Low Metallicity Galaxies Observation through BigBOSS

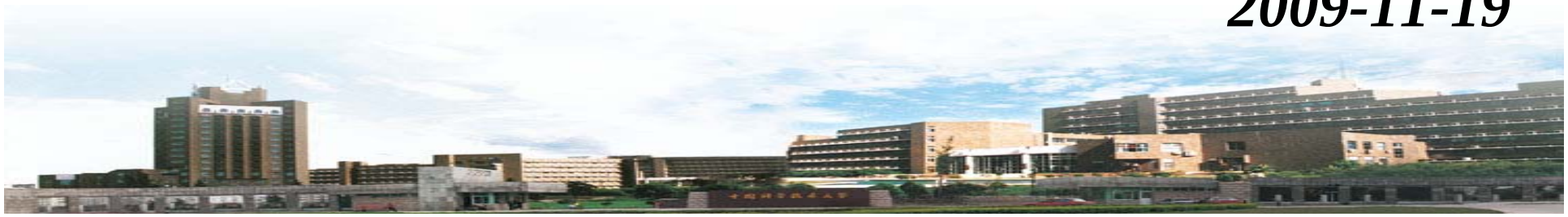
Xu KONG

Center for Astrophysics

University of Science and Technology of China (USTC)

BigBOSS meeting

2009-11-19



Outline

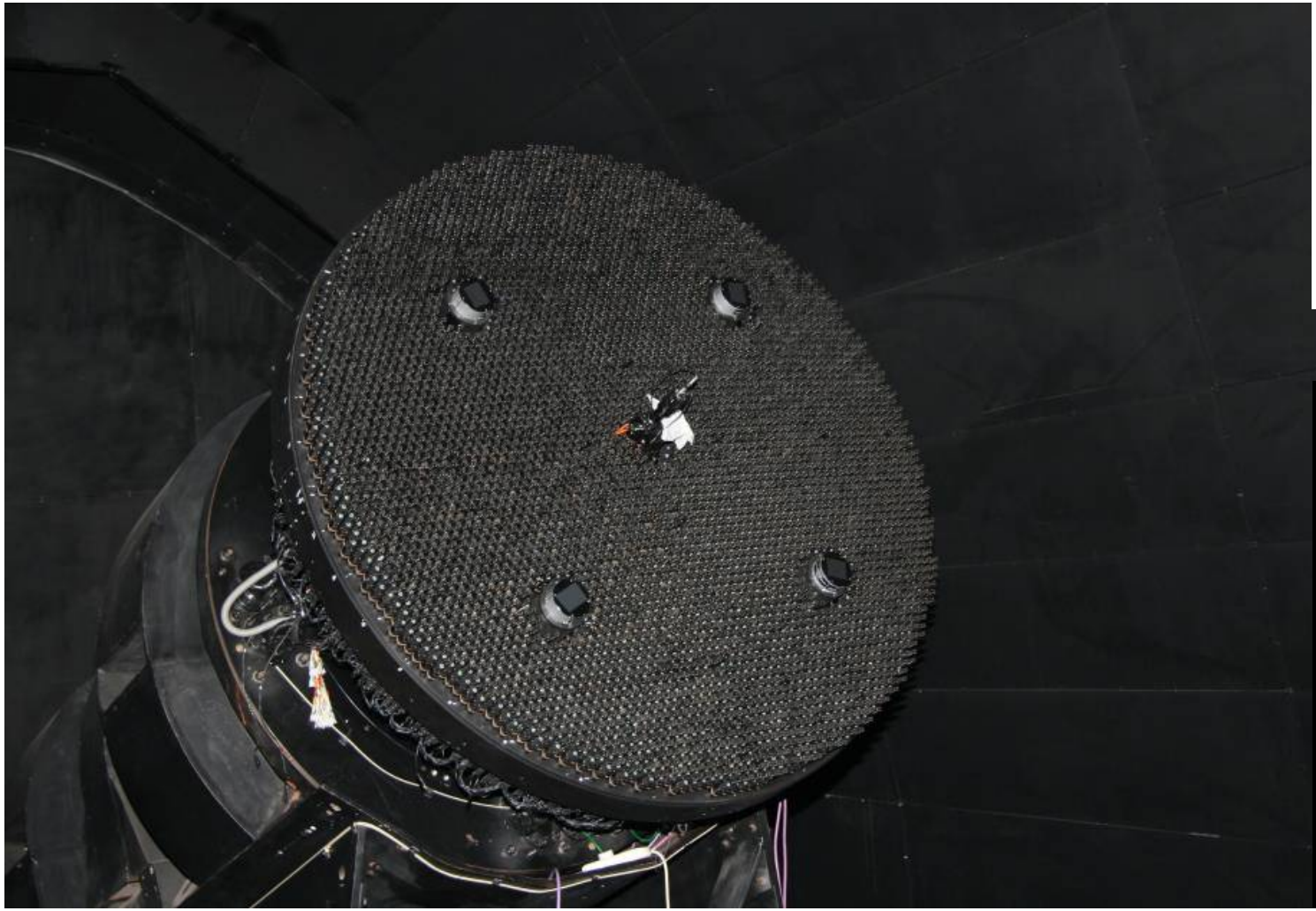
- What is the LAMOST project
- LAMOST ExtraGAlactic Surveys
- Low metallicity galaxies observation with BigBOSS

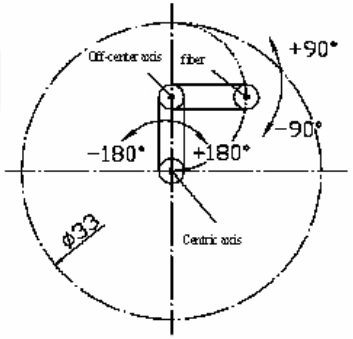
1. What is the LAMOST?

