Astronomical Researches in Mainland China

EAMA5

November 12-16, Taipei

Research Activities

Research group, PIs, progress , collaboration ……

mainly on :

Cosmology

Formation and Evolution of galaxies

Stellar Structure & Evolution

Star Formation

Gravitational lensing

PI: Wu X-P (NAO)

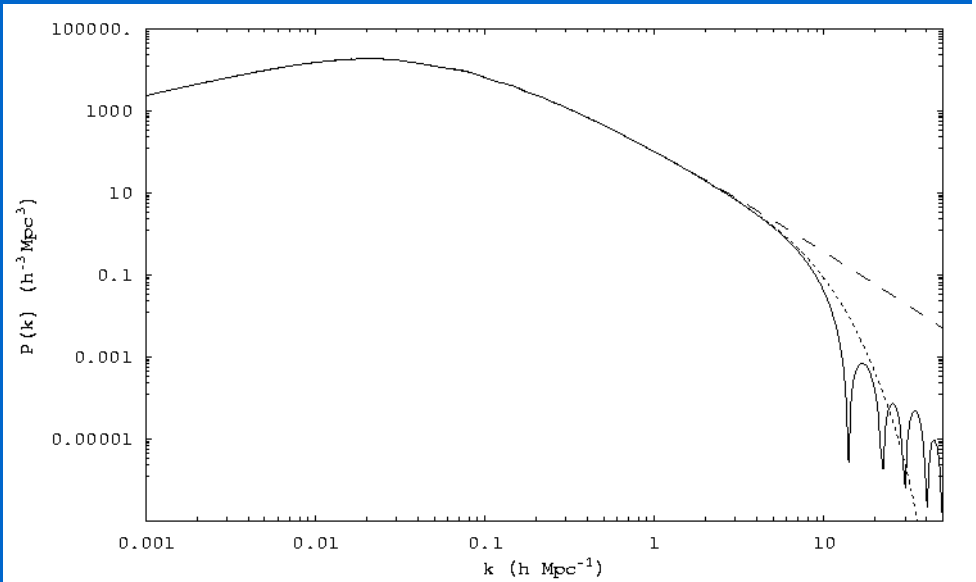
* lens statistics
* lensing effect on Hubble diagram for QSO sample
* compact dark matter nuclear in center of cluster
* effect of local density on Hubble constant
* mass determination for cluster of galaxy
* missing baryon problem

Early Universe & Particle Cosmology

PI : Zhang X.-M. (IHEP)
Zhang Y. (CS&TU)
Fan Z.-H (PKU)

Weakly-Interacting Massive Particles (WIMPs)

- Non-thermal production of WIMPs (cosmic string decay)
- co-moving free-streaming scale < 0.1 Mpc



W.B. Lin et al. 2001, Phys. Rev. Lett., 86, 954

Large scale structure

PI: Fong L-L (CSTU, Heifei)

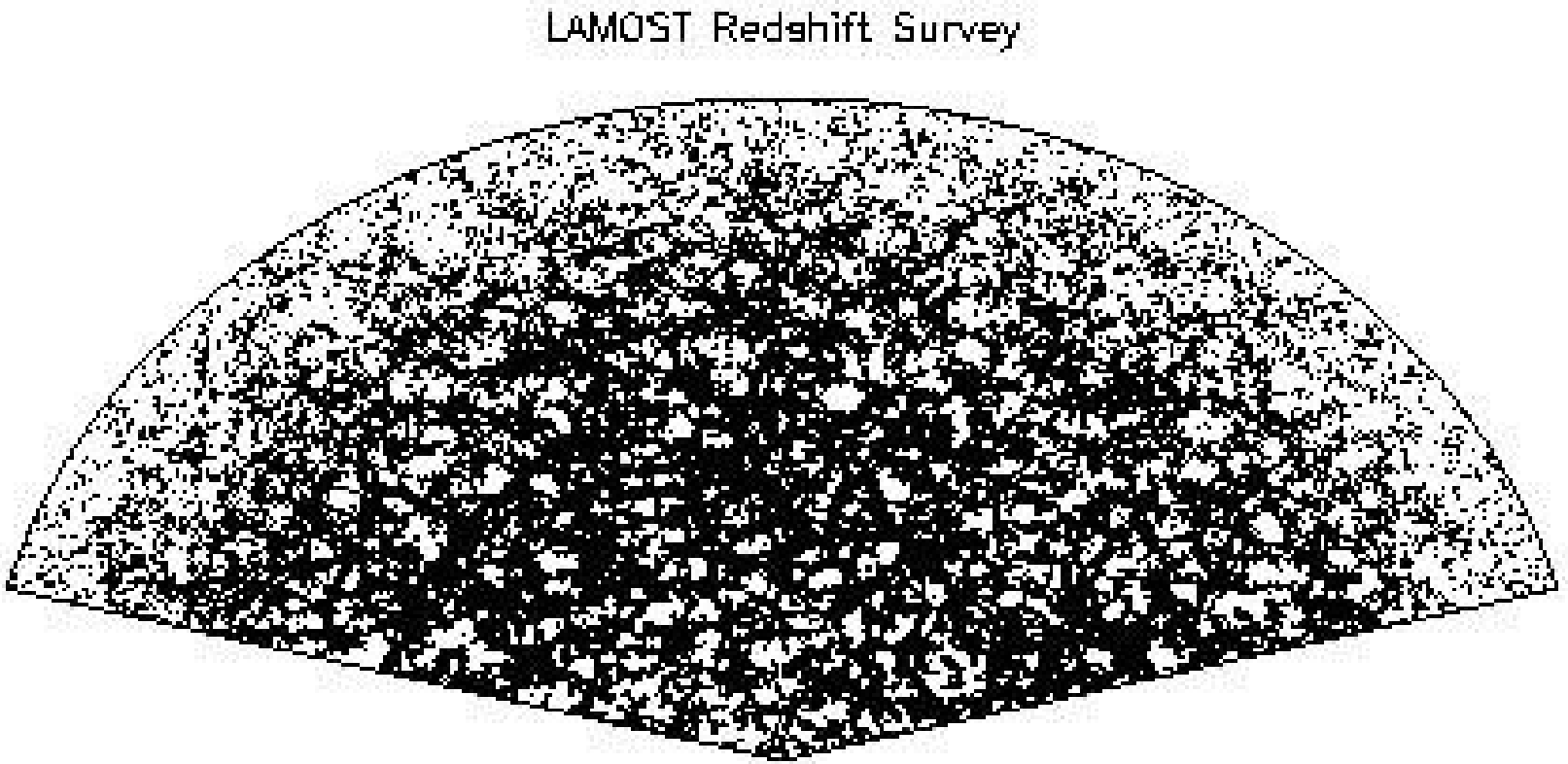
Deng Z-G. (Graduate school, CAS)

Jin Y._P (ShAO)

Zhang Y. (CS&TU)

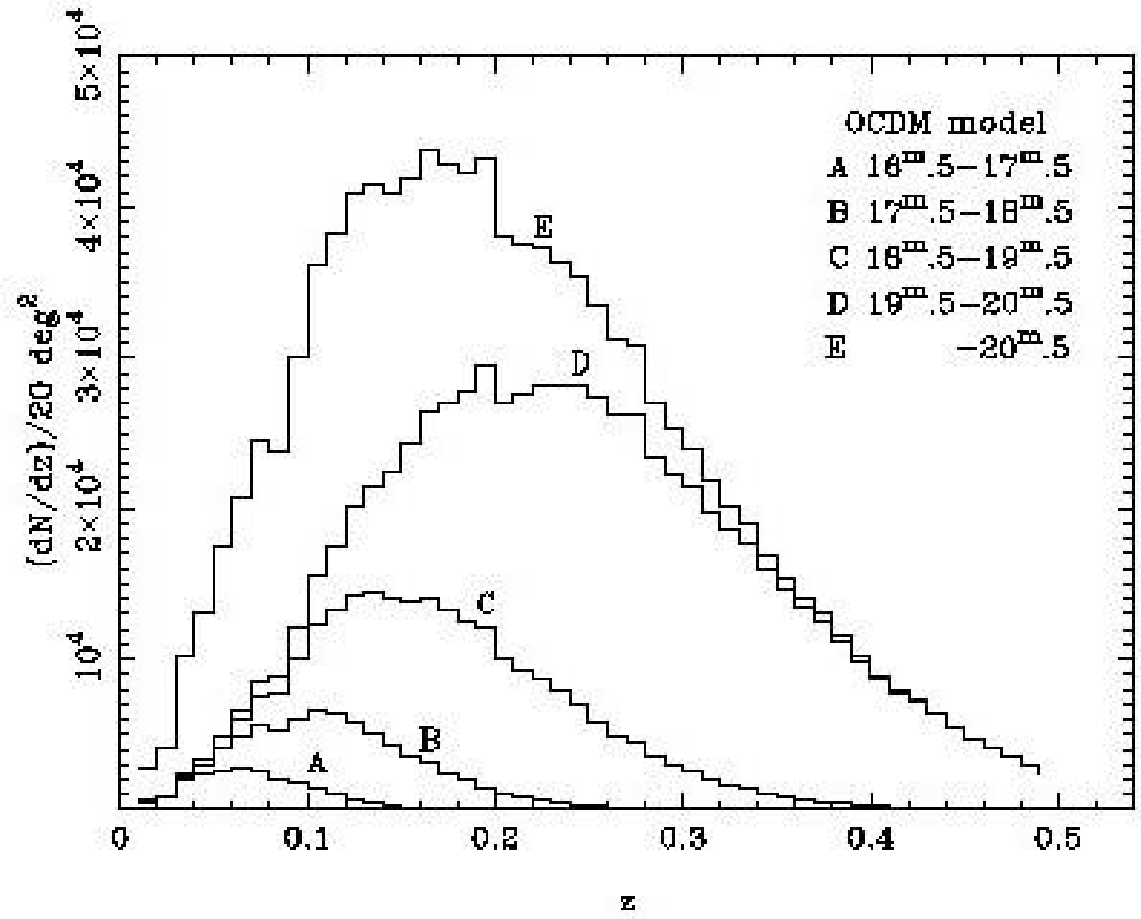
N body simulation , correlation function , galaxy segregation , power spectrum , mechanism for power law index , ...

