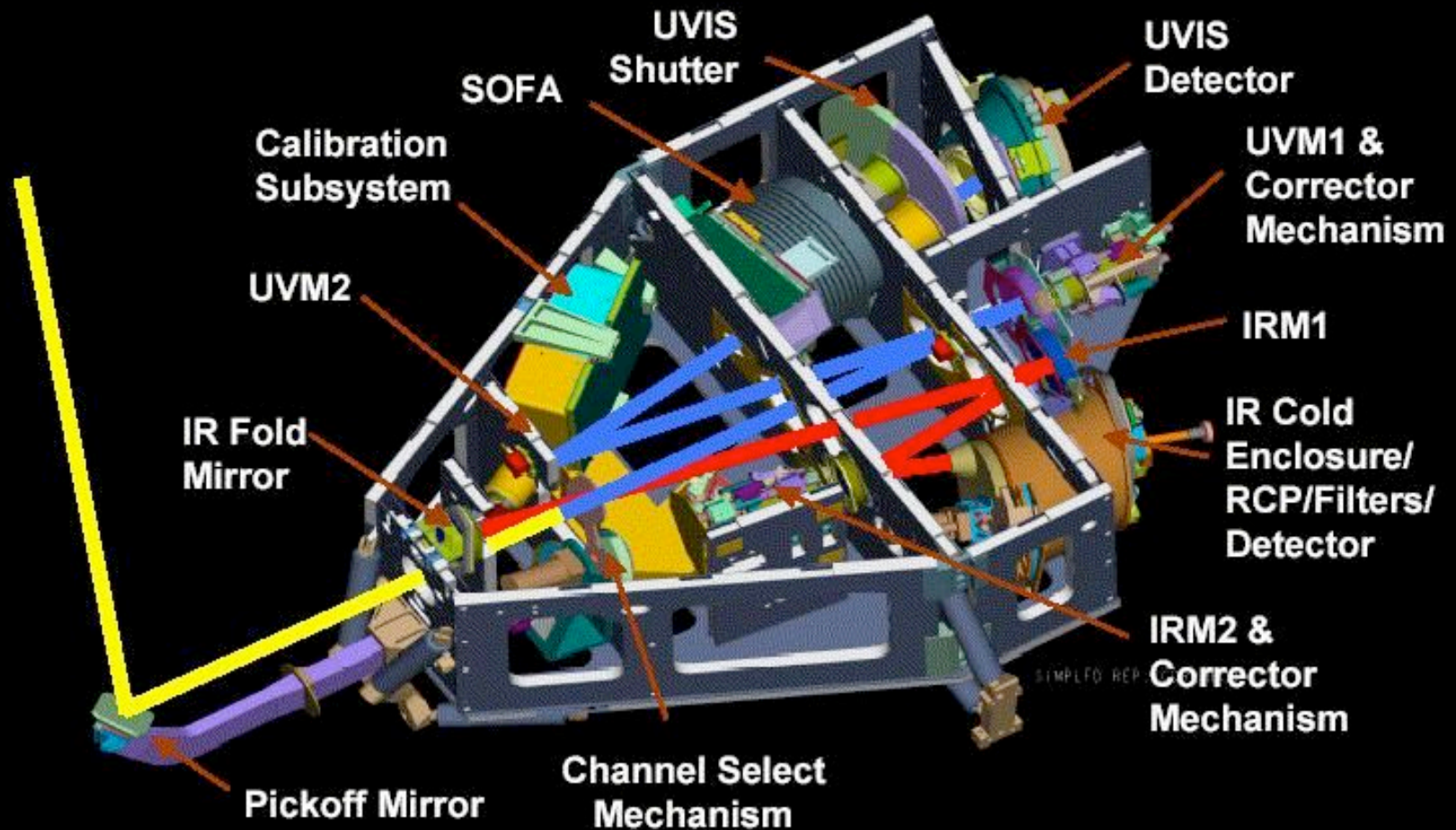
I. Star Formation in Nearby Galaxies

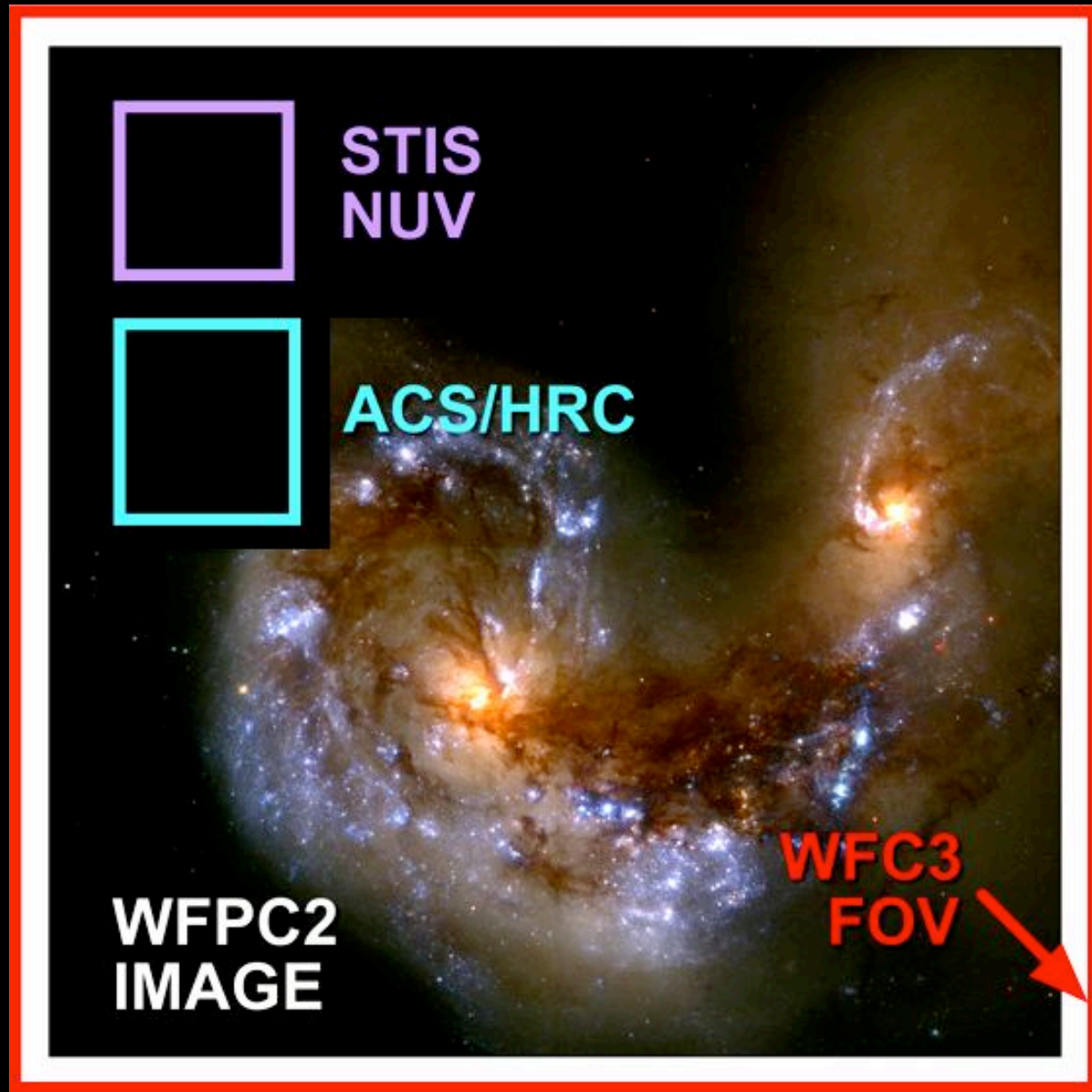
Leads: D. Calzetti and B. Whitmore

II. Panchromatic Survey of Galaxies at Intermediate Redshifts (GOODS Field Survey)

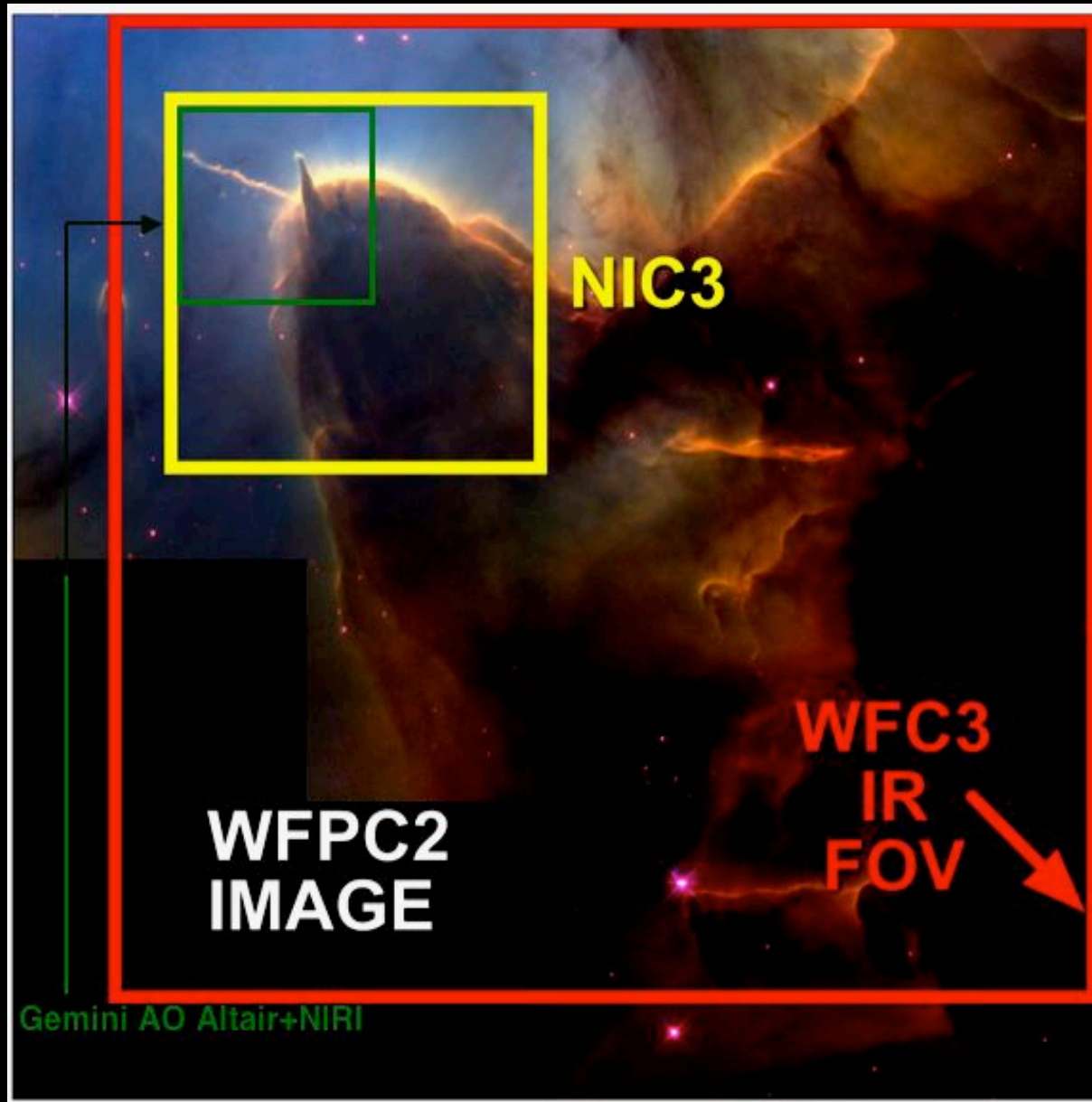
Leads: P. McCarthy and R. Windhorst

WFC3



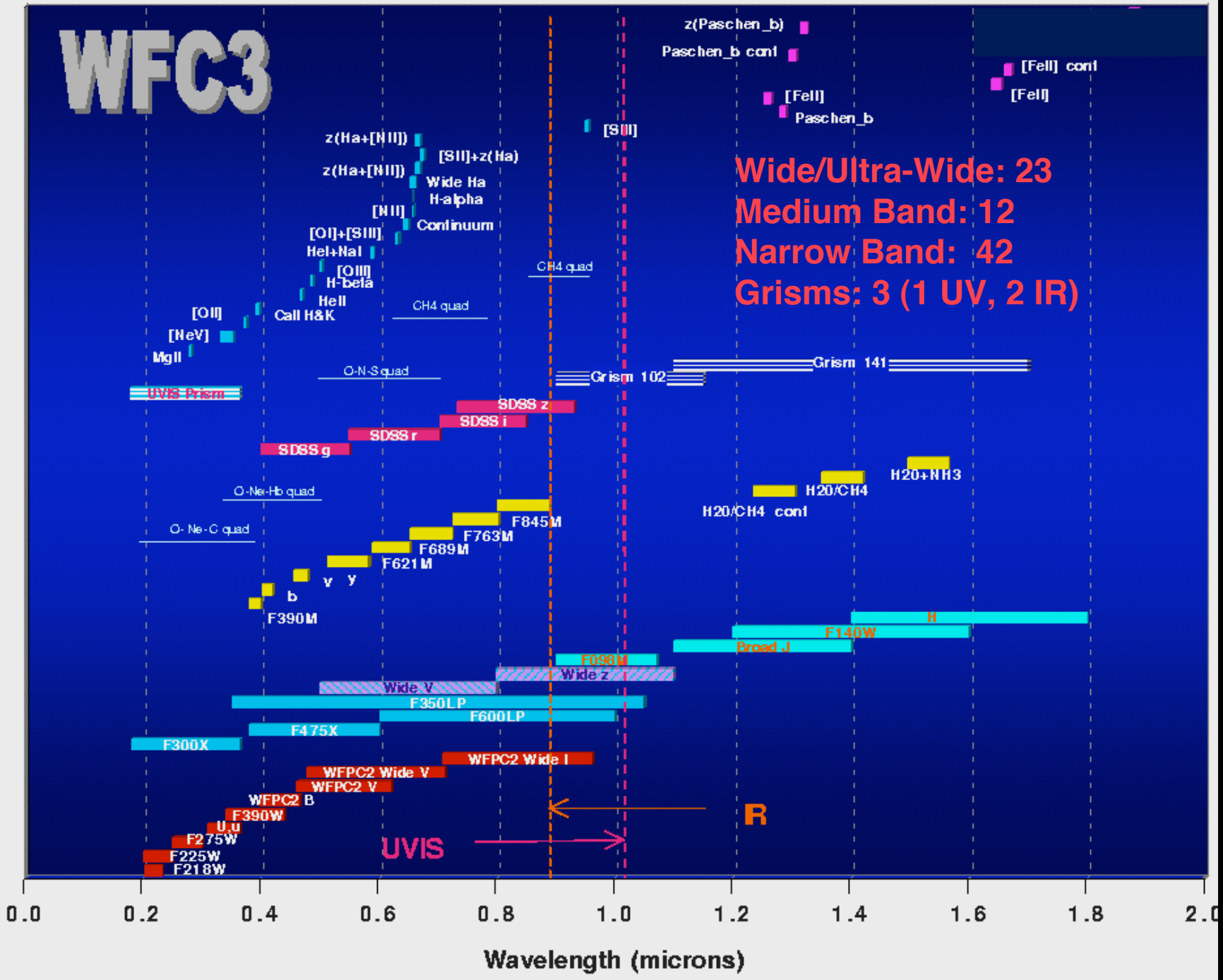


WFC3 UVIS Channel: 4096 x 4096, 0.039" pixels