Basic parameters of LAMOST

- 4m Schmidt telescope (SDSS 2.5m)
- Field of View: 20 square degrees
- 4000 fibers
- Spectrum resolution: R=1000,2000
- Spectrum coverage : 3700—9000Å

Fiber Positioning (Chao Zhai)





Partitioning the focal surface into small areas for parallel control the individual fiber positioning

2. Key Project of LAMOST-LEGAS

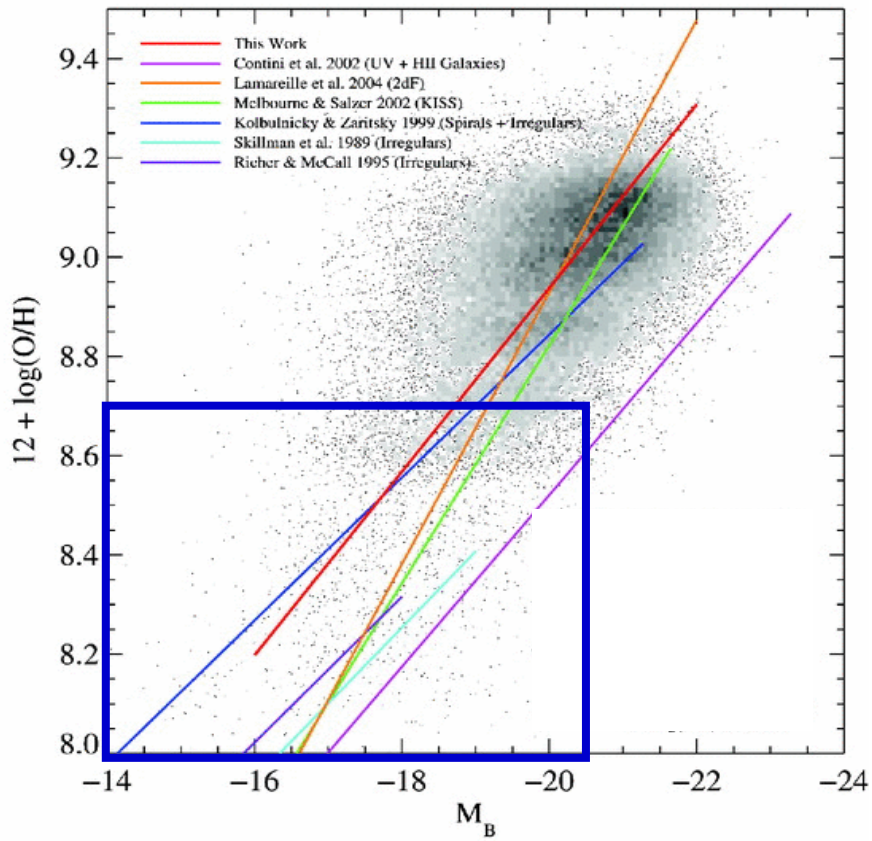
- LEGAS: LAMOST ExtraGAlactic Surveys
  - PI: Y.P. Jing
- Three sub-surveys:
  - LEGAS-Shallow, for large structure
    r=18.7mag,10^4deg^2,30min (TG. WANG)
  - LEGAS-QSOs, for AGN+IGM
  - LEGAS-Deep, for galaxy evolution
    r=19.5mag, 3600deg^2, 90min (X.KONG)

Galaxies Redshift Surveys

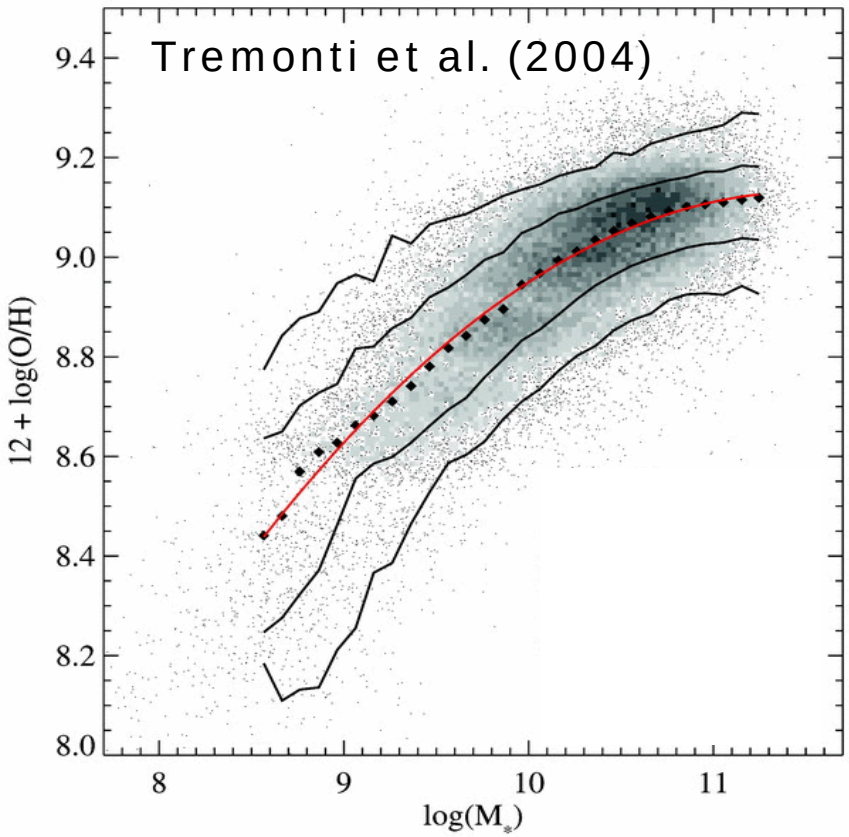
Instrument	Telescope	Redshift range	Area (deg^2)
2dFGRS	AAT	0.0-0.2	1500
SDSS I-II	2.5m SDSS	0.0-0.2	8400
6dFGRS	U.K. Schmidt	0.0-0.1	15000
GAMA	AAT	z<0.4	250
LEGAS-Deep: A bridge between z~0.2-0.6			
WiggleZ	AAT	0.7-1.0	1000
DEEP2	Keck	z>0.7	3
VVDS	VLT	0.0-5.0	16
zCOSMOS	VLT	0.5-2.5	1.7

