# Report on the COSPAR Capacity Building Workshop
## "X-ray Astrophysics: an advanced school for Asean astronomers"
### Xuyi Observatory Station – Jiangsu Province  - China -  September 2013

## I - Introduction

The workshop took place in the Xuyi Observatory Station, Province of Jiangsu, China, from 2  to 13 September 2013. Primarily organized by COSPAR, it counted with support from international organizations, like the space agencies ESA and JAXA, and the International Astronomical Union IAU, as well as from local sponsors, the Purple Mountain Observatory, CAS (main local organizer),  Nanjing University, Shanghai Jiaotong University and the National Science Foundation of China (NSFC).

The main aim of the workshop was to introduce young astrophysicists (PhD students and post-docs) to X-ray astronomy and multi-wavelength opportunities and to train them in the use of data and tools of the X-ray missions XMM-Newton (ESA), Chandra (NASA) and Suzaku (JAXA/NASA). Details about the workshop can be found under the COSPAR Capacity Building Program pages: cosparhq.cnes.fr/Meetings/Workshops.htm

## II - Participants

A total of 31 applicants were selected out of a total of 83 candidates from 5 Asian countries, with a very large majority coming from China and India. The selection, based purely on scientific merit, consisted of 16 students from China, 14 from India (14) and 1 from Turkey. Two of the selected students (both from India) could not make it at the last minute, leaving us with 29 selected students. Five extra Chinese candidates who had not been selected, but were invited by the local organizers on the basis of own funding, also participated in the school. Five further astronomy students of the Nanjing University who were acting as helpers in the local organization were also accepted in the school as normal participants. All in all we therefore had 39 participants.

The geographical distribution of the students showed at the end a strong local component, however very much diversified regionally within China. The gender distribution showed one third of female students. It has to be noticed that neither geography nor gender was a criterium for selection in this workshop, but just scientific qualification. The full list of students including affiliation and nationality is given in Appendix I.

## III - Lecturers

The core of the lecturers participating had already experience with previous X-ray COSPAR workshops, 4 of them (C. Gabriel [ESA, Spain], M. Méndez [KAI, the Netherlands], and R, Smith [CfA, USA] ) have been lecturers in all previous 5 X-ray workshops, a further lecturer (M. Guainazzi [ESA, Spain]) in the last 4. This time we had to miss the collaboration of two further experienced lecturers (K. Arnaud [CRESST, USA], and the initiator of the Capacity Building Initiative P. Willmore [Univ. of Birmingham, UK]). They had planned to participate but had to decline a couple of weeks before the workshop took place for private reasons. New in the "team" were: Tomaso Belloni [INAF, Italy], Li Ji [PMO, China], Michael Nowak [MIT, USA], and Yukikatsu Terada [Saitama University, Japan]. Invited local lecturers have participated in the programme. The full list is given in Appendix II.

## IV - Venue

The venue of the workshop was a small observatory in the province of Jiangsu, some 180 kms from Nanjing. The place was chosen to minimize costs; only some refurbishment took place to make the main presentations room (with capacity for ~ 50 people) and small meeting rooms (used for the hands-on sessions) more comfortable. Lunch and coffee breaks took place in the same observatory. Down the hill (~ 15-20 minutes walk) we got supper every day, in a restaurant located within a training centre in a small village. Transport to the observatory and back to the hotel was organized with 5 open minibuses (for 10 persons each) from a local company. Two of them were not able to manage the last and steepest part of the way to the observatory when fully loaded, so that some of our students (and one of the lecturers!) did this part walking every morning.

## V – The Hotel

The Quan Mountain Village offered us a quiet and peaceful place for lodging all students, lecturers and helpers. It is a nice resort composed by a central building with restaurant and social and meeting rooms and around 50 houses of different sizes (most of them 2 storage buildings with a bedroom on each floor, a living room and a kitchenette) distributed within a park at a lake. We have occupied 10 houses with 4 students each and 5 houses with two lecturers each. All houses provided wireless internet.