WFC3 IR Channel: 1024x1024, 0.13" pixels

WFC3



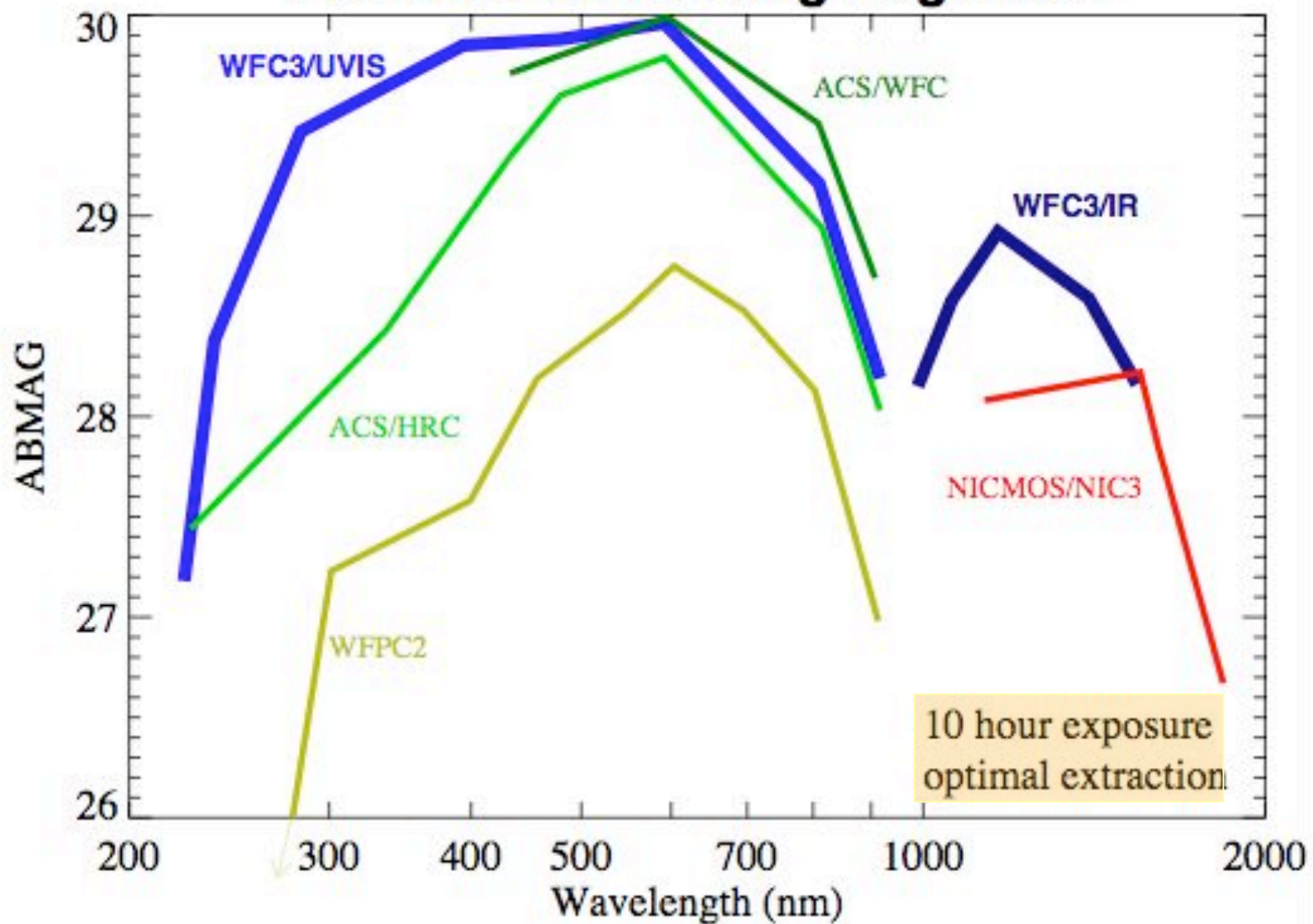
z(Paschen_b)
 Paschen_b cont
 [FeII]
 Paschen_b
 [FeII] cont
 [FeII]

- z(Ha+[N III])
- z(Ha+[N II])
- [S II]+z(Ha)
- Wide Ha
- H-alpha
- [N III]
- Continuum
- [O II]+[S III]
- HeI+NaI
- [O III]
- H-beta
- HeII
- CH4 quad
- CH4 quad
- CH4 quad
- [O II]
- [Ne V]
- Mg II
- UVIS Prism
- O-N-Squad
- SDSS z
- SDSS r
- SDSS i
- SDSS g
- O-Ne-Hb quad