Simulation for LAMOST



Slice 150^{o} x 30^{o} , Z ~ 0.5, model: Open CDM, ? = 0.3 ? = 0.21

Redshift distribution of LAMOST galaxies survey



Z ~ 0.2 for LAMOST

Z ~ 0.11 for SDSS

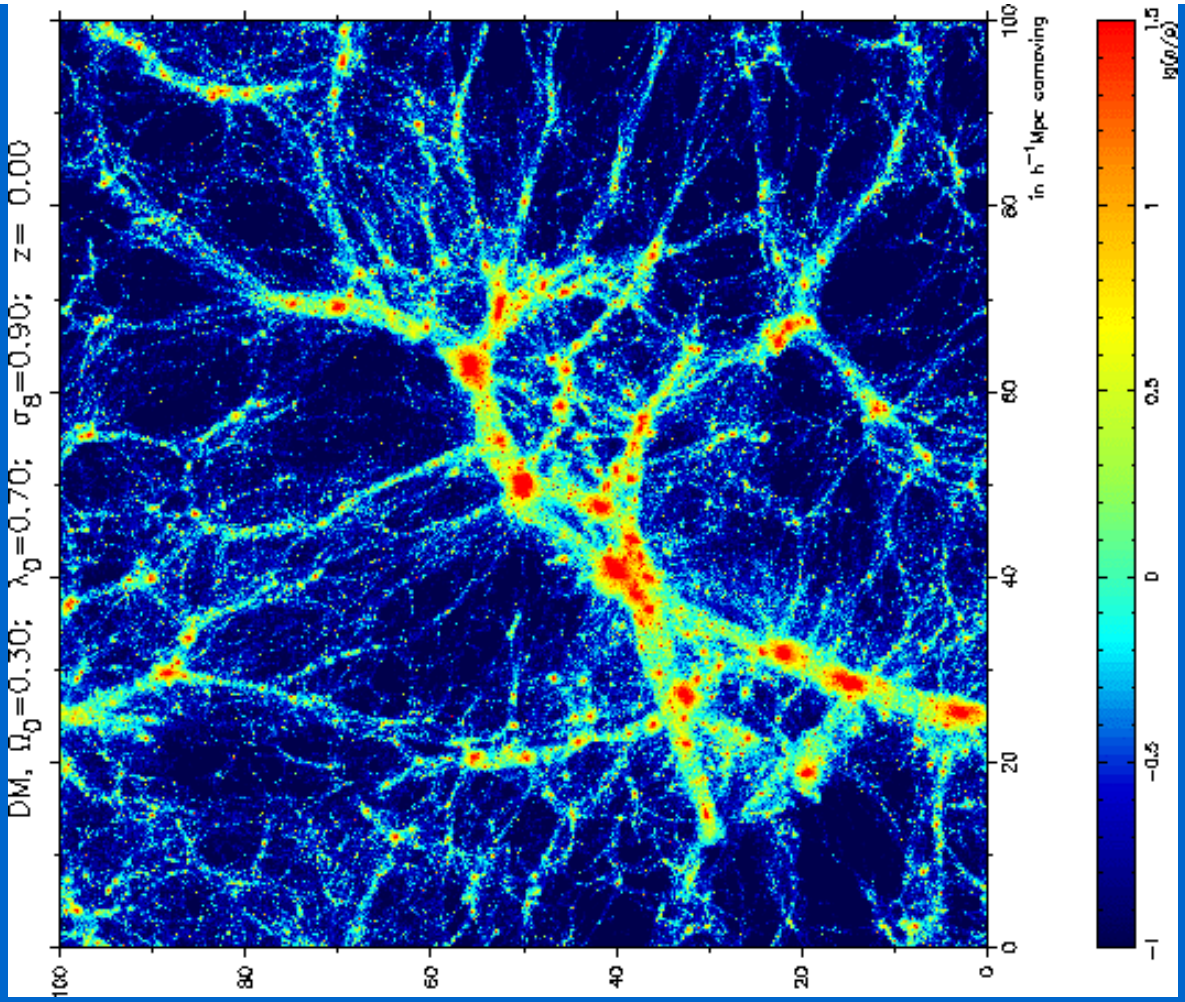
Z ~ 0.13 for 2df

Cosmological Simulations

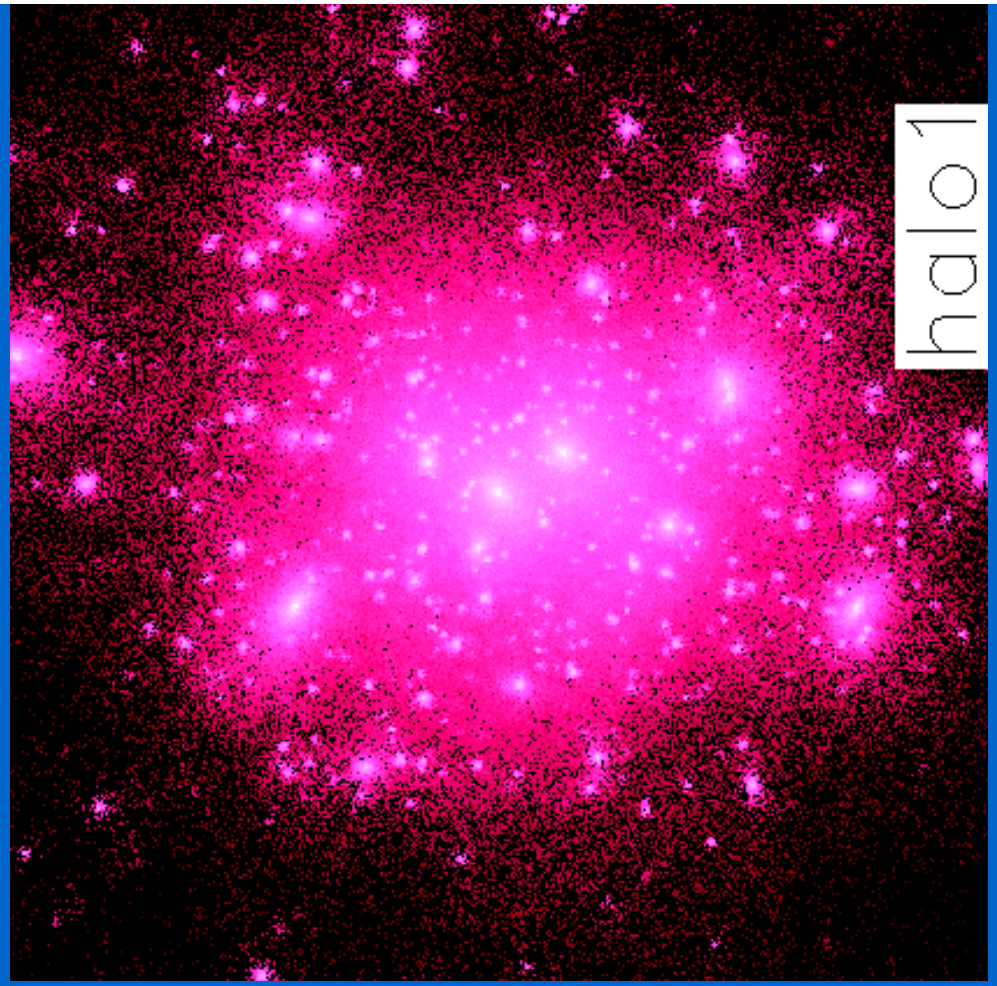
Jin Y-P and CAS-MPI group (ShAO):

In collaboration with Tokyo University, ~ 10^8 (512^3) particles , particle mass 6×10^8 solar mass, Force resolution 6 Kpc/h , very powerful for studying:

- galaxy distribution in dense regions (clusters)
- Merging of galaxies
- Clustering of galaxies on large scales
- Galavitaional lensing
- Properties of DM clustering and halos



The distribution of DM (the projection thickness 10 Mpc/h) around the most massive halo in the simulation. The halo is at the center of the picture.

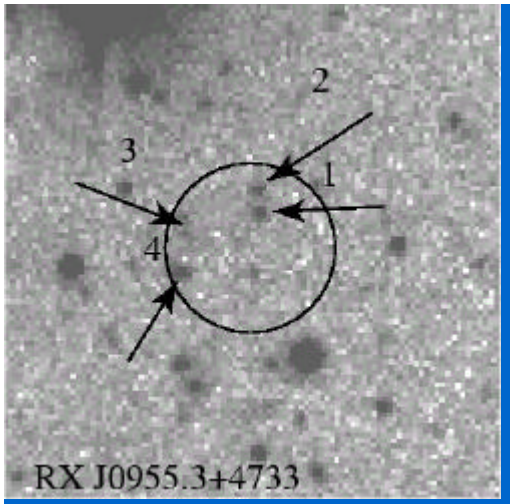


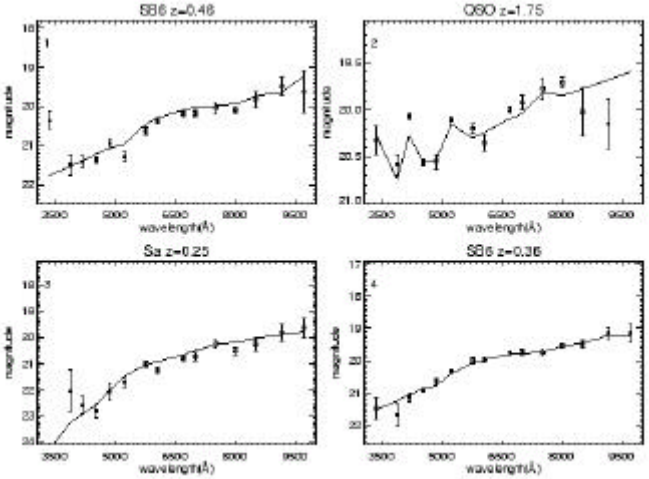
The distribution of DM within the halo. Substructures with the halo can solved well. This is the first such cosmological simulation which can *simutaneously* resolove both the large-scale structures and the internal structures within massive halos. The simulations are obviously important to study evolution of glaxies in dense enviroments, nonlinear evolution of DM and gravitation lensing.

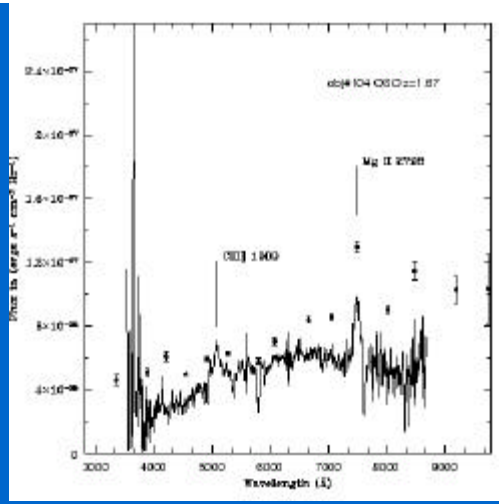
QSO survey

PI: Xue S-J, Zhou Xu, Zhang H-T (NAO):

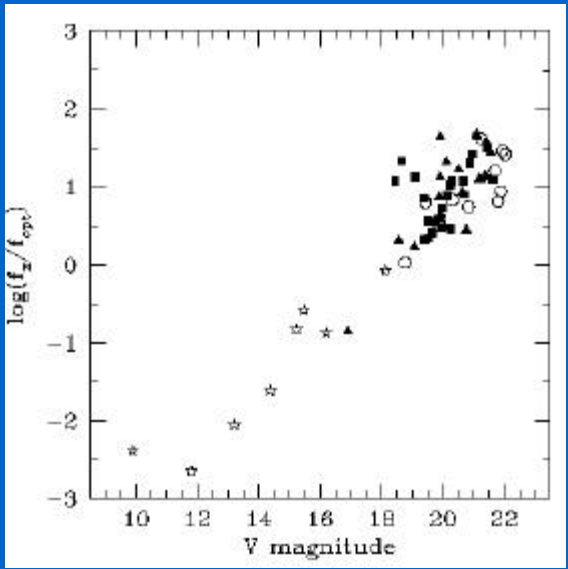
Extensive studies on QSO survey : QSO SED templets , selection effect, Monte Carlo simulation, multi-wavelength cross identification ……