## VI - Program

From the program (Fig. 1) it can be read that the school was structured with approximately 30% of the time dedicated to science lectures, 10% to lectures on missions' specifics (spacecrafts, instruments and data analysis software) and 60% to the projects the students had to carry on. As in previous occasions, the lecturers have acted also as projects' supervisors.

Fig. 1: Program of the Workshop in Xuyi - China - September 2013

## VII - The projects

The students largely defined their projects themselves. A division in 4 groups was made for assigning individual main supervisors according to the subjects chosen, leaving 2 to 4 supervisors per subject, depending on the number of students in each group. Due to the somewhat low number of supervisors (two lecturers could not participate as planned, and another one could only stay for one week), each of the supervisors had on average more than 5 students under his/her primary responsibility, although due to the characteristics of the different projects, analysis and interpretation stages, etc., de facto each of the supervisors has dealt on average with around 10 students, some of them even with more. For instance, this time, many of the students have used data from more than one mission. The number of supervisors was felt at some point as a bit too low.

As in all astronomy workshops held in the last 3 years, all students worked on their projects using their own laptops. Working with different operating systems and flavors can be a significant additional burden for a workshop, not only for the installation of the different mission specific tools but also due to eventual problems with specific libraries, etc. We prevented this by asking the students to install and check all the packages needed (SAS, CIAO, FTOOLS, etc) in the weeks before the workshop, offering active support from our side. With few exceptions this was done. The problems found during the workshop in this sense have been minimal and could be promptly solved.

The whole of the XMM-Newton archive (raw and processed data) and a good portion of the Chandra archive have been brought in external disks, to avoid the problems appearing when 40 students try to download data at the same time. This, a lesson learned from past workshops, proved to be an excellent measure.

## VIII - Results

At the end of the workshop each student gave a short presentation (5 minutes + 3 minutes discussion time) summarizing the results obtained. This time it was especially important to keep the time because we decided that all students present their work to the whole of their mates, i.e. avoiding parallel sessions, with all 39 presentations in the last day (more than six hours!). A list of the individual projects is given in App. III. The results have been excellent, showing that all the participants understand the methodologies of the work in the field and are able to work with data and tools of at least one of the three missions, in most cases with more than one, after returning to their home institutes.

## IX - General evaluation

We have prepared and distributed among the students an evaluation sheet (App. IV), for getting a feedback concerning the different aspects of the workshop, obtaining twenty-three answered evaluation sheets (almost 68%). A first analysis of the results has been performed. The results are largely similar to the ones obtained in the former X-ray workshop in San Juan, Argentina.

 There is a high level of satisfaction with the workshop in general, but especially with the lecturers and supervisors.  Only very few students made negative comments showing that the workshop has not fully filled their expectations. A large majority of them think to be able to use X-ray data in their future research. Unanimously they feel to have benefitted significantly from attending the workshop, there is a significant difference though between the Asian and the Latin American students about the need of help in the future for working with astronomy X-ray data. While the latter were

considering themselves able to perform it without much help, the former agree with this only at the level of 30%. This can have a sociological root (especially given the large level of coincidence in all other aspects), exposing the difficulties when comparing different populations for such evaluations. Another interesting aspect is the linguistic one: many students have chosen all three parts (science, software, project) "the most useful part of the workshop". All of them were among the Chinese students. This overloading is probably the product of the lack of an article in the Chinese language. So was the question probably by several understood as "is this part most useful?", which can be answered affirmatively to two or all three of them.

The financial support for travelling (limited almost completely to non-Chinese students, and not covering completely the request for budgetary reasons) is considered sufficient by most students. The couple of social cases, where single students have approached the organizers exposing their problems, have been all positively resolved and to the students' satisfaction. The main problem we faced in the preparatory phase was bureaucracy, i.e. the long time needed by several Indian students to obtain the OK from their institutes, summing up to the long time (and documentation issues!) needed for obtaining the Chinese visa. Two of the selected Indian students were not able to do everything in time and have given up, very much to our regret. This is a lesson to be learned for the future.

The part of the workshop most valued by the students (despite the linguistic problem) is the project, with a very high ranking for the given support, but also the diverse lectures, both on science and software, are well considered both in level and duration.