USTC

3. Low-Z galaxy observation through BigBOSS



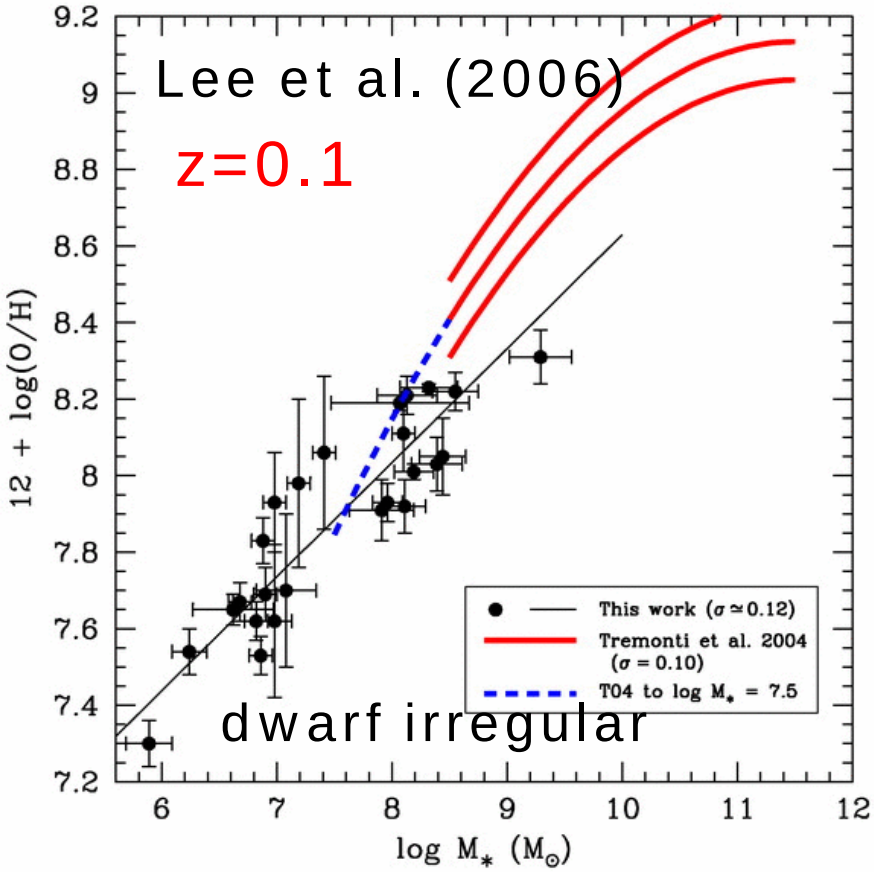
"Luminosity-Metallicity Relation"