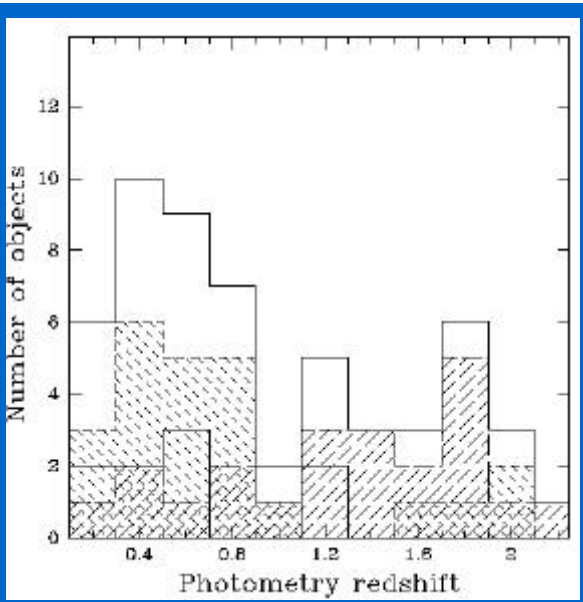


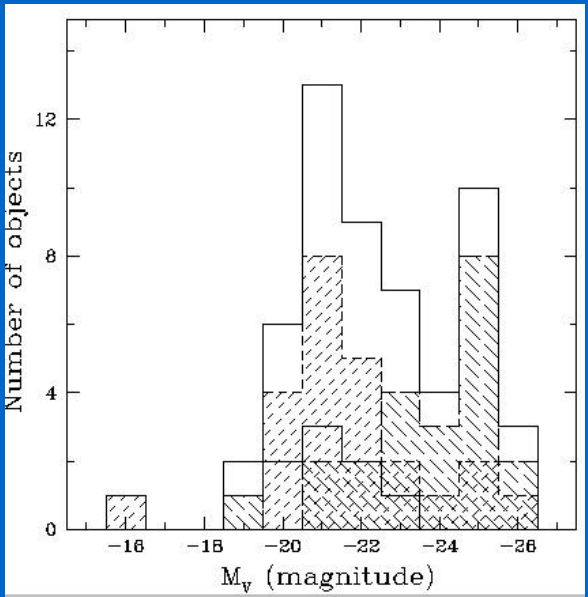




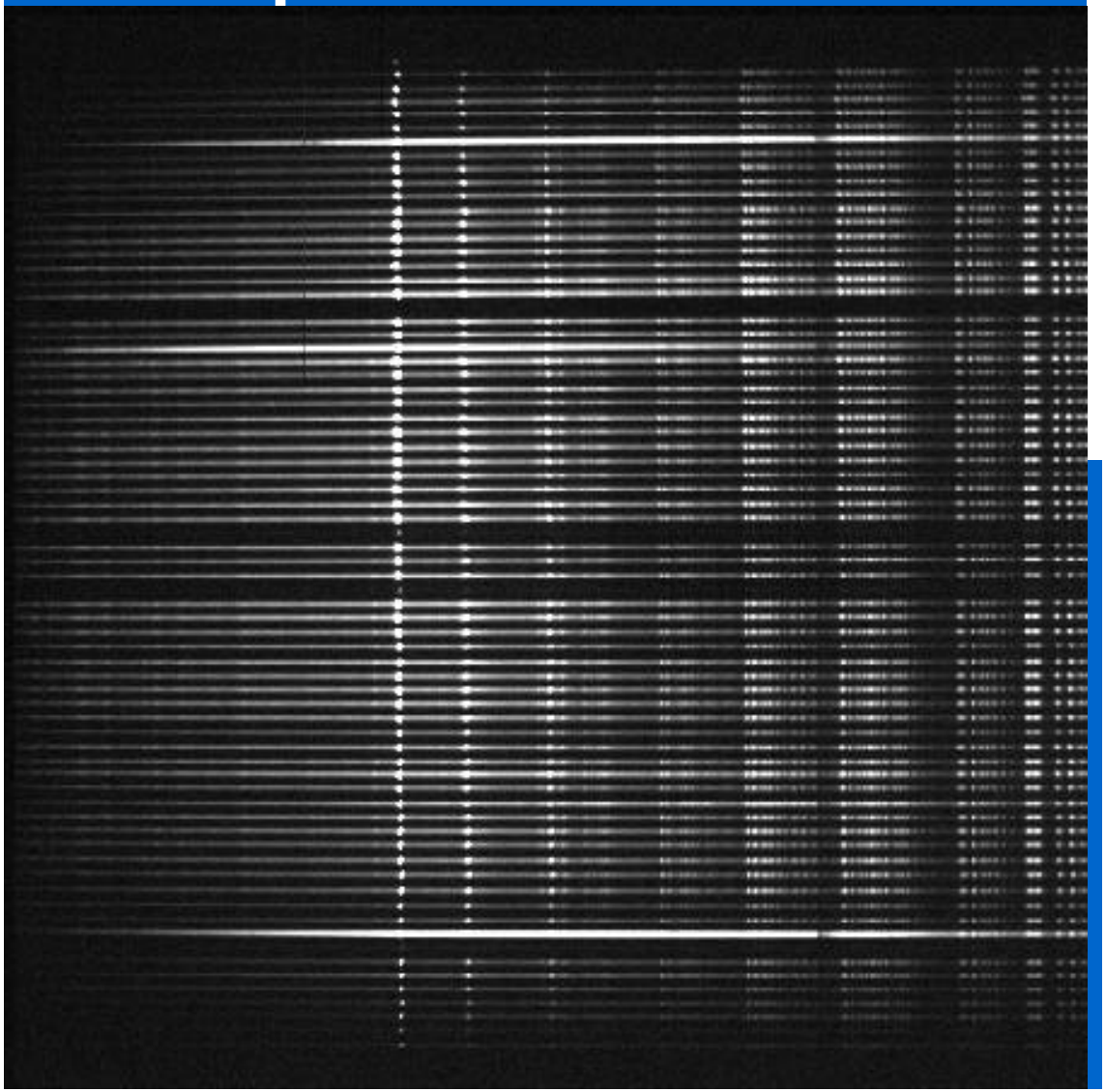
AGN Search From Multicolor Photometric Observations of Faint ROSAT X-ray sources in An One Square Degree Field