The accommodation and venue aspects received a high mark this time (differently to the workshop in San Juan, Argentina). Both food and lodging, but also the facilities at the observatory have been highly appreciated. Our special gratitude in this respect should go to the local organizers. They made also possible that the isolation of the venue and the hotel were not felt as such, it was possible to arrange for social events in several evenings, e.g. we had students read a theater play, a lecture music playing the piano, several lecturers and students singing (in some cases much to our regret!), and even singing with a karaoke machine. The level of socialization among the students and the lecturers was remarkable high.

Again, we would like to thank all the people (specially the local organization committee) and the institutions that have substantially contributed to making possible this event.

Carlos Gabriel - Mariano Méndez

# Appendix I - List of participants

| Name | Gender | Country |
|---|---|---|
| Aru Beri | female | India(Rupnagar) |
| Biao Zhang | male | China（Hefei） |
| Cemile Ezer | female | Turkey(Istanbul) |
| Dipak Debnath | male | India(Kolkata) |
| Gaoyuan Zhang | male | China（Nanjing） |
| Hongquan Su | male | China（Beijing） |
| Hui Zhu | male | China（Beijing） |
| Jai Bhagwan | male | India(Naintal) |
| Jiren Liu | male | China（Beijing） |
| Jithesh Vadakkumthani | male | India(Malappuram) |
| Jiuzhou Wang | male | China（Wuhan） |
| Junjie Mao | male | China(Beijing) |
| Main Pal Rajan | male | India(Pune) |
| Md Shah Alam | male | India(New Delhi) |
| Ming Lyu | male | The Netherlands(Groningen) |
| Nazma Islam | female | India(Bangalore) |
| Ningxiao Zhang | male | China（Nanjing） |
| Partha Sarathi Pal | male | India(Kolkata) |
| Ping Zhou | female | China（Nanjing） |
| Preetha Athaniparambil | female | India(Malappuram) |
| Qingcui Bu | female | China（Beijing） |
| Radhika Doraiswamy | female | India(Bengaluru) |
| Santanu Mondal | male | India(Kolkata) |
| Shiju Kang | male | China（Wuhan） |
| Shu Niu | male | China（Nanjing） |
| Soma Mandal | female | India (Taki) |
| Xi Long | male | China（Beijing） |
| Xiaochuan Jiang | male | China(Fujian) |
| Xiaogu Zhong | male | China(Kunming) |
| Xiaohong Cui | female | China（Beijing） |
| Yihao Su | male | China(taiwan) |
| Yuanjie Du | male | China (Beijing) |
| Zhenghao Zhu | male | China(Shanghai) |
| Zhu Liu | male | China（Beijing） |

## Volunteers

| Name | Gender | Country |
|---|---|---|
| Baisheng Liu | male | China (Nanjing) |
| Chao Hou | female | China (Beijing) |
| Ping Zhang | male | China (Nanjing) |
| Qian Wang | female | China (Nanjing) |
| Shuang Liang | male | China (Nanjing) |

# Appendix II - Lecturers and Supervisors

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                        Lecturers / Supervisors
Carlos Gabriel      ESA                     Spain
Li Ji               Nanjing Univ.           China
Mariano Méndez      KAI                     the Netherlands
Matteo Guainazzi    ESA                     Spain
Michael Nowak       MIT                     USA
Randall Smith       CfA                     USA
Tomaso Belloni      INAF-OAB                Italy
Yukikatsu Terada    Saitama Univ.           Japan

                        Local presentations
Fangjun Lu          IHEP, CAS               China
Weimin Yuan         NAO, CAS                China
Yongquan Xue        UST                     China
Zhijuan Li          Nanjing Univ.           China
Zhongxiang Wang     Shanghai Astr. Obs.     China
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# App. III - Projects