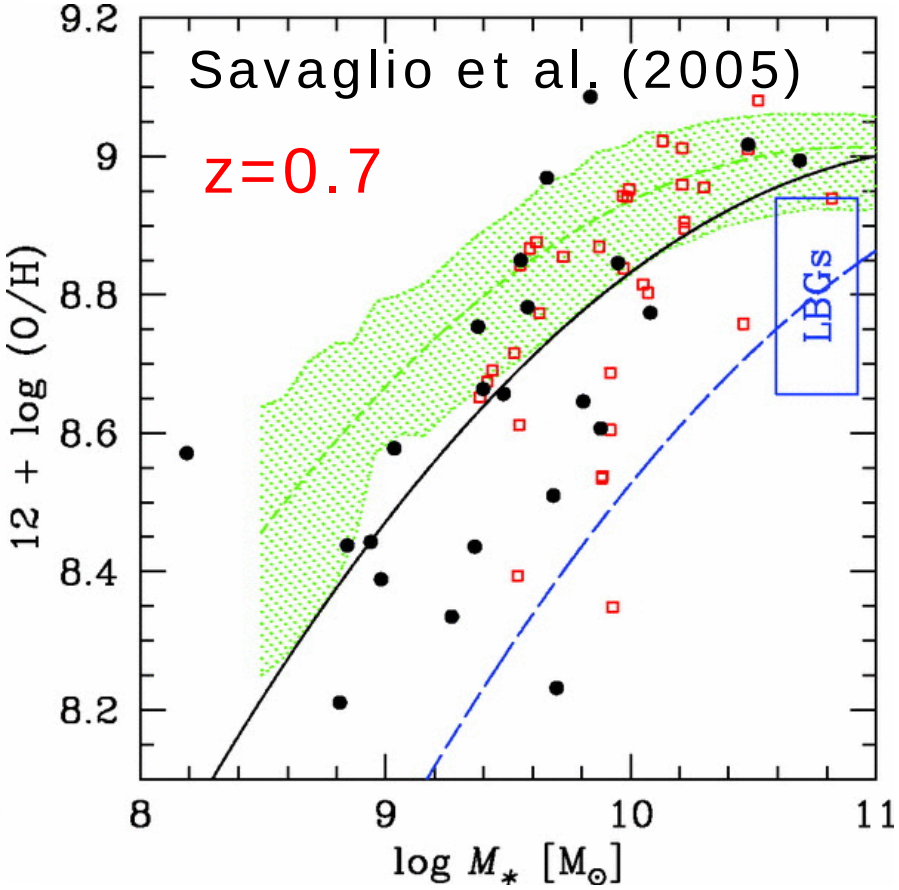


"Mass-Metallicity Relation"