- O-Ne-C quad
- F845M
- H2O/CH4
- H2O/CH4 cont
- H2O+NH3
- F689M
- F763M
- F621M
- F390M
- b
- v
- y
- F300X
- F475X
- F600LP
- F350LP
- Wide V
- Wide z
- F689M
- Broad J
- F140W
- H
- WFC2 Wide I
- WFC2 Wide V
- WFC2 V
- WFC2 B
- F390W
- UVIS
- F275W
- F225W
- F218W
- R
- Grism 102
- Grism 141
- Grism 141

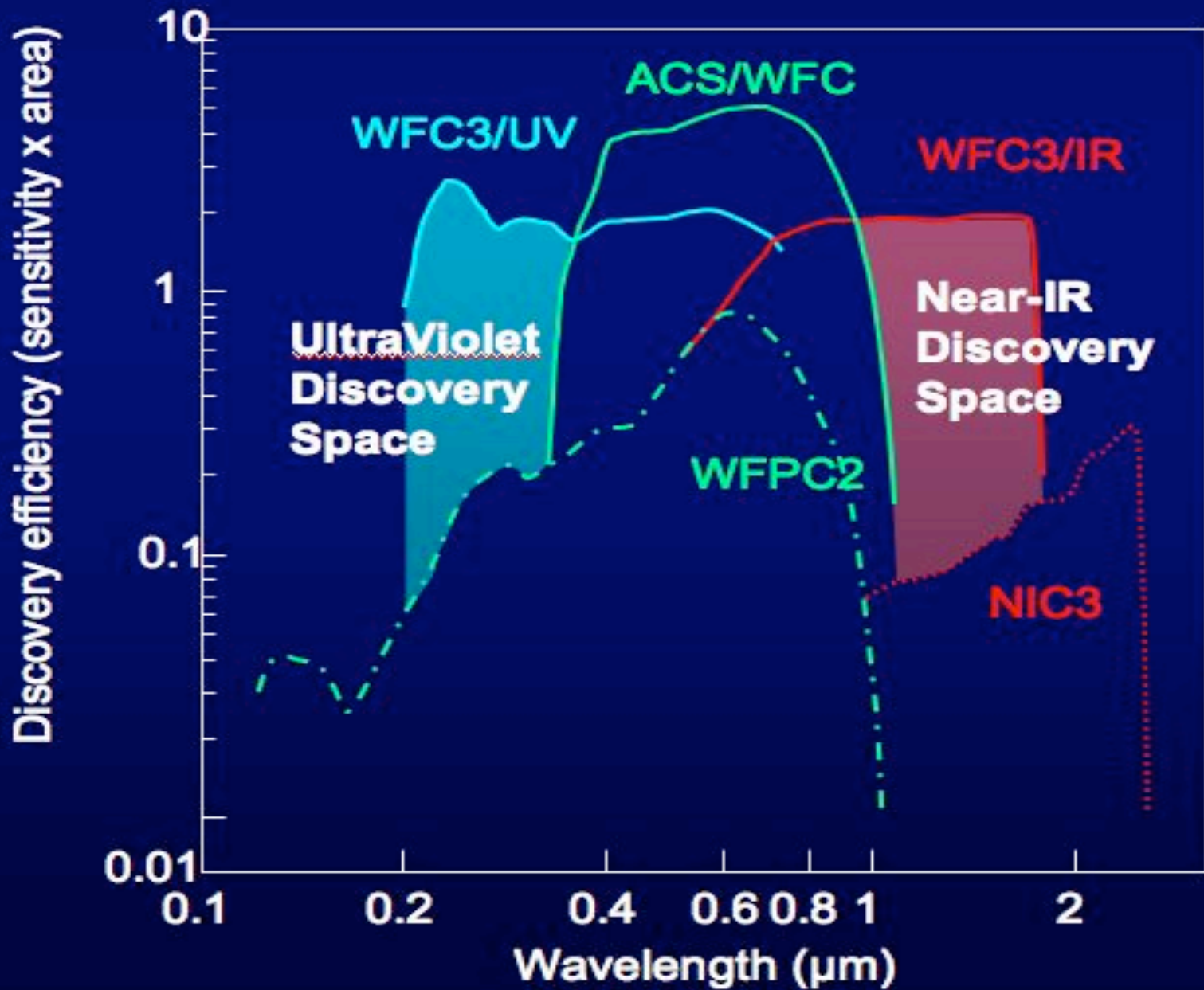
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

Wavelength (microns)