## Projects

A Test for SNR EW Map
Broad-band X-ray emission for IRAS 13224-3809
Chandra observation of the merging cluster A1758N
Chandra Observations of SNR RCW 103
Chandra Observations of SNR RCW 103
Characterizing time-frequency properties of QPOs around black holes & BH-candidate
Constraining the BH spin in 1H 0707-495
Diffuse emission of NGC3603
Fitting the Spectra of REJ1034+396
Interaction of Tycho and Molecular Cloud
Kepler's SNR proper motion in Chandra X-ray observation
Multi-wavelength study of 3C 273
Proper Motion of Arc Structure in Tycho's SN Remnant
Radial temperature profile of clusters of galaxies
Search for AGN at the center of NGC1399 & NGC1316
SNR Kes 41 - A Thermal Composite SNR
Source Detection in M 31 with Chandra and XMM-Newton
Spectral analysis of Blazar PKS 2155-304
Spectral Analysis Of Disk Dominated State Of 4U 1957+11 with XMM-Newton
Spectral and Timing studies of the Microquasar GRS 1915+105 - XMM-Newton and Chand
Spectral fitting of GRO J1655 - 40
Study of the Timing and Spectral properties of H 1743-322 using XMM Newton data
The Anomalous Arm of NGC 4258 (M106)
The discovery of a new transient magnetar
The properties of HCG 62
The Suzaku Spectrum of 4U1822-371
The XMM-NEWTON X-Ray study of MGRO J2019+37
Timing Analysis of 4U 1636-53
Timing and Spectral studies of GX 339-4
Warm hot gas along the sight line of the 3C273
Where is the AGN in NGC4472?
X-ray Pulse Profiles and Spectra of Pulsars
X-ray Scattered Halo Around EXO 2030+375
X-ray Spectral and Timing behavior of Swift J1357.2-0933
X-ray spectroscopy of LMXB to study the abundance of interstellar medium
X-Ray Spectrum of the Black Hole Candidate Swift J1753.5-0127
XMM-Newton Observation of Supernova Remnant W51C

# Appendix IV - Results from the evaluation form

**18th COSPAR Capacity-building workshop, Xuyi Observatory Station, Jiangsu Province , China (2013)**
**Workshop Evaluation Form - Carlos Gabriel**

**General**

|  | 5 | 4 | 3 | 2 | 1 |  |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  | 5=strongly agree |
| The website told me all I needed to know about the workshop | 13 | 8 | 0 | 2 | 0 | 4=agree |
| The application form was easy to fill in | 12 | 8 | 3 | 0 | 0 | 3=no strong feeling |
| Applications were efficiently handled | 12 | 10 | 1 | 0 | 0 | 2=disagree |
| I had time enough to make my travel arrangements | 11 | 9 | 0 | 3 | 0 | 1=strongly disagree |
| The financial support I got was sufficient | 7 | 7 | 2 | 1 | 1 |  |

Comments

Actually, some of the students from NAOC including me had booked the tickets to Nanjing several days before the informative e-mail which suggested us t

After getting selected we have to take permission from our Institute to attend the conference. That is a long process. After that only we can book ticket an

Need sufficient time of at least 7-8 weeks to apply for visa and travel arrangements.

Good enough

|  | 5 | 4 | 3 | 2 | 1 |  |
|---|---|---|---|---|---|---|
| **Science Lectures** |  |  |  |  |  | 5=strongly agree<br>4=agree<br>3=no strong feeling |
| These lectures were for me personally the most useful part of the workshop | 10 | 10 | 1 | 0 | 0 | 2=disagree<br>1=strongly disagree |
| The time spent on the lectures was too long *Answer only one of these* | 3 | 1 | 3 | 0 | 0 |  |
| *Or* the time spent on the lectures was too short | 1 | 0 | 0 | 0 | 0 |  |
| *Or* the time spent on the lectures was just right | 6 | 9 | 0 | 0 | 0 |  |
| The lectures were at too high a level *Answer only one of these* | 0 | 1 | 2 | 0 | 0 |  |
| *Or* the lectures were at too low a level | 0 | 0 | 0 | 0 | 0 |  |
| *Or* the lectures were just right | 12 | 8 | 0 | 0 | 0 |  |
| The lectures were well presented | 14 | 8 | 1 | 0 | 0 |  |
| The lectures were stimulating | 10 | 12 | 1 | 0 | 0 |  |
| The lecturers responded well to questions | 11 | 9 | 1 | 0 | 0 |  |
| I found it easy to get on with the lecturers | 6 | 8 | 7 | 2 | 0 |  |
| The lecture room was comfortable | 7 | 9 | 6 | 0 | 0 |  |

**Comments**
**Were there any other topics you would have found especially useful?**
*I think I could be benefit a lot if there were a lecture concern about the strategies or some tricks adopted in terms of fitting the X-ray spectrum.*

*A more through introduction of the X-ray emission mechanism, their history, how they work, I feel, is helpful for us to understand the 1-ray objects.*

It is not poosible to bring Chandra or XMM-Newton here, how about a model? Then we may have more direct feeling of it.