SDSS 53000 spectra @ 0.0 < z < 0.2

M-Z relation of galaxies

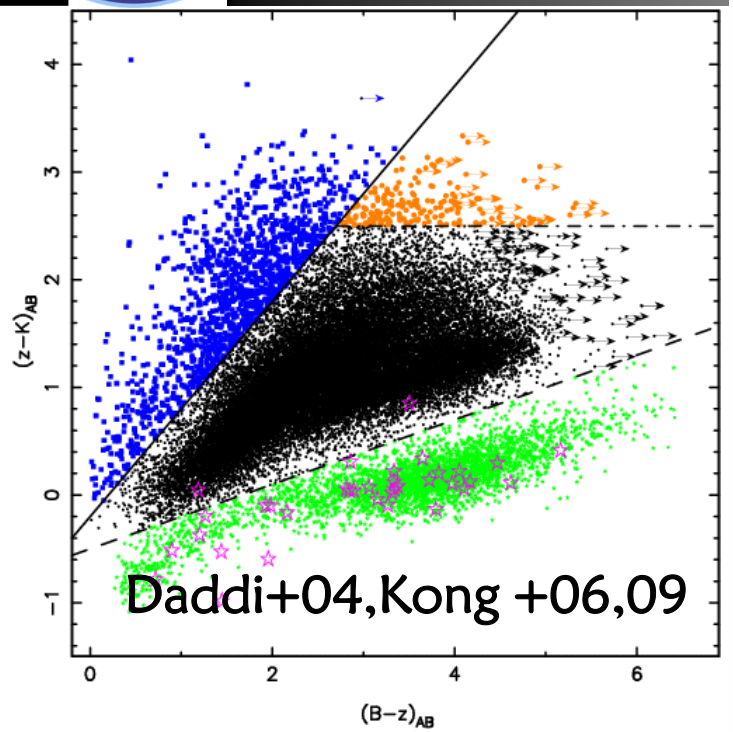


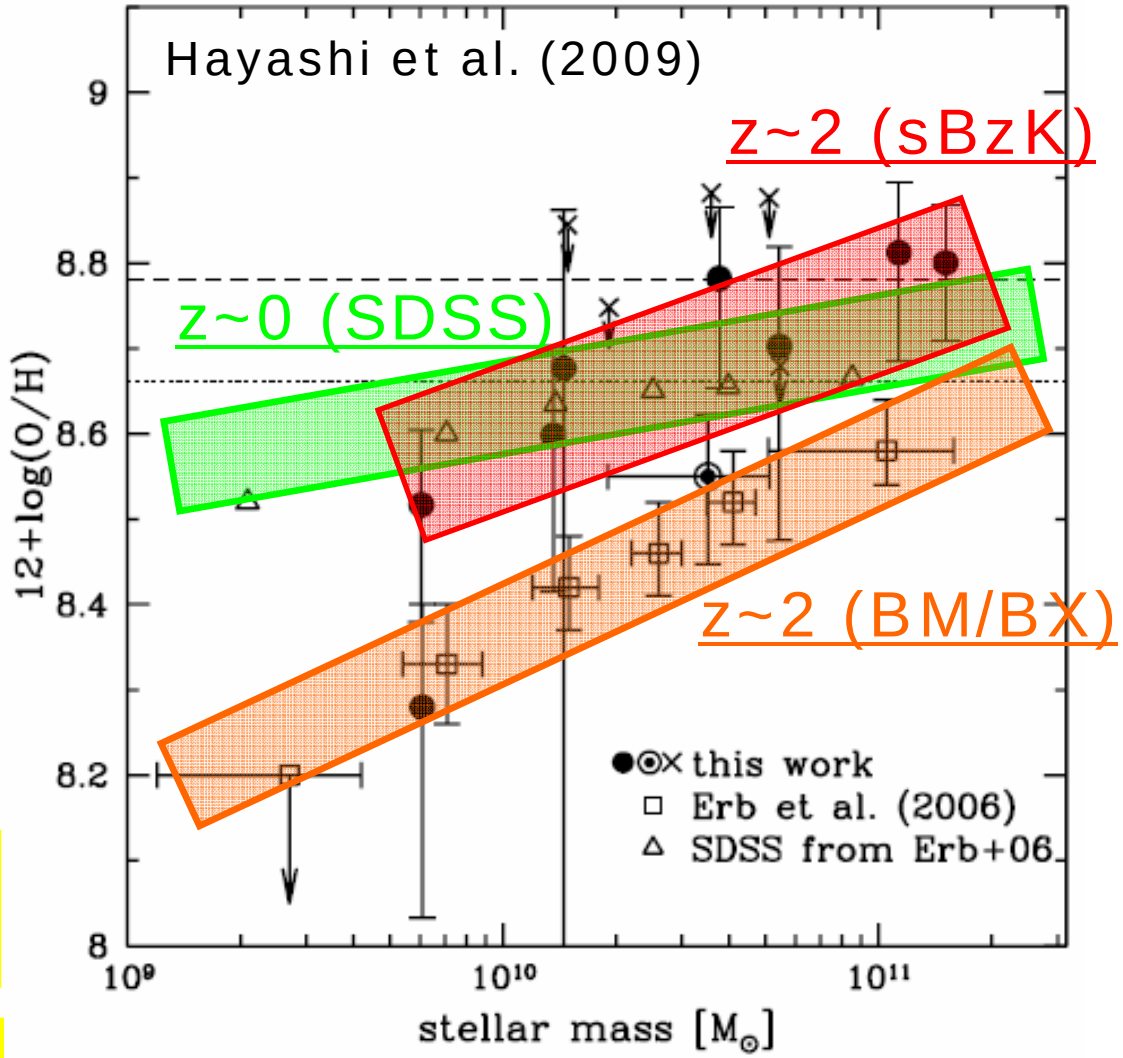


Mass/Redshift-dependent M-Z evolution?

GDDS(cir.) & CFRS ~ 60 spectra @ 0.4 < z < 1.0

BX/BM or BzK?





No evolution in M-Z rel. between z~0 & z~2 !?

M-Z rel. depends on galaxy stellar pop. !?

15 sBzK's (non-UV-selected)

Science Motivations (I)

- What determines a galaxy's metallicity?
  - Does luminosity drives galaxy's metallicity?
  - Does mass drive galaxy's metallicity?
  - Are there other parameters?
- What drives the mass-Z relation (MZR)?
  - specific physical processes on the MZR, such as starbursts and mergers?
  - other possible sources of scatter: environment?
  - additional physical sources of scatter in the MZR?
- How about Metallicity Evolution of Star-Forming Galaxies (z=0→z=2→...)
- Need large sample of low-Z galaxies!

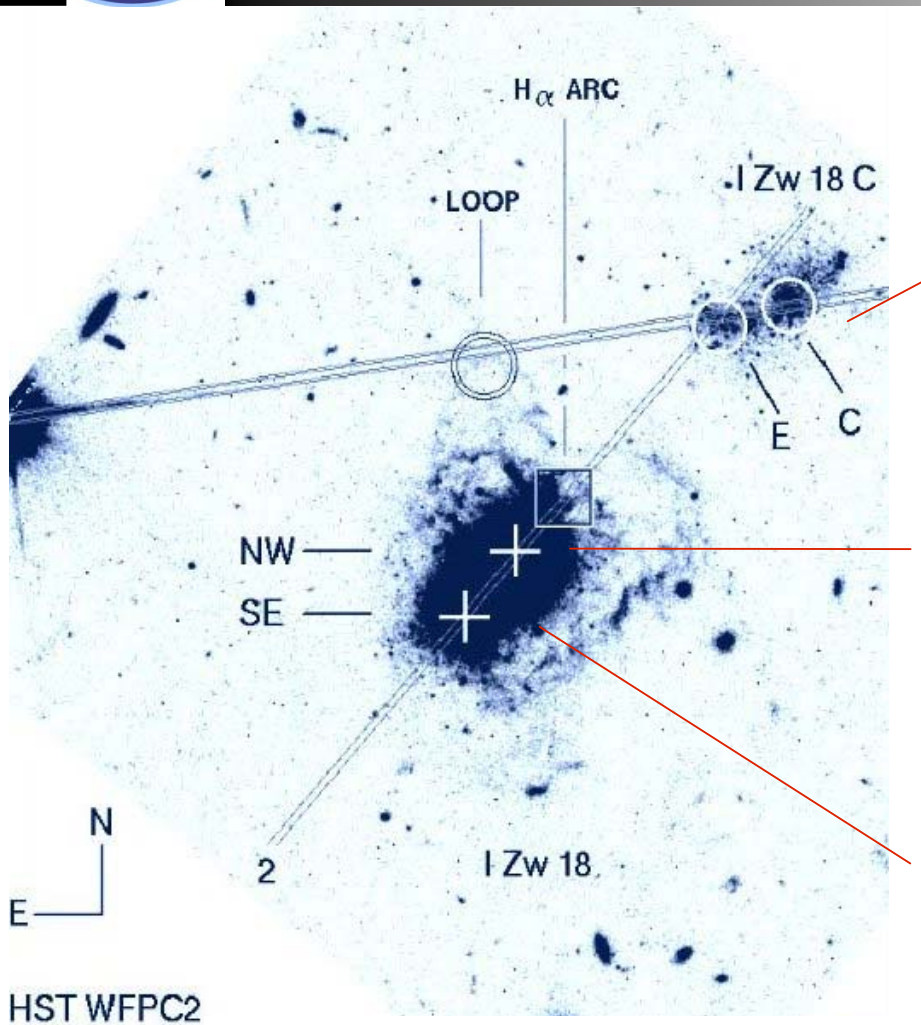
Science Motivations (II)