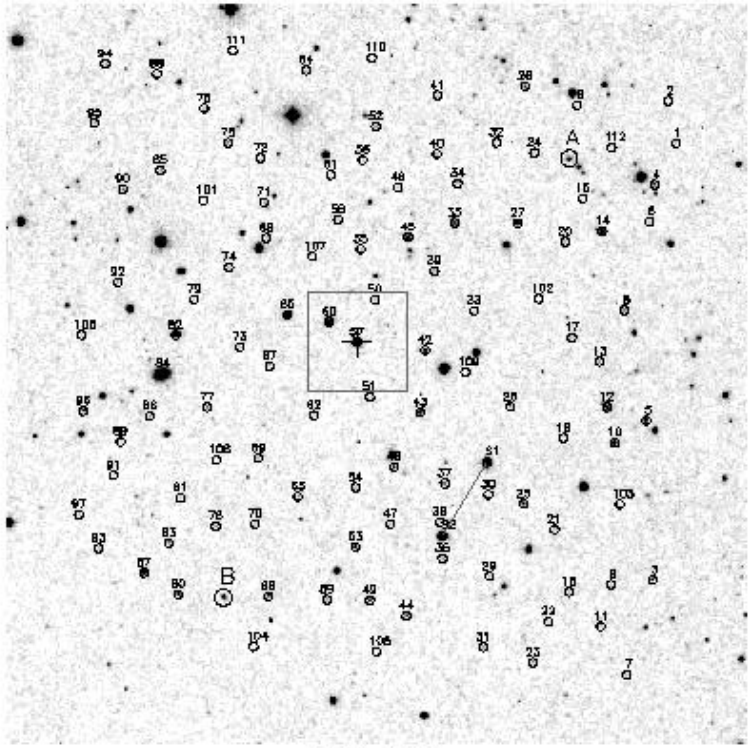


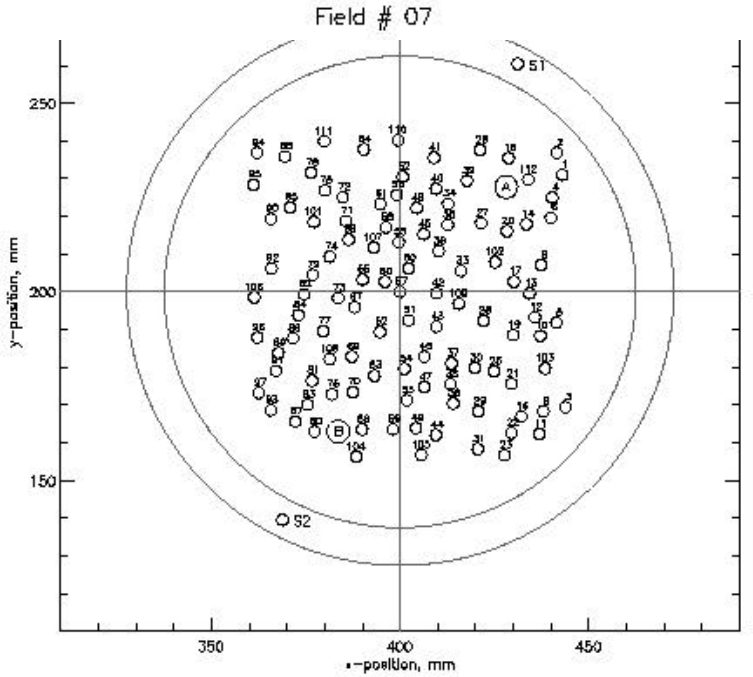




Fibre spectra using SAO 6m telescope for BATC QSO survey follow up observations





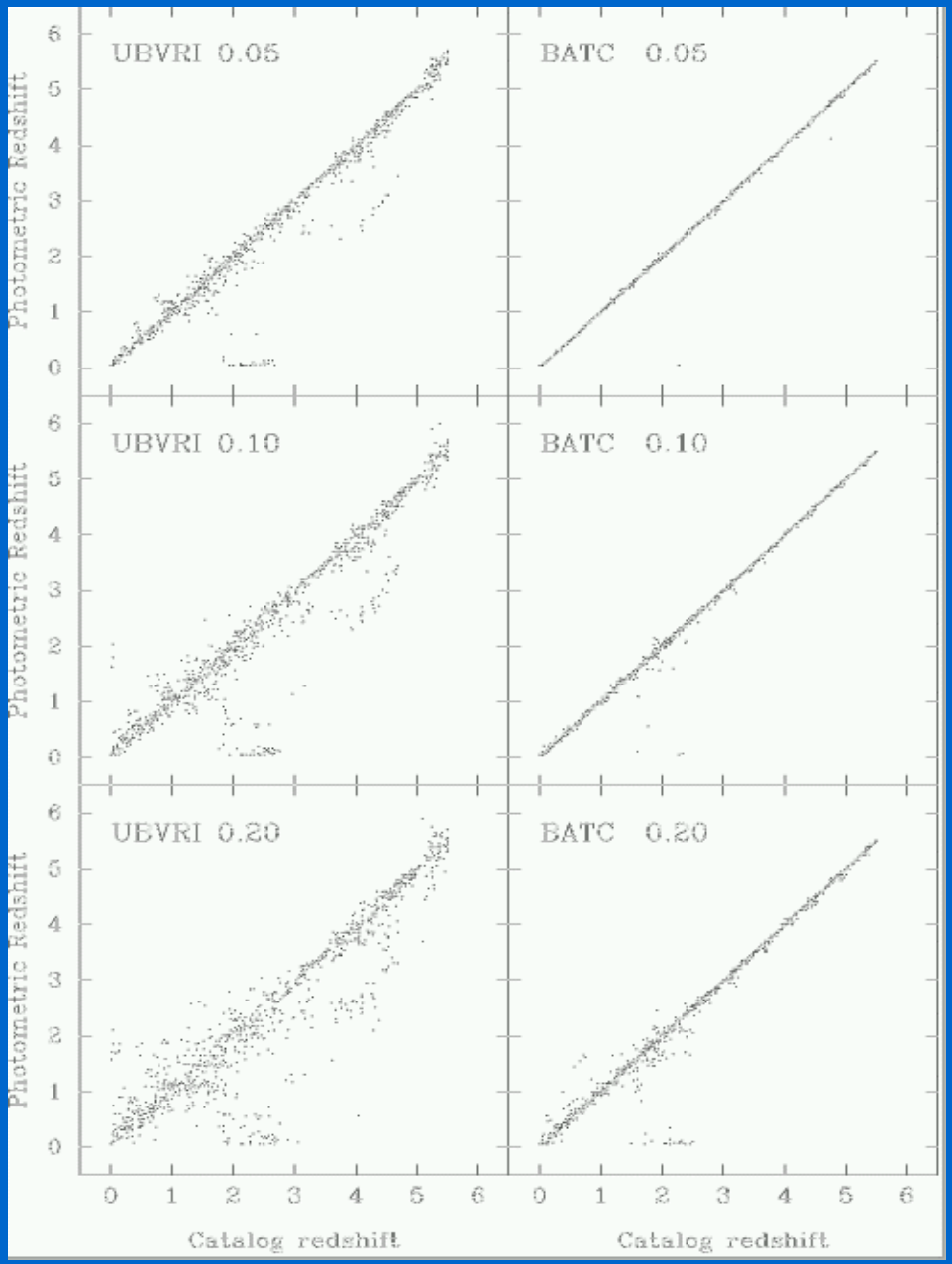


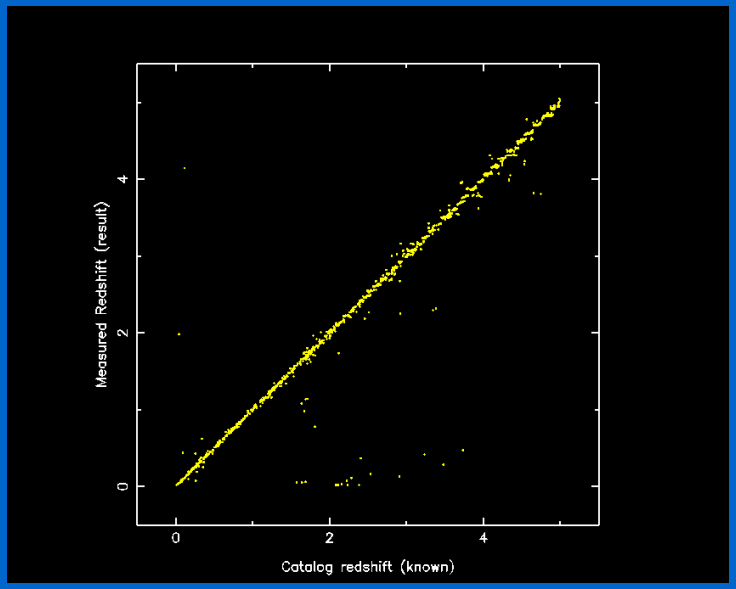
Photometric redshift

PI : Zhou Xu (NAO)

Huang H (BNU)

using 15 color median band photometry and galaxy SED templates to obtain the redshifts of galaxies in Abell cluster, membership, structure, luminosity…….





BATC Photometric Redshift

The technique has been used to determine the redshift of faint galaxies in Abell cluster

THE ASTRONOMICAL JOURNAL, 122:1718–1735, 2001 October

MULTICOLOR PHOTOMETRY OF THE GALAXIES IN THE CENTRAL REGION OF ABELL 2634

QIRONG YUAN,[1,2,3] XU ZHOU,[1] JIANSHENG CHEN,[1] ZHAOJI JIANG,[1] JUN MA,[1] HONG WU,[1] SUIJIAN XUE,[1] AND JIN ZHU[1]

Received 2001 April 9; accepted 2001 July 11

ABSTRACT

An optical photometric observation with the Beijing-Arizona-Taipei-Connecticut multicolor system is carried out for the central region of the nearby cluster of galaxies Abell 2634. From the 2K × 2K CCD images with 14 filters, which cover a range of wavelength from 3600 to 10000 Å, 5572 sources are detected down to $V \sim 20$ mag in a field of 56′ × 56′ centered on this regular cluster of galaxies. As a result, we achieved the spectral energy distributions (SEDs) of all sources detected. There are 178 previously known galaxies included in our observations, 147 of which have known radial velocities in the literature. After excluding the foreground and background galaxies, a sample of 124 known members is formed for an investigation of the SED properties. The comparison of observed SEDs of the early-type member galaxies with the template SEDs demonstrates the accuracy and reliability of our photometric measurements. Based on the knowledge of SED properties of member galaxies, we performed the selection of faint galaxies belonging to Abell 2634. It is well shown that the color-color diagrams are powerful in the star-galaxy separation. As a result, 359 faint galaxies are selected by their color features. The technique of photometric redshift and color-magnitude correlation for the early-type galaxies are applied for these faint galaxies, and a list of 74 faint member galaxies is achieved. On the basis of the newly generated sample of member galaxies, the spatial distribution and color-magnitude relation of the galaxies in the core region of Abell 2634 are discussed. There exists a tendency that the color index dispersion of the early-type members is larger for the outer region, which might reflect some clues about the environmental effect on the evolution of galaxies in a cluster.

Key words: galaxies: clusters: individual (Abell 2634) — galaxies: distances and redshifts — galaxies: fundamental parameters

AGN

- Black Hole, FeK? , blue bump, accretion disc ……

PI : Zhou Y-Y, Wang T-G (CS&TU)

Wu X.-B (PKU)

Xue X.-J (NAO)

Cao X.-W (ShAO)

- Variability, statistics……..

Fan J-H (GU)

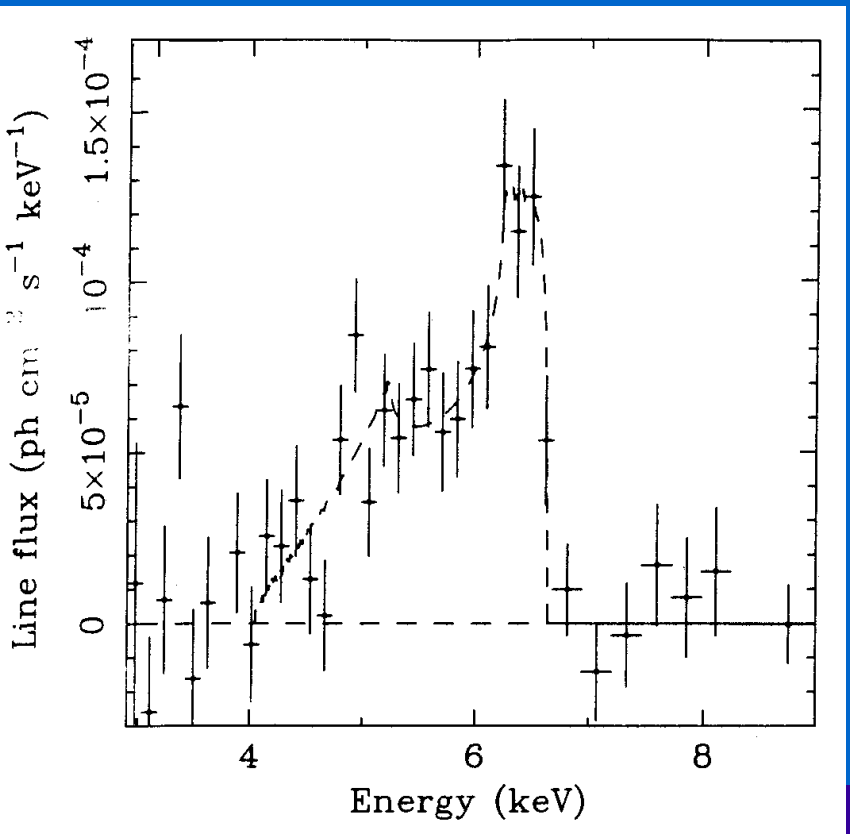
Xie G-Z (YAO) ……

- VLBI

Jiang D-R (ShAO) …...

NGC 4151: Fe K? line ---- access to central BH engine

temporal profile variation



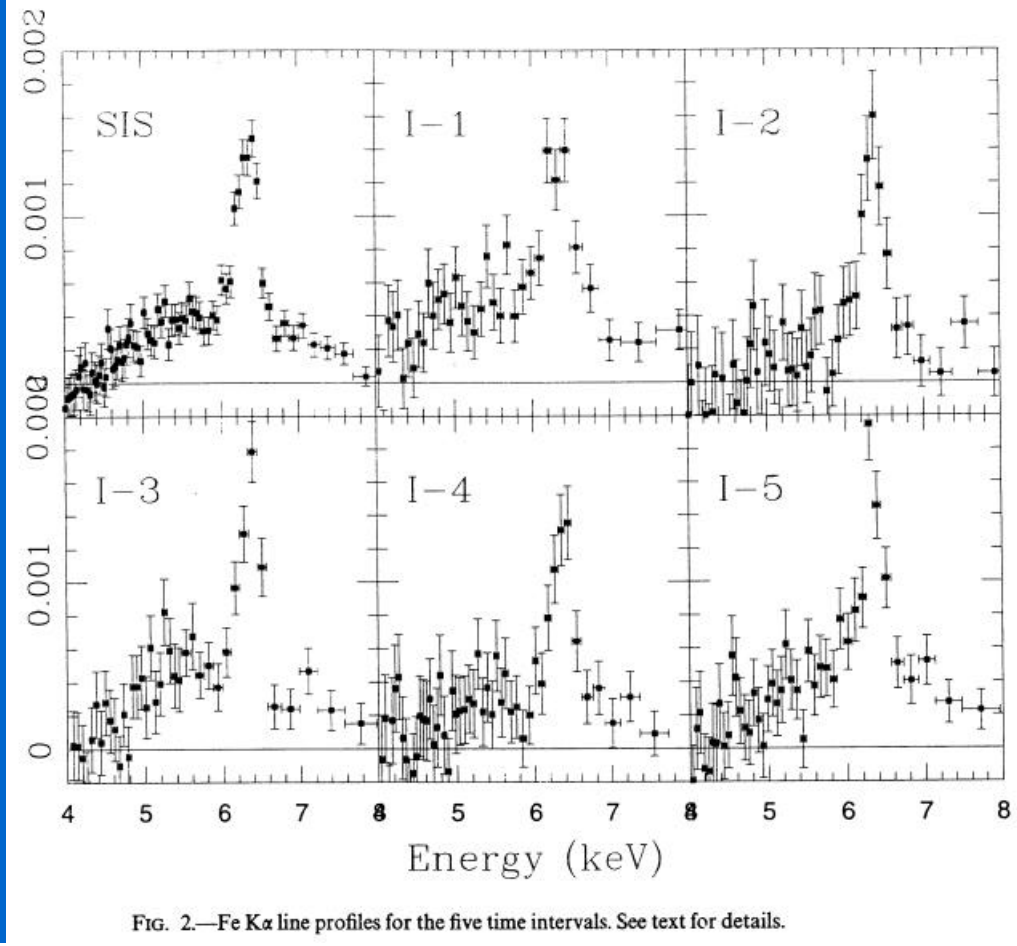


FIG. 2.—Fe Kα line profiles for the five time intervals. See text for details.