*Lectures by Matteo Guainazzi on AGN was excellent and motivational. Also lecture on ISIS by Mike Nowak was really good and got a nice introduction abou*

*some data reduction step*

*There could have been an introductory lecture on NuSTAR science and analysis, since the data will be public soon and many will be interested to work on the*

*I think I could be benefit a lot if there were a lecture concern about the strategies or some tricks adopted in terms of fitting the X-ray spectrum.*
**Other comments?**
*Arrange lectures averagely everyday*

|  | 5 | 4 | 3 | 2 | 1 |  |
|---|---|---|---|---|---|---|
| **Software Lectures** |  |  |  |  |  | 5=strongly agree<br>4=agree<br>3=no strong feeling |
| These lectures were for me personally the most useful part of the workshop | 7 | 8 | 4 | 1 | 0 | 2=disagree<br>1=strongly disagree |
| The time spent on the lectures was too long *Answer only one of these* | 0 | 1 | 1 | 1 | 0 |  |
| *Or* the time spent on the lectures was too short | 2 | 0 | 0 | 0 | 0 |  |
| *Or* the time spent on the lectures was just right | 8 | 8 | 2 | 0 | 0 |  |
| The lectures were at too high a level *Answer only one of these* | 0 | 1 | 1 | 1 | 0 |  |
| *Or* the lectures were at too low a level | 1 | 0 | 0 | 0 | 0 |  |
| *Or* the lectures were just right | 9 | 8 | 2 | 0 | 0 |  |

| | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| The lectures were intelligible | 12 | 7 | 2 | 0 | 0 |
| The lectures were well presented | 14 | 6 | 3 | 0 | 0 |
| The lectures were stimulating | 13 | 6 | 2 | 0 | 0 |
| The lecturers responded well to questions | 12 | 7 | 4 | 0 | 0 |
| I found it easy to get on with the lecturers | 11 | 8 | 1 | 0 | 0 |

**Comments**

*It would be better to show more tricks that are not included in the online threads, such as displaying the "banana plot" of Chandra HETGS. Prof. Michael No*

**Theads are really helpful to learn on his/herself.**

These lectures were very much useful and valuable for me.

**There should be some hands on practice sessions for all of us to get idea about all the softwares here before starting projects. All participants should be**

The hands-on sessions on software will be more useful than the software lectures. Also the application of some specific tools in the hands-on session will h

**Good enough**

*It would be better to show more tricks that are not included in the online threads, such as displaying the "banana plot" of Chandra HETGS. Prof. Michael No*

Shift-and-add technique may need more time connecting to isis in order to search twins kHz QPOs.

| **Projects** | | 5 | 4 | 3 | 2 | 1 | | 5=strongly agree |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 4=agree |
| | | | | | | | | 3=no strong feeling |
| The project was for me personally the most useful part of the workshop | | 18 | 3 | 1 | 0 | 0 | | 2=disagree |
| | | | | | | | | 1=strongly disagree |
| The time spent on the projects was too long | *Answer only one of these* | 0 | 1 | 1 | 0 | 1 | | |
| *Or* the time spent on the projects was too short | | 3 | 0 | 0 | 0 | 0 | | |
| *Or* the time spent on the projects was just right | | 12 | 4 | 1 | 0 | 0 | | |
| | | | | | | | | |
| The instruction I received to install software before the workshop were appropriate | | 11 | 12 | 0 | 0 | 0 | | |
| The lectures did not prepare me adequately for the projects | | 2 | 1 | 5 | 7 | 5 | | |
| I would have preferred to have a PC provided than using my laptop | | 0 | 1 | 4 | 4 | 10 | | |
| I would have preferred to have an own laptop instead of using the provided PC | | 12 | 5 | 3 | 1 | 0 | | |
| I had difficulty using Linux | | 1 | 1 | 3 | 4 | 11 | | |
| The help I got with my project was adequate | | 15 | 4 | 3 | 1 | 0 | | |
| I found the supervisors helpful and easy to get on with | | 18 | 3 | 1 | 0 | 0 | | |
| I realized too late which the ultimate scope of the project is | | 2 | 1 | 4 | 8 | 3 | | |