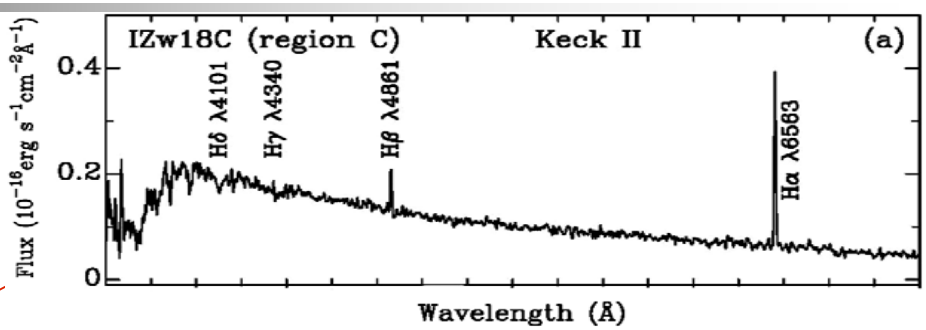
- Search for extremely metal poor galaxies/ primordial galaxies/ primordial He abundance
- Evolution of the galactic properties for low-Z emission line objects
- Relationship between metals in the gas phase and those in the dust as a function of Z
- Requiring Large Spectroscopic Sample!!

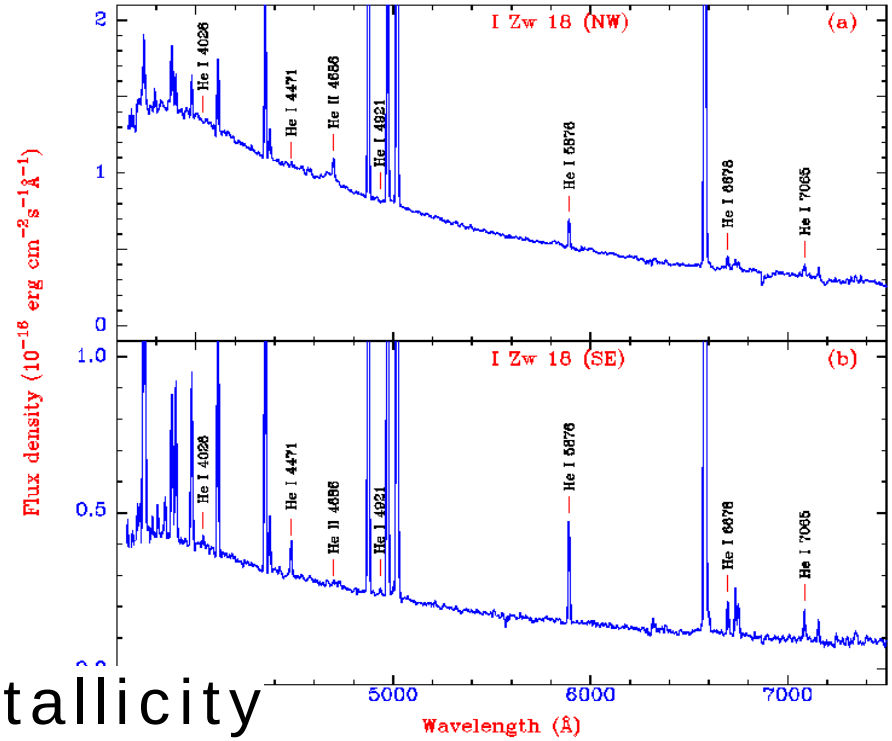
Why BigBOSS?

- Uniform derivation of the Z at 0<z<2
  - 3400Å<λ_{obs}<11300Å, R= 2300-6100
- Fainter limited magnitude than SDSS
  - a large sample down to i_{AB}~22 or deeper?
- Physical properties: from spectroscopic features (like SDSS)

How to select?