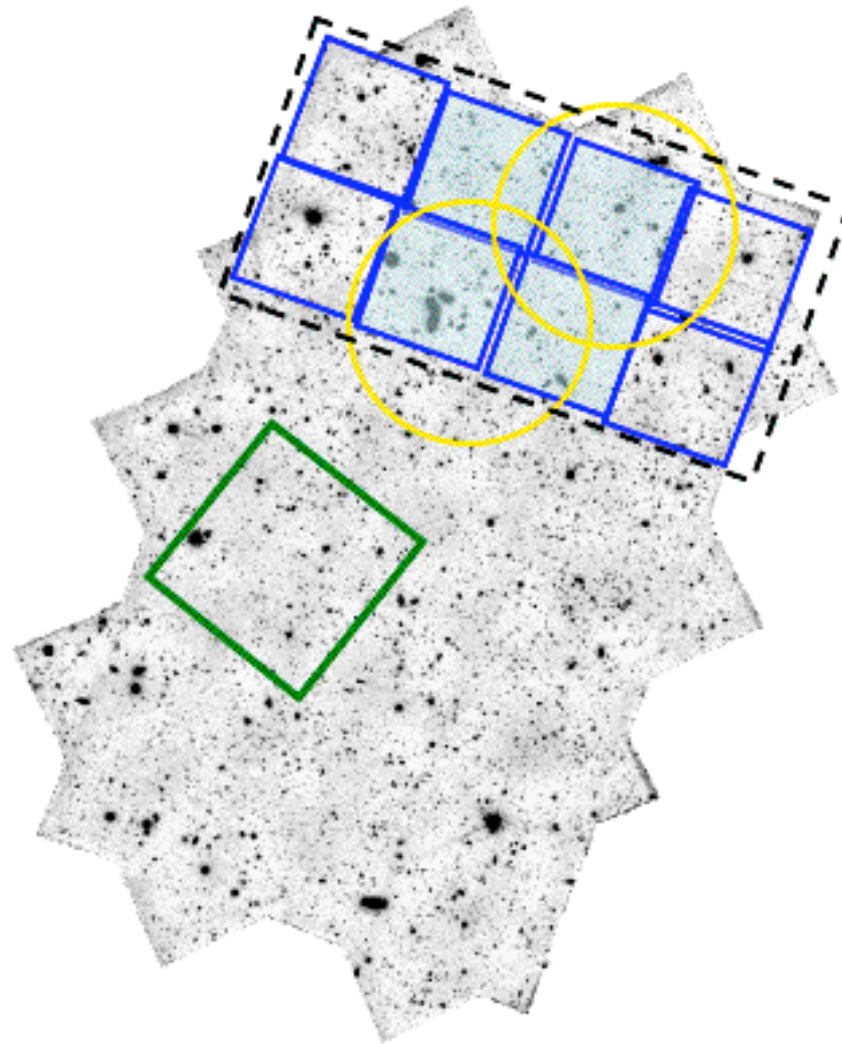
Point Source Limiting Magnitude



DISCOVERY EFFICIENCIES



WFC3 GOODS FIELD SURVEY



Single 5'x10' field

8 WFC3 pointings

5 filters + 1 grism in each pointing

2 add'l grisms in 4 central pointings

Nominal 2 orbits/filter

+ ACS Parallels (4 filters)