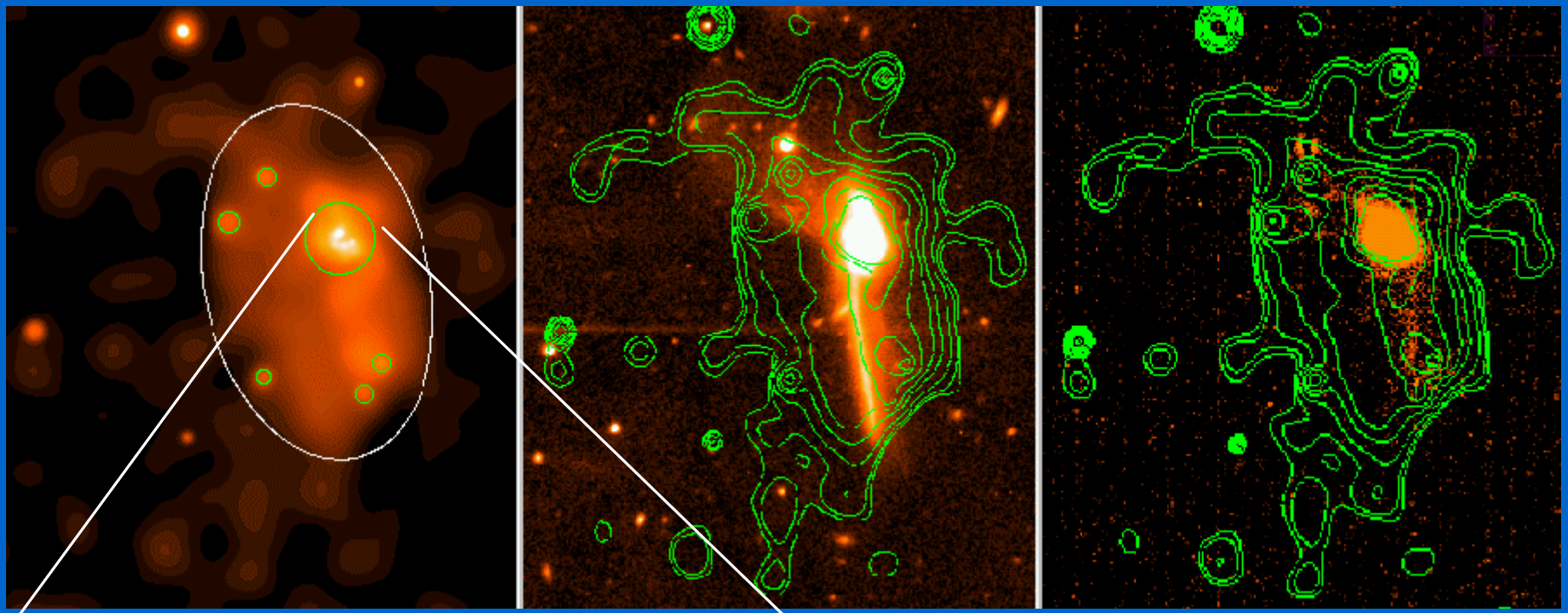
Galaxy: interaction, merger & environment

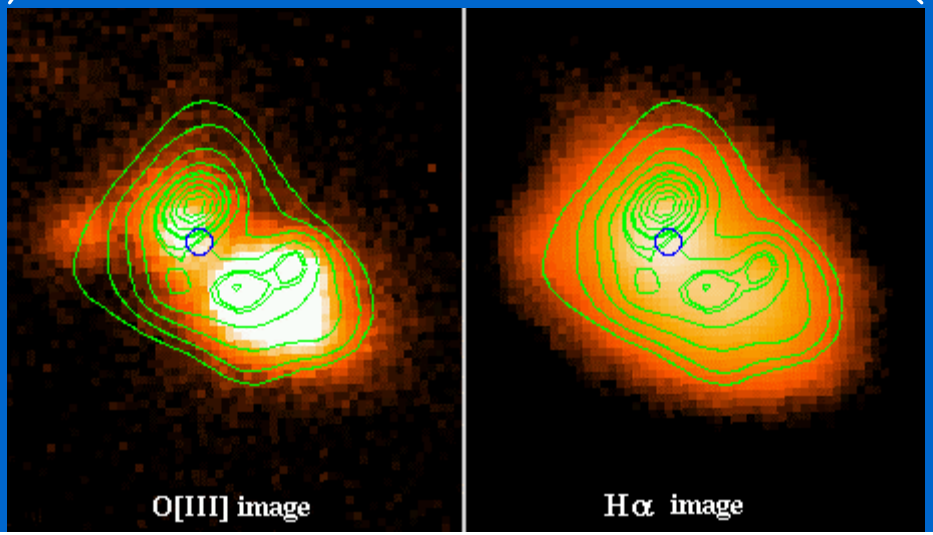
PI: Xia X-Y (TNU)

Zou Z-L , Xue S-J (NAO)