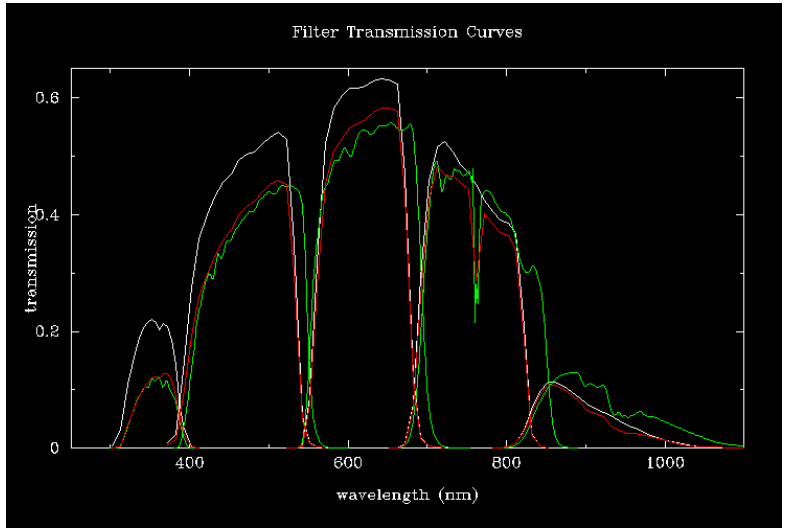


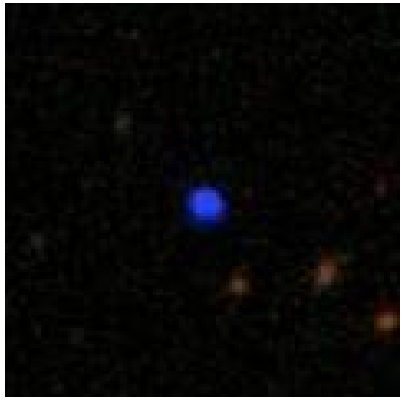


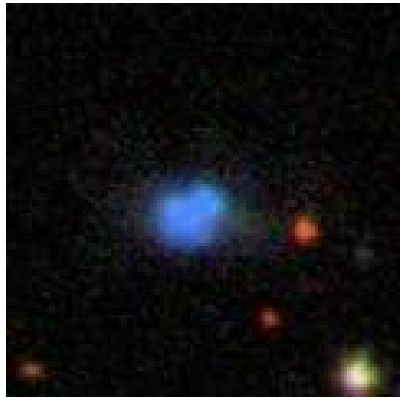


IZw18 1/50 solar metallicity

Color image of low-Z

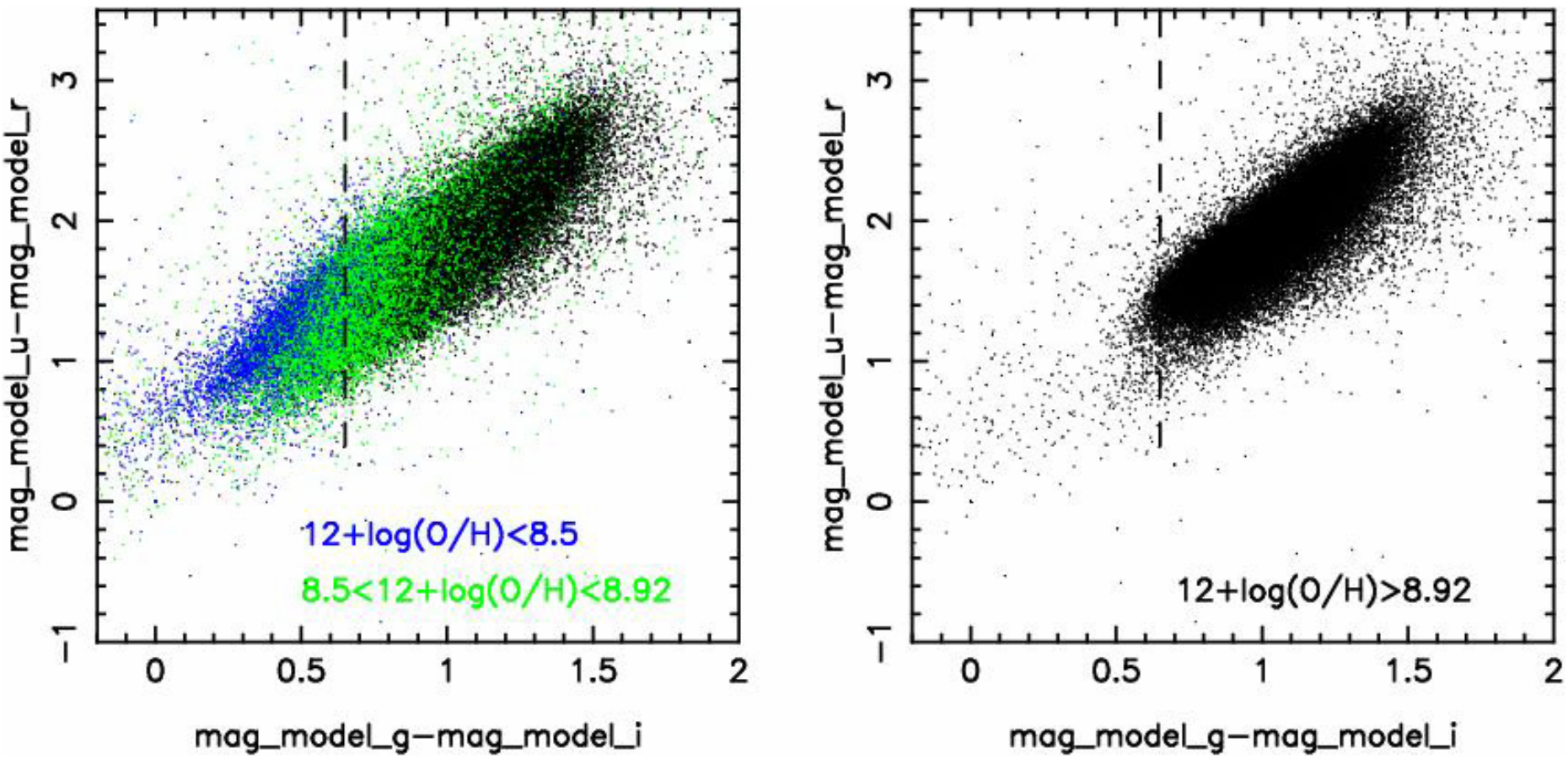






Simple color criteria:

g-i<0.65 for z=0

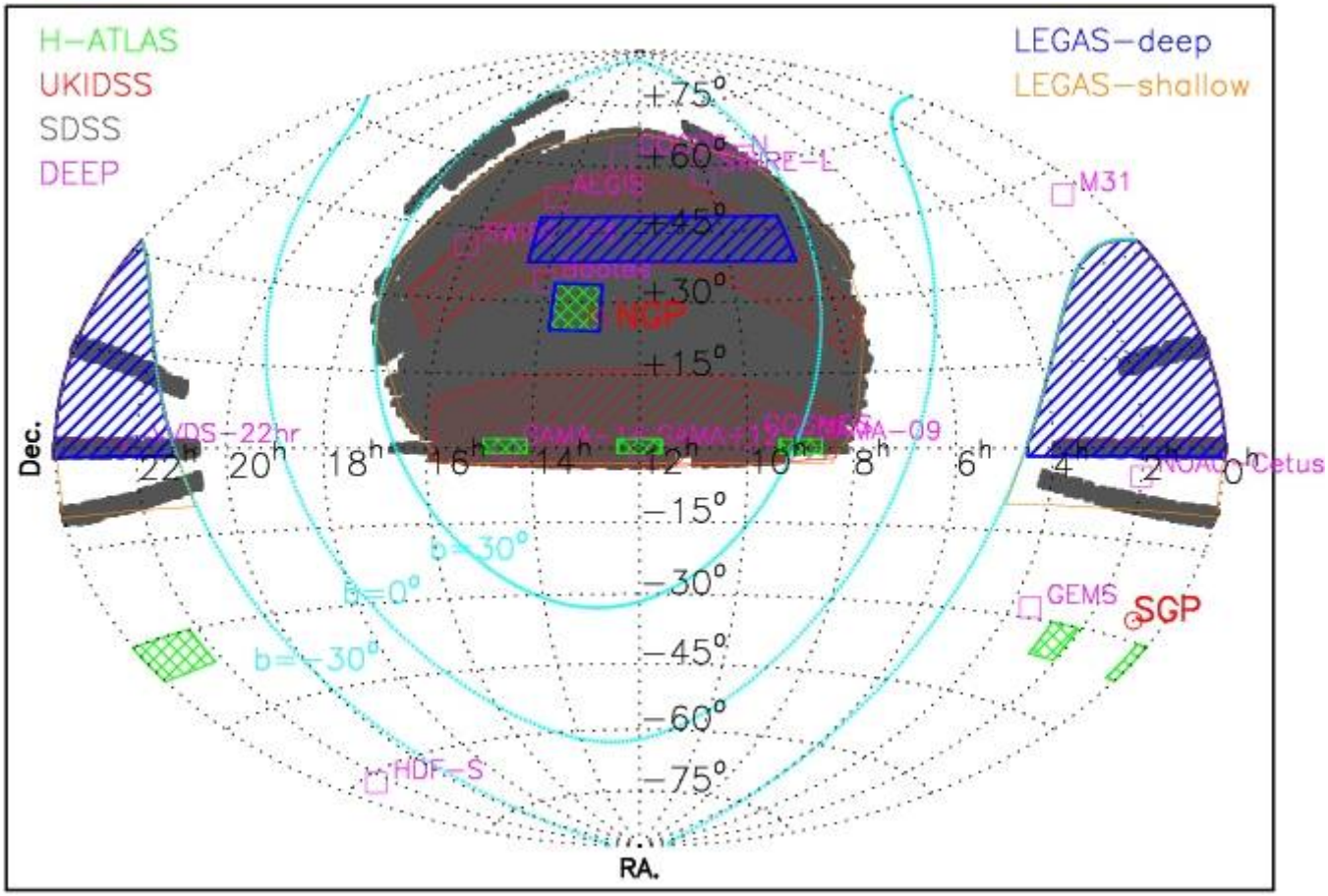


THANKS!

Metallicity determinations

Calibration	Origin	Pros	Cons
Kobulnicky & Kewley (2004)	R23, photo-ionization models	Simple to use, solves for q	2-valued, needs dust correction
Kewley & Dopita (2002)	Photo-ionization models	Solves for q, wide range of options	Requires dust correction
Zaritsky et al (1994)	Averaged R23 of 3 calibrations	Simple, so widely used	dust correction and only log(O/H)+12>8.4
Denicolo et al (2002)	Calibrated from "direct" T_e O/H	No dust correction, uses only [NII] Hα	Sensitive to q, saturates at high Z
Pettini & Pagel (2004)	Calibrated from "direct" T_e O/H	No need for dust correction	Sensitive to q, saturates at high Z
Pilyugin (2001)	Calibrated from "direct" T_e O/H	Simple to use, corrects for q	Saturates at high Z

Area for the LEGAS-Deep



Southern field: 2700 deg^2

Northern field: 700 deg^2

NGP field: 200 deg^2

Weather, Dec., Foreground Extinction, Multi-λ data