GOODS CDFS

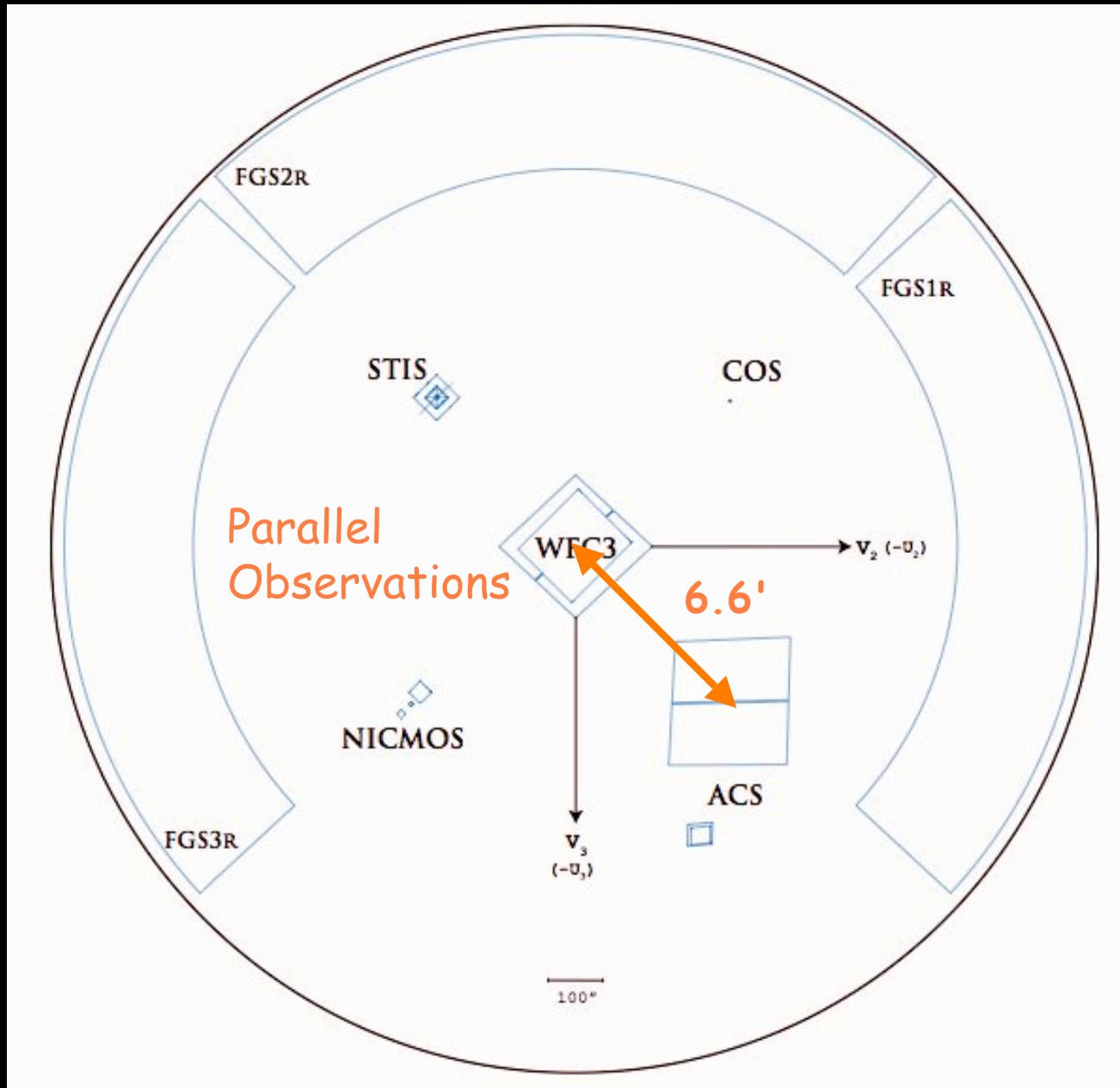
— WFC3

— HUDF

— PEARS

— WFC3 Grisms

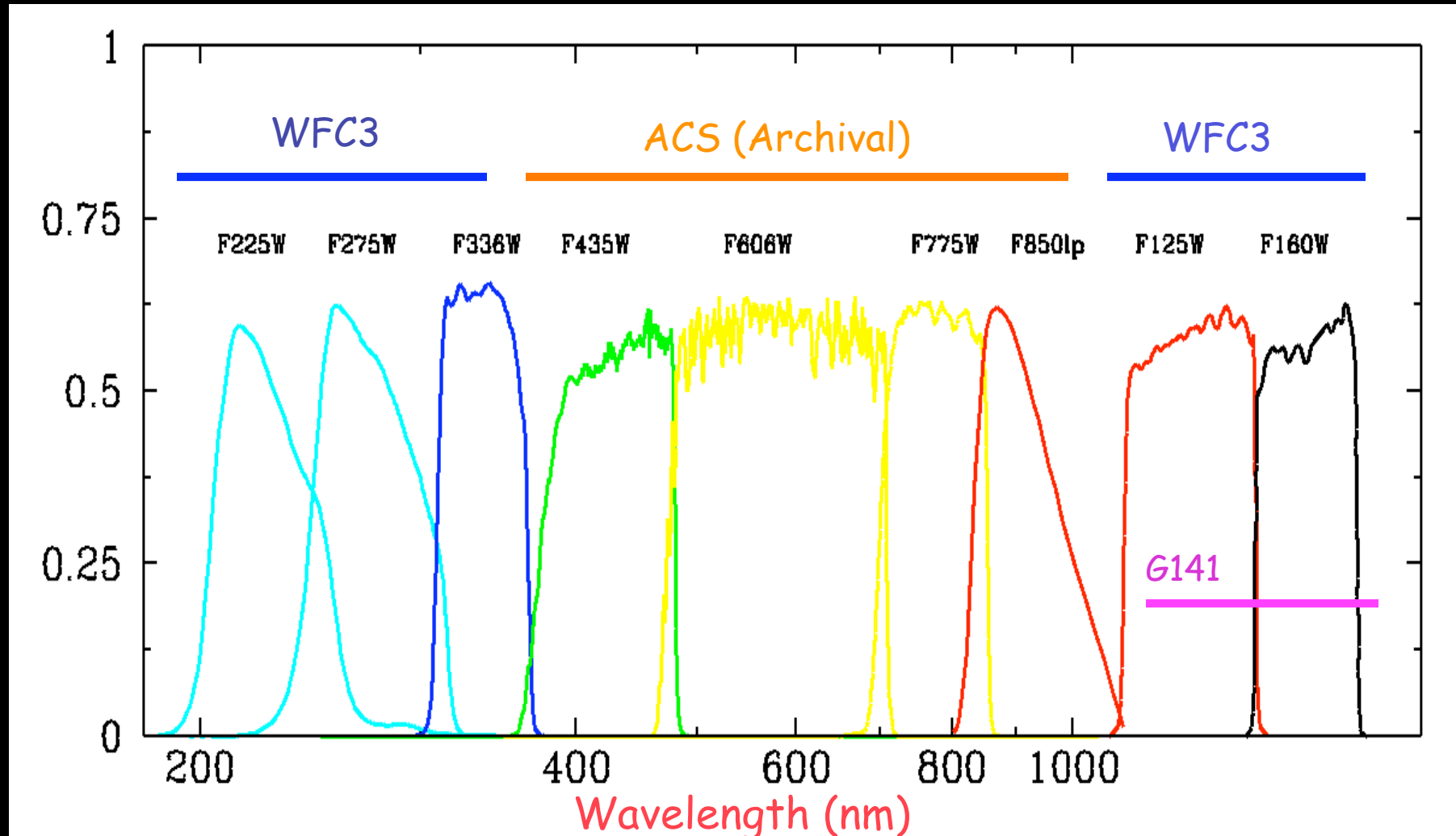
HST Focal Plane

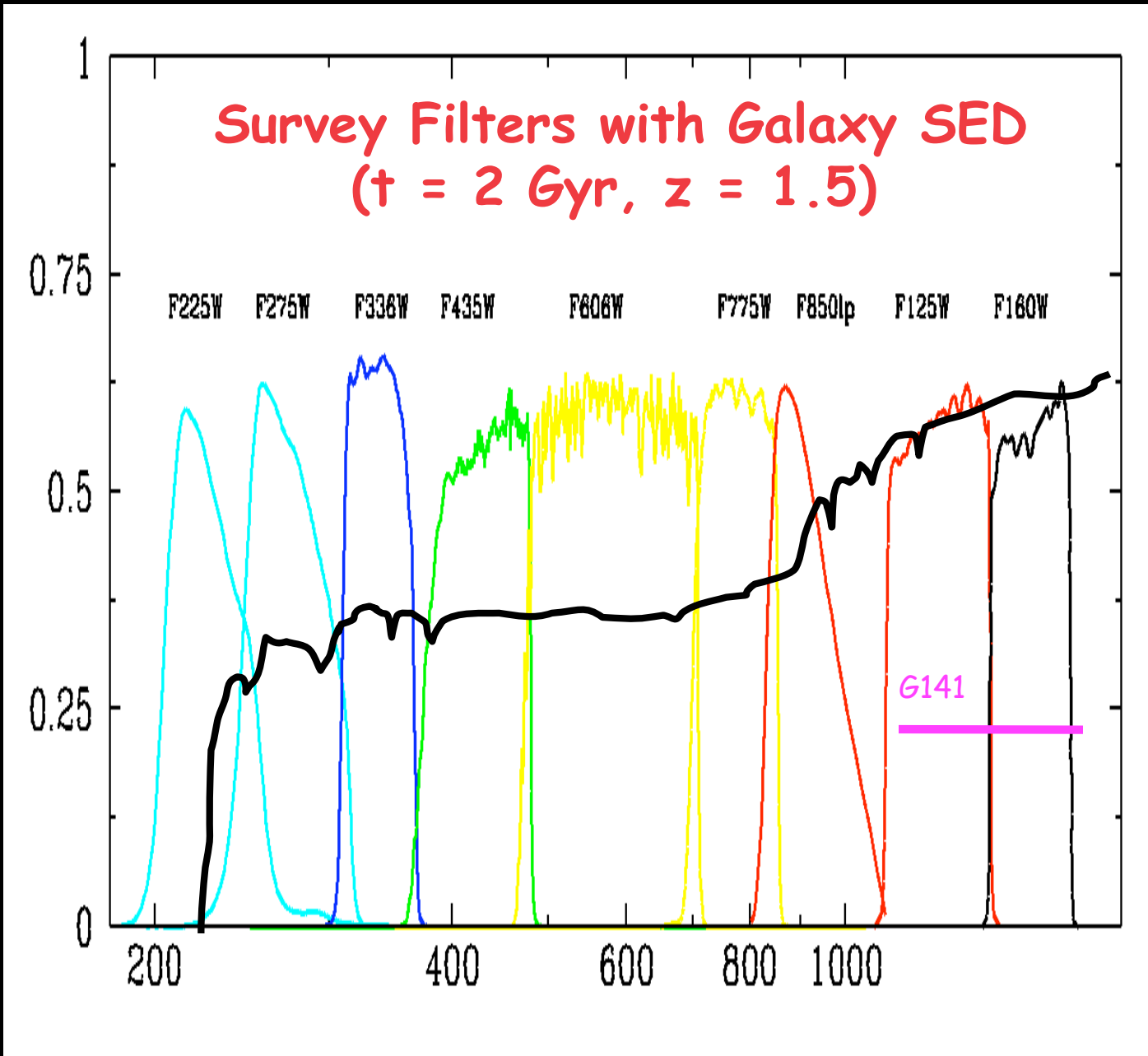


Intermediate Redshift Program Science Goals

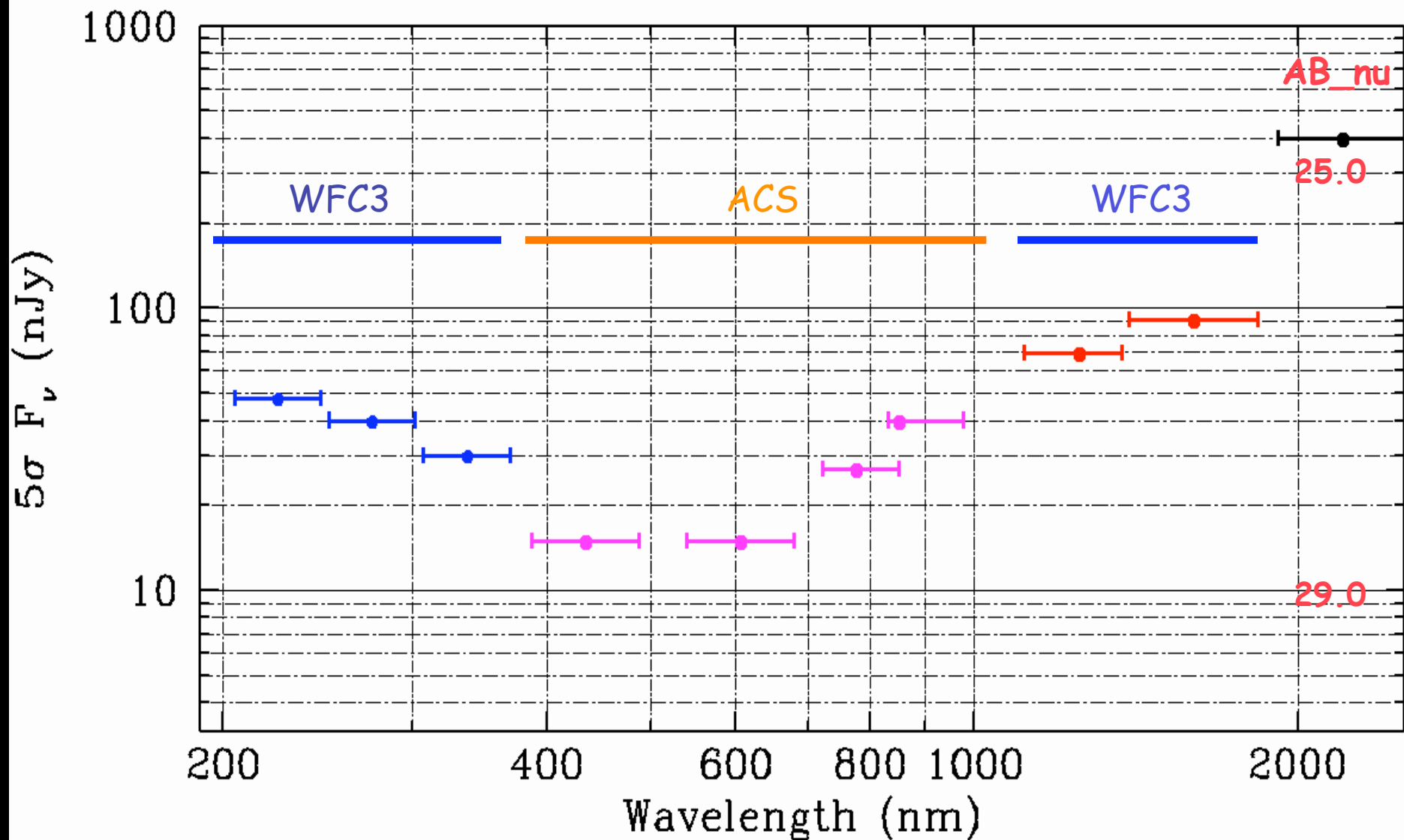
- Overall: galaxy assembly/origin of Hubble sequence at critical epoch $z \sim 1-3$
 - Improved photo- z 's and spectrophoto- z 's from broader SED coverage (filters) and grism spectra (especially $z \sim 1-2.5$ and > 7)
 - SF rates $z \sim 1-2$ from well-sampled rest UV (filters) and Ly-Alpha/H-Alpha (UV/IR grisms)
 - Slope of the low-mass luminosity function (IR filters)
 - "UV-upturn" population in old systems $z \sim 1$ (UV filters)

GOODS Field Survey: Filters





GOODS Field Survey: Depth



Star Formation in Nearby Galaxies

---Sample---

(m-M)	Galaxy	Nature	Type
31.0	NGC 4382	- SO in Virgo (star formation)	S0
31.0	NGC 4150	- SO in Virgo (star formation)	S0