extra-luminous IR galaxies, X-ray radiation,

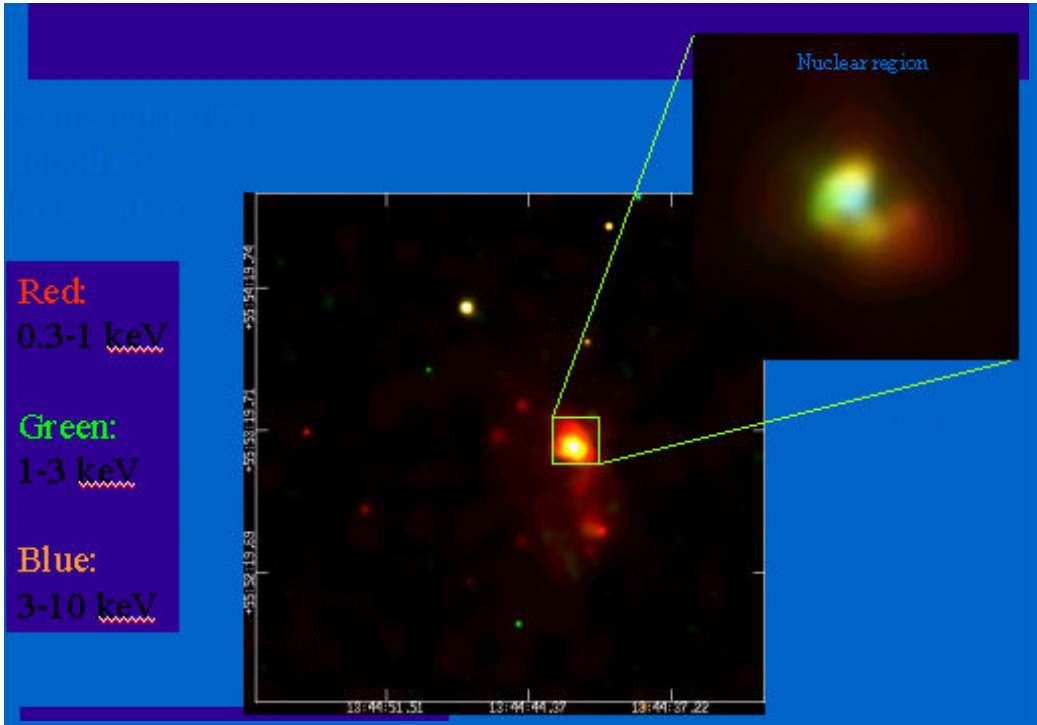
Mergers and Star Burst Galaxies





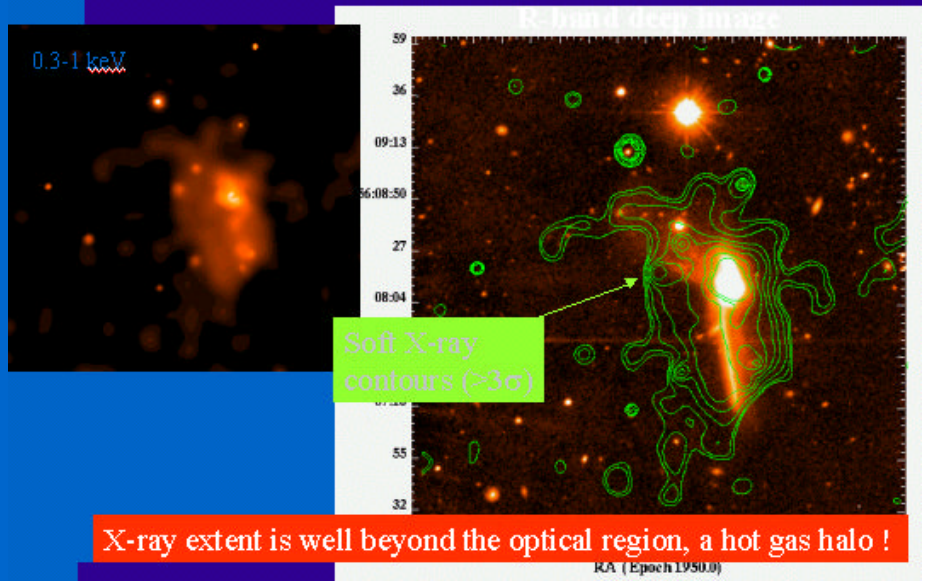
Mrk 273

Xia, X. et al. 2001, ApJ



MrK 273 : compact hard X-ray core and extended soft X-ray halo

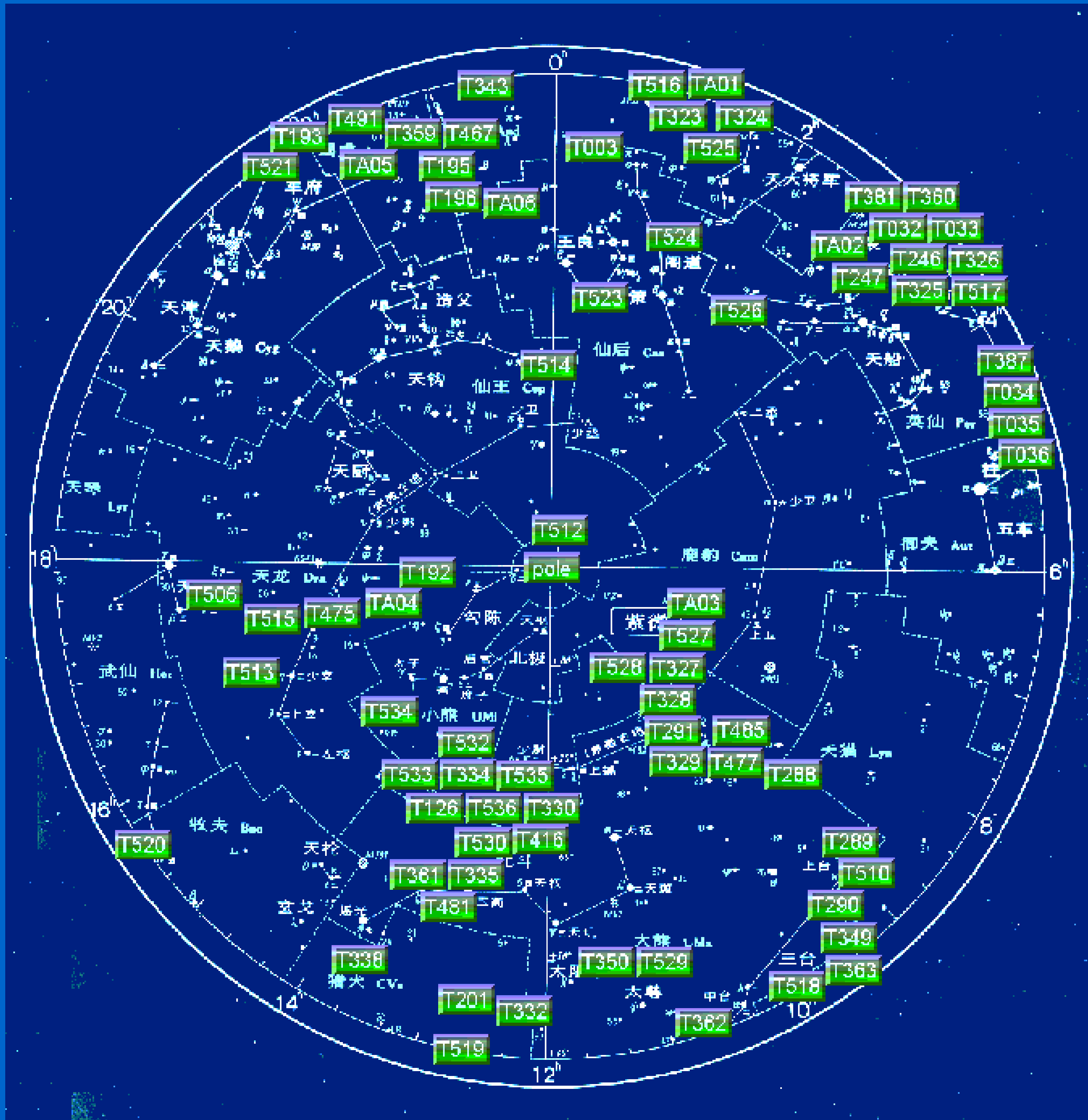
Extended emissions



BATC Survey

Beijing - Arizona - Taibei - Connecticut

15 color Photometric Survey



0h
2h
4h
6h
8h
10h
12h
14h
16h
18h
20h
pole
T343 T516 TA01 T491 T193 T359 T467 T323 T324 T003 T525 T521 TA05 T195 T198 TA06
T381 T360 T032 T033 TA02 T246 T326 T247 T325 T517 T524 T523 T526 T514
T387 T034 T035 T036 T512 T192 T506 T515 T475 TA04 TA03 T527 T513 T528 T327 T328
T534 T532 T291 T485 T533 T334 T535 T329 T477 T288 T126 T536 T330 T530 T416
T520 T289 T510 T361 T335 T481 T290 T349 T338 T350 T529 T363 T518 T201 T332 T362 T519
仙后 Cas
仙王 Cep
天鹅 Cyg
天龙 Dra
小熊 UMi
大熊 UMa
御夫 Aur
英仙 Per
鹿豹 Cam
天猫 Lyn
牧夫 Boo
武仙 Her
猎犬 CVn
五车
勾陈
北极
王良
阁道
造父
天津
天钩
天船
三台

Stellar population synthesis

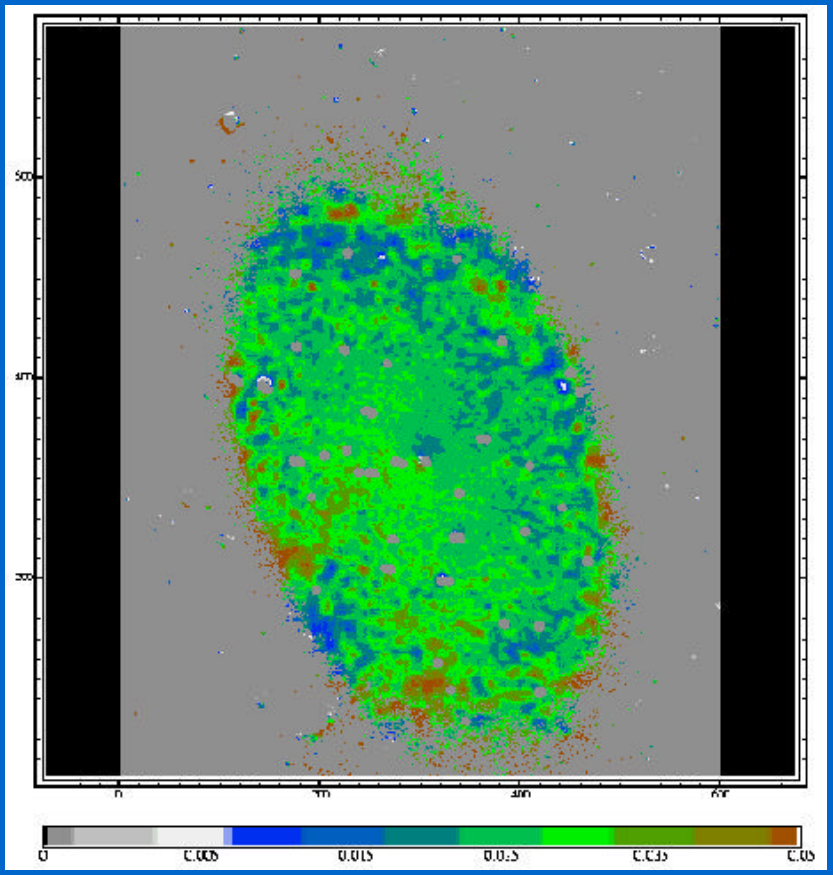
PI: Zhou Xu, Ma J , (NAO)

Kong X (CS&TU)

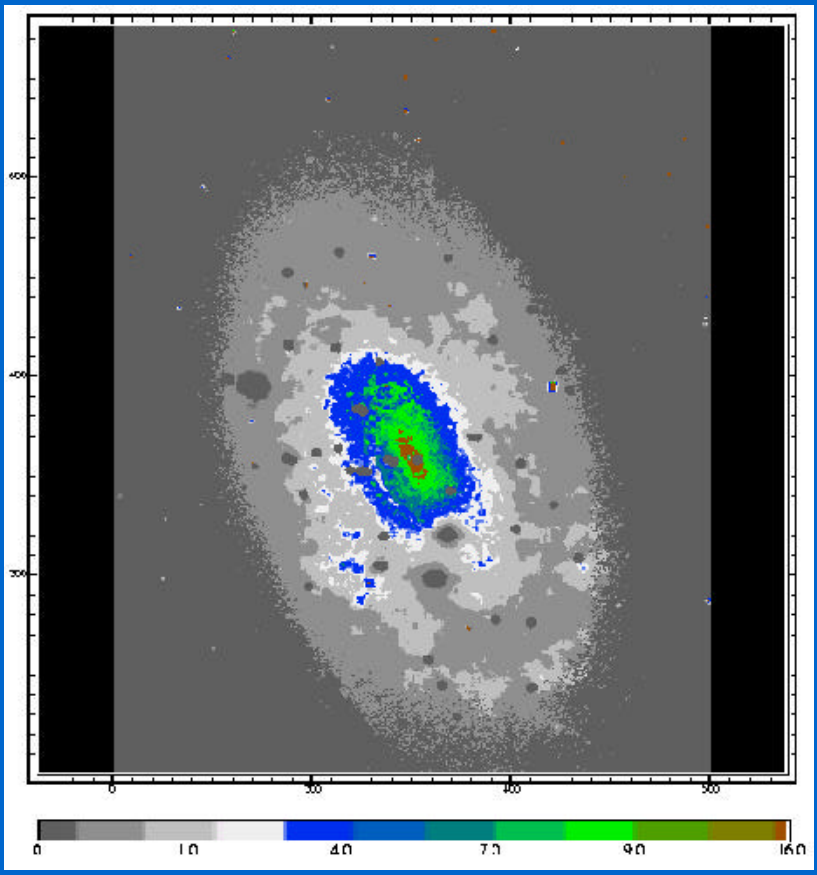
using BATC 15 color photometry and stellar evolution tracks and SED templets of stellar atmosphere to study 2-dimensional distribution of the metalicity and age distribution of nearby galaxies