30.0	NGC 4592	- “retarded” galaxy	Spiral
29.9	NGC 2841	- flocculent spiral	Spiral
28.6	CenA	- nearest elliptical (accretion)	Elliptical
28.6	M 83*	- grand-design spiral	Spiral
27.9	NGC 4214	- dwarf	Irregular
26.9	M 82	- dusty starburst	Irregular
18.5	30 Dor	- $10^5 M_{\odot}$ LMC star cluster	Star cluster
13.9	NGC 3603	- $10^4 M_{\odot}$ Galactic star cluster	Star cluster

* Two pointings

Star Formation Program Science Goals

- Star formation histories from multiband...
 - Aperture photometry
 - Pixel-by-pixel photometry
 - Resolved stars
 - Resolved star clusters
- Environmental influences on cluster LF's
- ISM properties (ionization, shocks), SF feedback & regulation
- Local Group clusters: VLM IMF and pre-MS accretion

Star Formation Program: Filters

Continuum: NUV, U, B, V, I, YJ, H

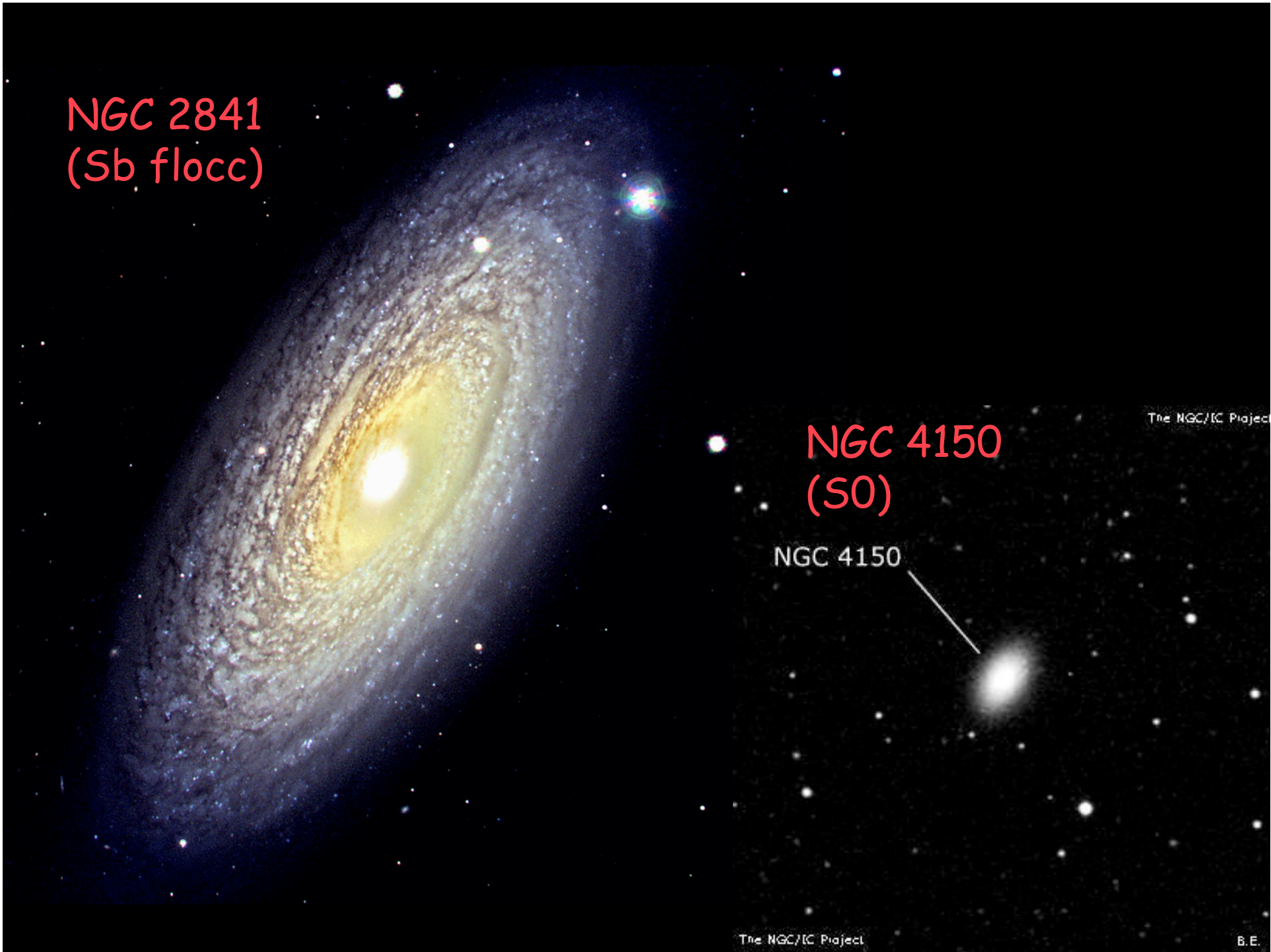
Line: [O II], H-Beta, [O III], H-Alpha,
[S II], P-Beta, H₂O, [Fe II]

NGC 2841
(Sb flocc)

NGC 4150
(S0)