M81

Metallicity map



Age map



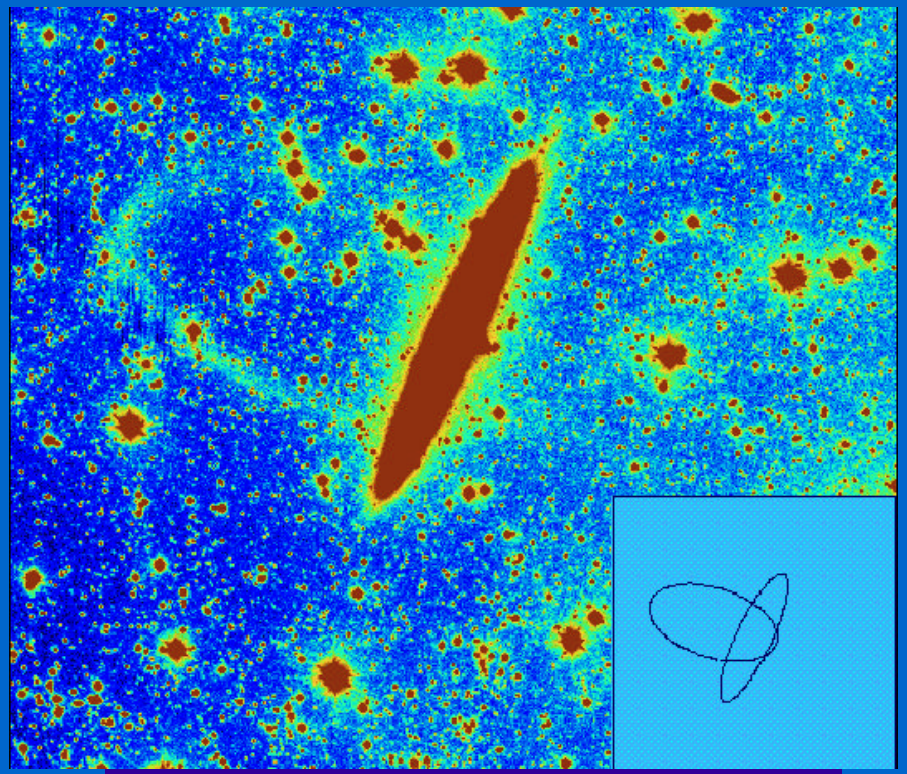
Deep Surface Photometry of Galaxies

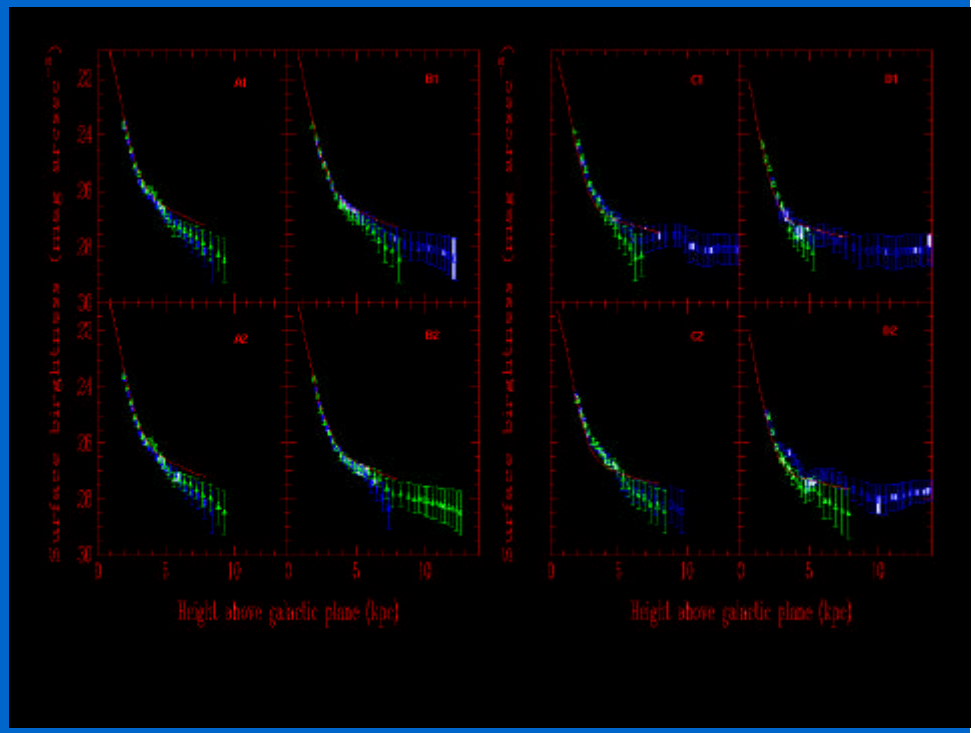
PI : Wu H. (NAO)

using very deep large field CCD surface photometry (down to 29m/?) to study the thick disc & halo component, dark matter etc ……

NGC 5907:

deep surface photometry





Magnetic field map in galaxies

PI : Han J.-L. and his CAS - MPI research group

Stellar Structure and Evolution

PI: Xiong D-R (PMO)
Deng L-C (NAO)
Huang R-Q , Li Y , Han Z-W (YAO)

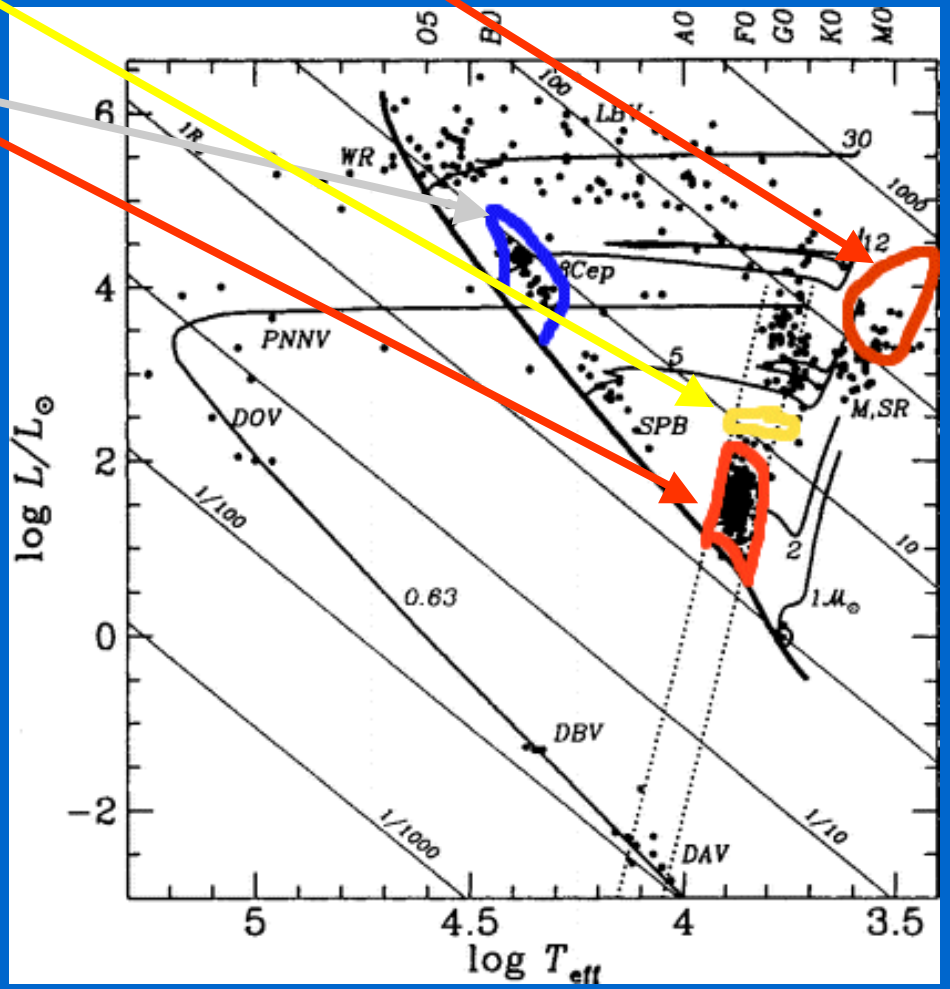
extensive studies on stellar structure and evolution :
convection theory, stellar instability, massive star evolution, mass-loss, H-R diagram

Stellar Structure and Evolution

By using a non-local theory for stellar convection, we have done a survey for pulsational instability in the HRD, well defined strips for ? Cephei, ? Scuti, RR Lyrae and long period variables.

High lights:

- For the first time, we give a definition for the Red-Edge of ? Scuti band, which fits observation very well;
- A well defined instability strip for ? Cephei, with upper boundary, and fits observations much better;



M67: H-R diagram and blue straggler

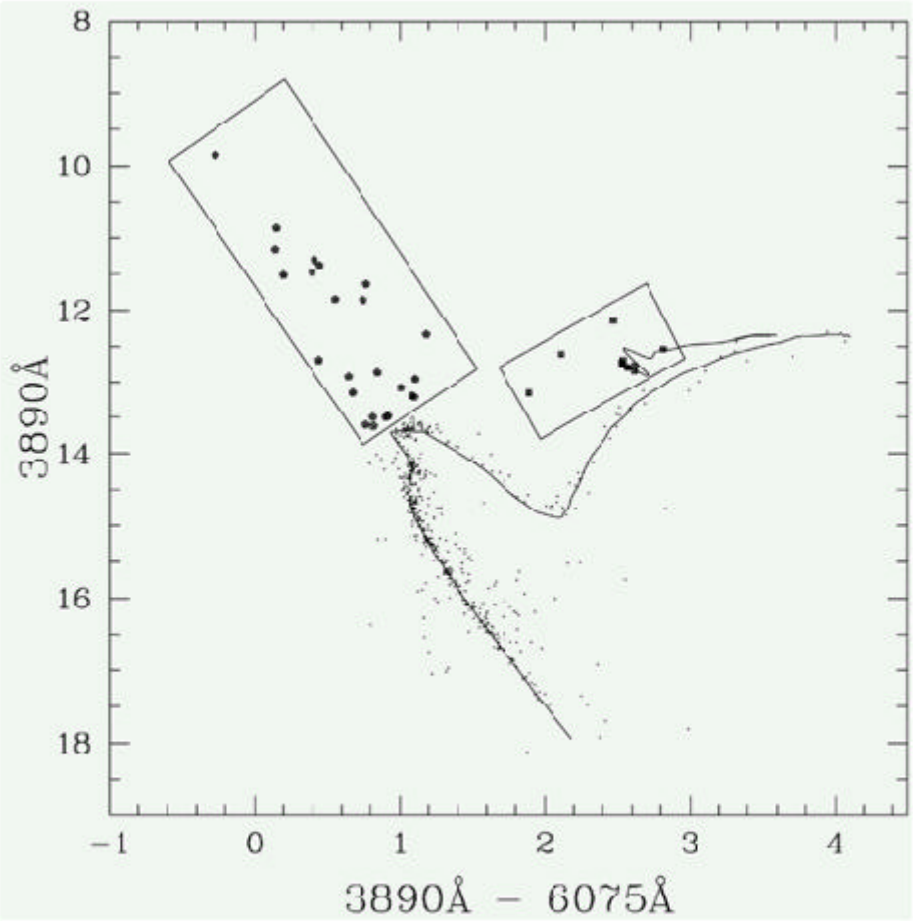


Figure 4. Color–magnitude diagram of M67. BSS are large dots in the box on the left. As presented in Deng *et al* 1999 *Astrophys. J.* **524** 824.