NGC 4150

The NGC/IC Project

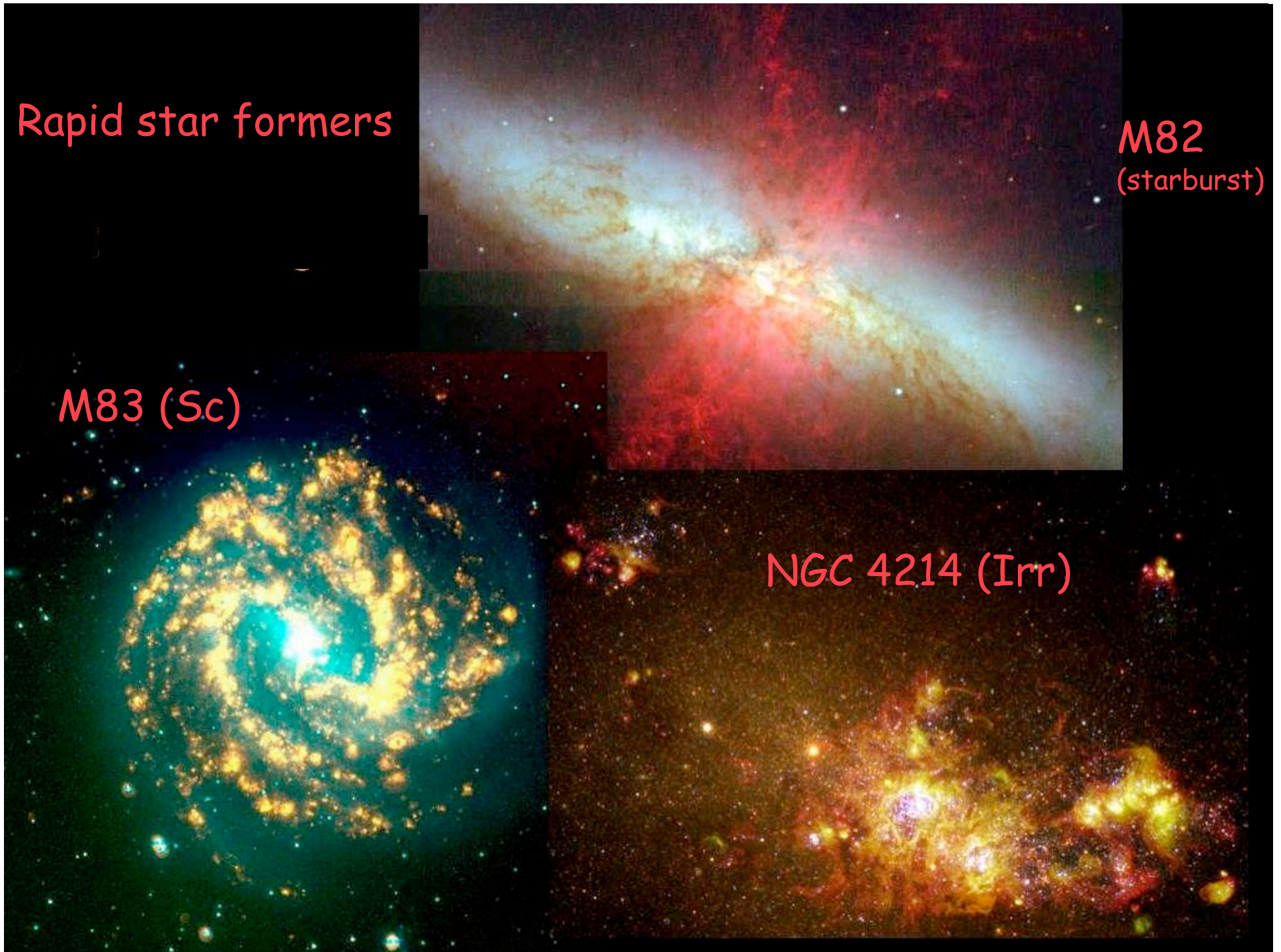


Rapid star formers

M82
(starburst)

M83 (Sc)

NGC 4214 (Irr)



Massive Local Group Star Clusters



LMC: 30Dor/R136

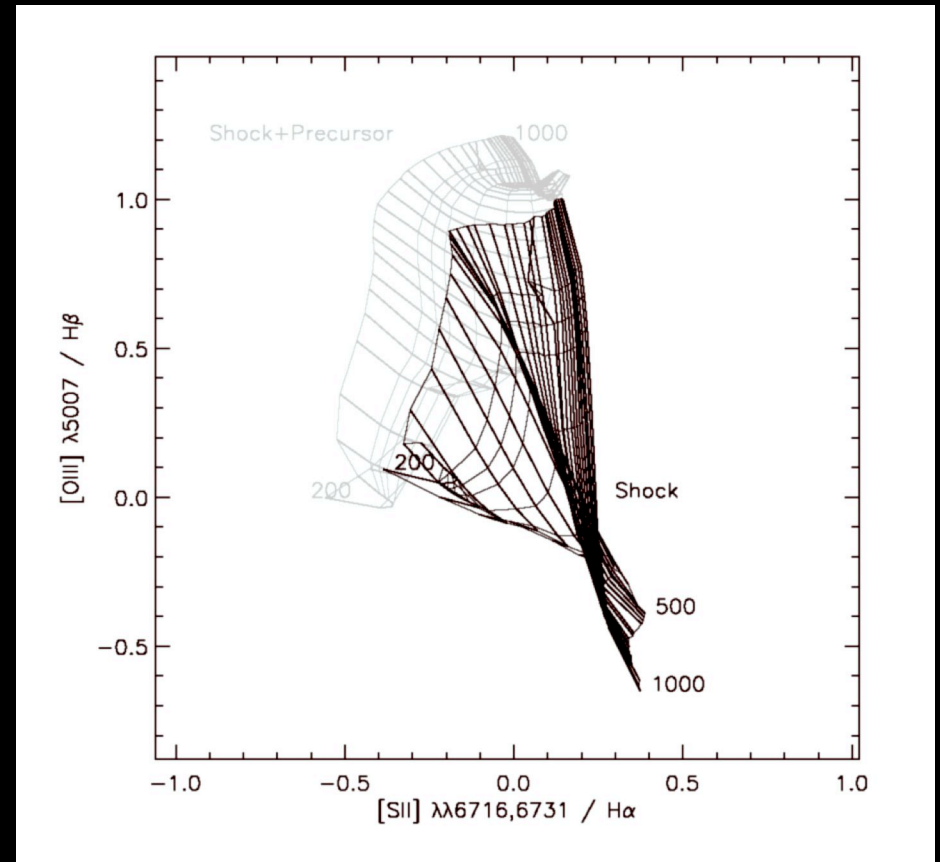
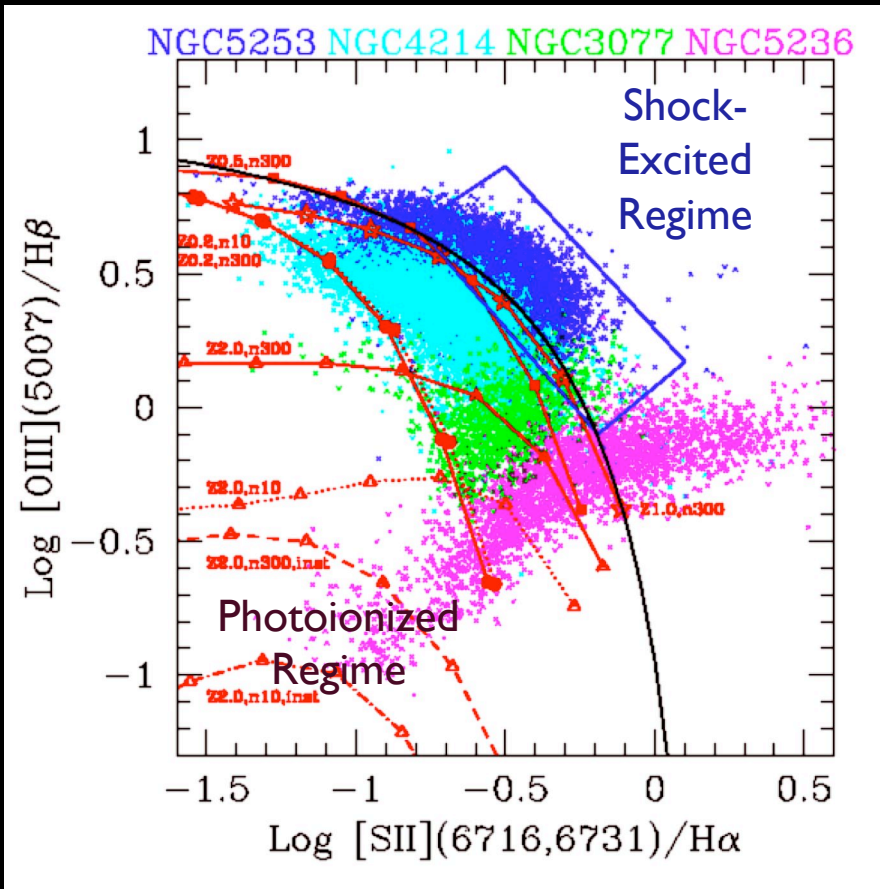


MW: NGC 3603

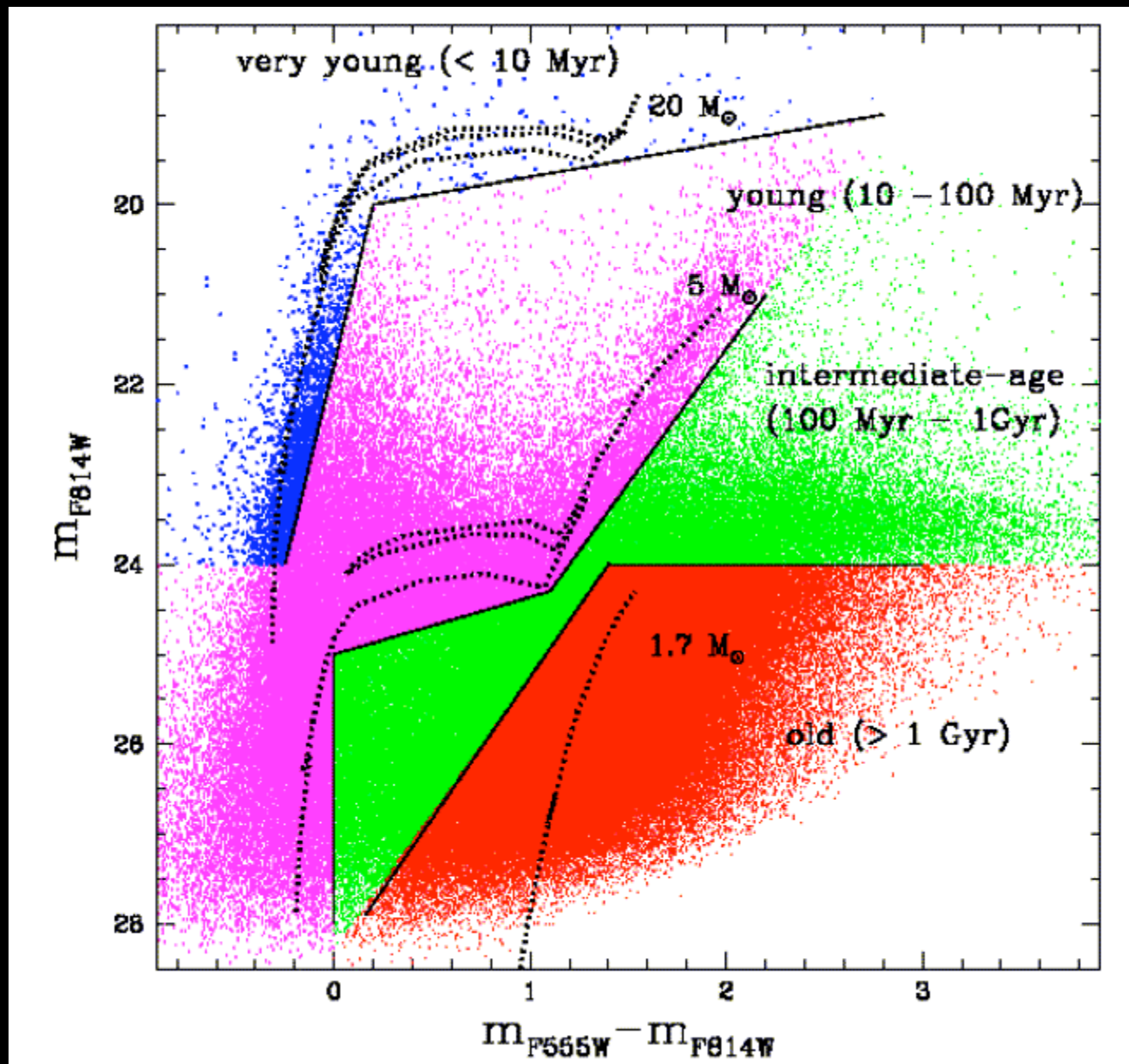
Examples of ISM Diagnostic Plots

Observations: Calzetti et al. 2007
Models: Kewley & Dopita

High Velocity Shock Models:
Allen, Dopita & Kewley 2007

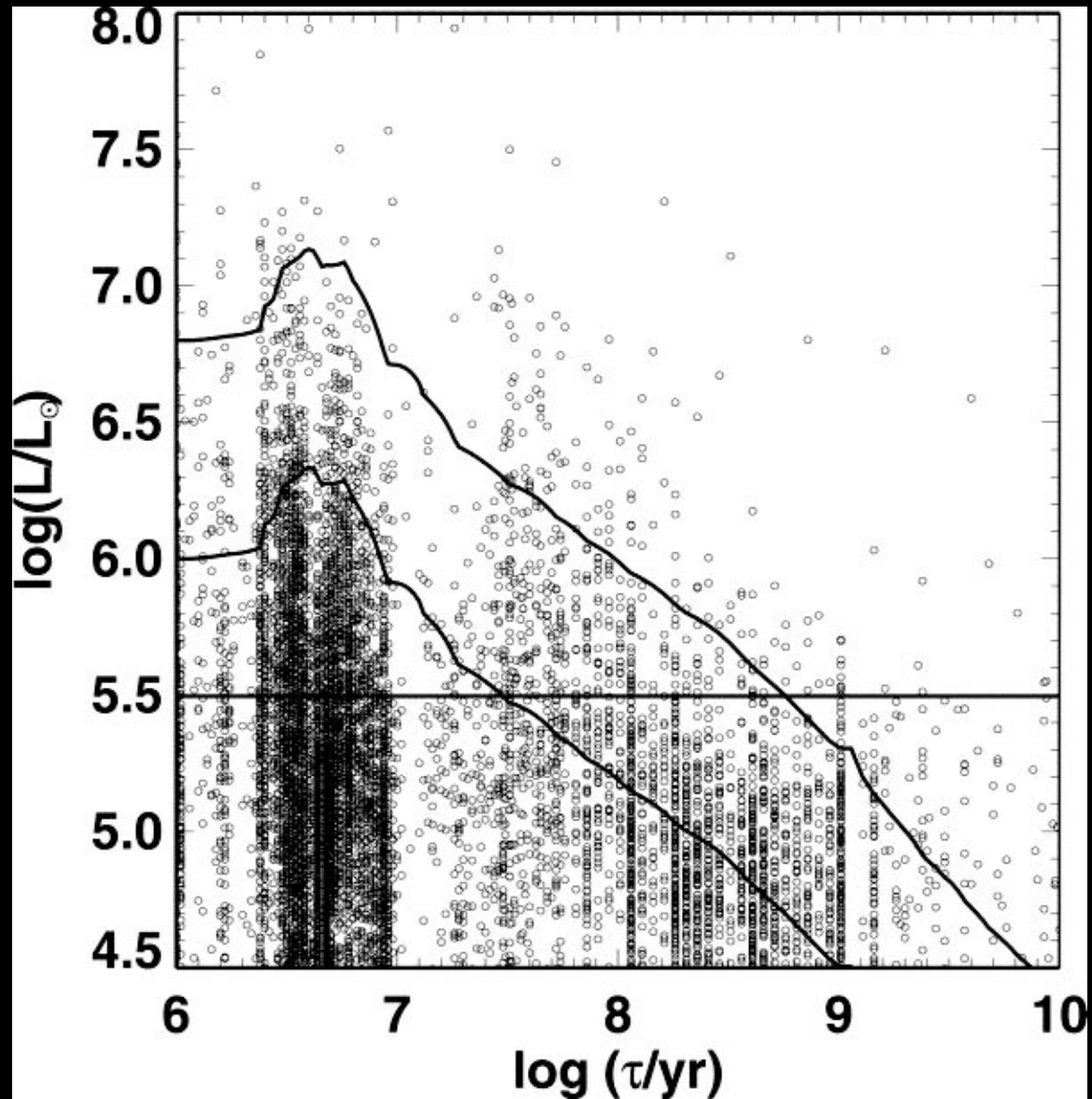


Multiband Dissection of Star Formation History



N4449, Annibali et al. (2007)

Star Cluster Age Distribution, Antennae (Fall et al. 2005)





Cen A

END