Variable stars

PI : Li J.-P (NAO)

Zhang X.-B. (NAO)

Hao J.-X. (NAO)

Liu Q.-Y. (YNO)

Be stars, pulsating stars, Binaries, light curves, multi-site cooperation, radial velocities, multi-frequency analysis ……

Proper motion and membership of open clusters

PI : Zhao J.-L. (ShAO) and his group

Using historical photographic plates of astrometric telescope to determine the proper motion and membership and used to obtain the H-R diagram , steller evolution , galactic structure ……

SN Survey and remnants

PI : Wang J.-R, Chen Y. (PMO)

SN remnants

Qiu Y.R. (NAO)

nearby SN survey,

light curves

Star formation

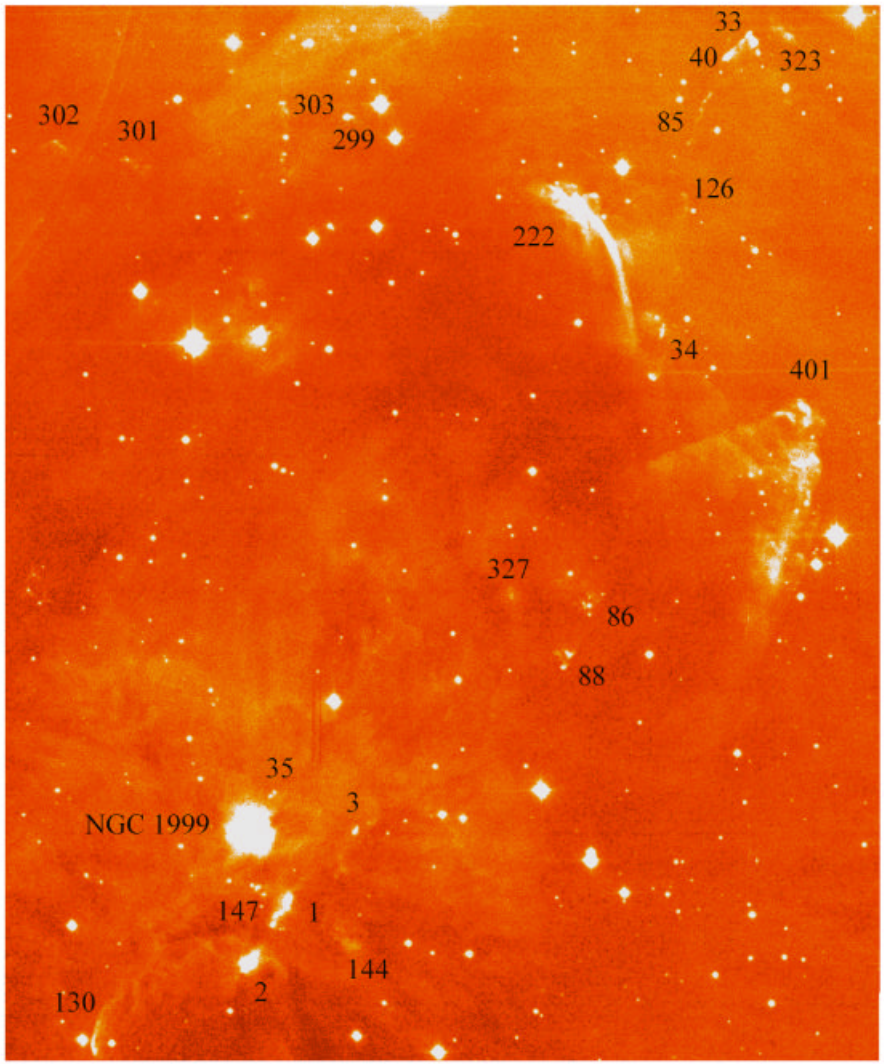
PI: Yang J, Yen J …… (PMO)

Wu Y-F (PKU)

Wang J.-J (NAO)

Molecular cloud , star formation , H-H objects, mm-submm astronomy,

Star Formation



Large-Scale Distribution of HH Objects in Near-by Star Forming Regions

L1641
(Wang, M. et al. 2001)

Chemical Abundances

PI : Zhao G (NAO)

Liu X.W, Lo S.G. (PKU)

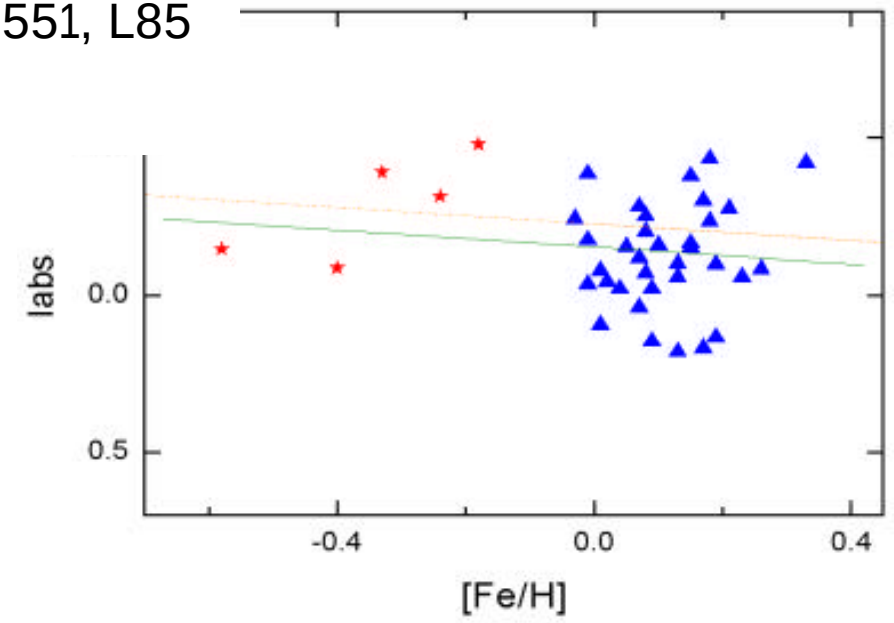
metal poor stars, chemical abundances, planetary nebular , QSO absorption lines, ……

High-resolution spectroscopic observations of Hipparcos red clump giants give a relation of metallicity vs. l_{abs} as following:

$$M_I = (0.13 \pm 0.15)[Fe/H] - (0.15 \pm 0.03)$$

which give a correction of distance determination from red clump giants

G. Zhao, H.M. Qiu & S.D. Mao, 2001, ApJ, 551, L85



Pulsar, strange star, GRBursts

PI : Dai J-G, Lu T (NU) GRB

Qiao G.-J (PKU) Pulsar

Xu R.-X. (PKU) Strange stars

Wu X.-J. (PKU) Pulsar observations

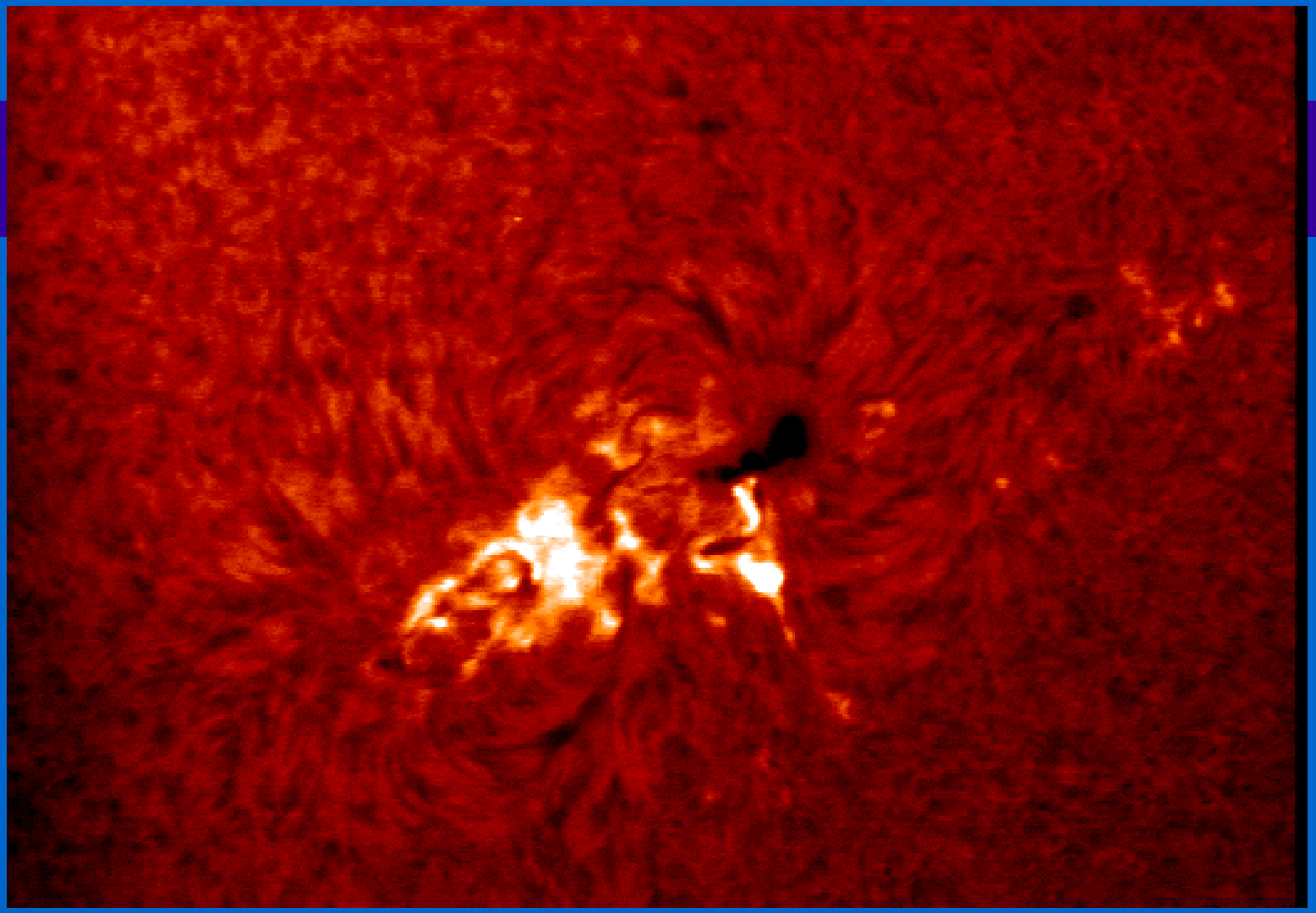
GRB model: Dense medium model

The Afterglow of GRB010222

- In the dense medium model of Dai & Lu (1999, ApJ, 519, L155), environment density: $n \sim 10^5$ cm^{-3} (Masetti et al. 2001; in 't Zand et al. 2001).
- A relativistic fireball or a mildly collimated jet begins to become non-relativistic at $t_{nr} \sim 0.7$ days.
- Afterglow spectrum implies p=2.2
  Early-time afterglow: $?_1 = 3(p-1)/4 = 0.9$
  Late-time afterglow: $?_2 = (3p-4)/2 = 1.3$
- **Conclusion:** The dense medium model may also explain the afterglow data of GRB010222.

Solar Physics

- Solar Magnetic Fields
- Solar Corona Dynamics
- Solar Interior Structure and Seismology
- Solar High-energy Phenomena
- Solar-Terrestrial Environments
- Solar Radio Emission
  - Monitoring by high-resolution radio spectroscopy
  - Plasma Physics



H_alpha Image of an Active Region
by Huai-rou Solar Magnetic Field Telescope
(Zheng, H. et al 2000)

Over-seas Collaborations

- ASIAA-PMO @ SMA
- Variable Star Monitoring
- VLBI Networks
- Gong
- The Portable Submillimeter Telescope (POST)

Comments: personal view

Some important factors

for a successful inter-regional collaborations

among

East - Asian astronomical communities

- Common research sources which can lead to good sciences
  - accessible large telescope time or valuable data archieve
  - financial support , man power ……
- Common interest project and compensative contributions :

  1 + 1 > 2 principle

  mutual benefits principle
- Decision making can be done by pure scientific communities (the regions are very different in political and economical situation, Scientific and technical development level …….)
- Easy contact , effective organization
- Transparent information
- . . . . . .