**Comments**

*I''m gratitude to my adviser Dr. Randall Smith. Randall is extremely nice, especially he's very patient, always encourages me and the students in our group a*

Some pre-designed projects may be helpful.

The Professors are so kind!!!!

I am really happy to do the project with Matteo Guainazzi. He explained each and every thing with minute details during the project. Also he was very co-o

The time alloted for projects could have been a bit more, so that it would have been possible to at least try out the reduction procedures for all 3 satellites

| **Accommodation and Venue** | 5 | 4 | 3 | 2 | 1 | | 5=strongly agree |
|---|---|---|---|---|---|---|---|
| | | | | | | | 4=agree |
| | | | | | | | 3=no strong feeling |
| The airport transport was efficiently done | 5 | 4 | 6 | 1 | 0 | | 2=disagree |
| The rooms at the Quan Mountain Hotel were good | 15 | 7 | 1 | 0 | 0 | | 1=strongly disagree |
| The food at the Quan Mountain Hotel was good | 11 | 10 | 0 | 1 | 1 | | |
| The lunch food at the observatory was good | 7 | 12 | 2 | 0 | 2 | | |
| The dinner food at the restaurant close to the observatory was good | 9 | 12 | 2 | 0 | 0 | | |
| Generally, the accomodation environment was good | 13 | 8 | 1 | 0 | 0 | | |
| The Xuyi Observatory Station was a good place to hold this workshop | 10 | 11 | 1 | 0 | 0 | | |

**Comments**

Actually, I don't know the airport transport efficiency, since there  a "0" is not an option I assume the airport transport was efficiently done, : )

I was surprised to see the lectures do not need too much rest. I feel one additional free hour after lunch and one hour before dinner will release the nervo

It will be nice, if the accommodation place and the workstation close by. We faced difficulty in accessing the internet.

Somehow a little far away from towns, hard to buy something useful like washing powder.

| | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|
| **The Future** | | | | | | 5=strongly agree |
| | | | | | | 4=agree |
| | | | | | | 3=no strong feeling |
| I will be able to use X-ray data in my future research | 10 | 8 | 2 | 2 | 0 | 2=disagree |
| I have learned enough to do this without much extra help | 1 | 6 | 9 | 4 | 2 | 1=strongly disagree |
| If I have problems, I know where to go for help | 8 | 12 | 2 | 0 | 1 | |
| I have benefitted significantly from attending the workshop | 14 | 7 | 0 | 0 | 0 | |

**General Comments** (on anything whatever to do with the workshop)
Thanks for the well-organized workshop, special thanks for Prof. Ji and the volunteers, who have devoted a lot to this workshop. Likewise, the lectures are

Thank God, YOU are here. I did get my problems solved and learn a lot.

I have learned many basic things and also few techniques regarding the data analysis. I also thankful to my teachers for their co-operation. Teachers are ve

Maybe some paper script would be helpful

My expectation was that everyone will be introduced to every
softwares. Learning softwares just by listening to the lectures
is just like learning swimming by reading book. We would become familiar
to the software only if we come in to practice. The science part too
will be more familiar to us when we extracting something from real data
using these softwares. If we had hands on experience with all the softwares
we can access the rest from the experts. So, Frankly say, I am little
bit frustrated after this workshop because I was knowing little bit
chandra analysis and I did the same after came heare. The lectures were good
but if there had practical sessions too, it would do more benefit.
    And one more thing about food. I feel that you were not considering the vegetarians.
Breakfast and dinner was almost fine but we were not eating other than
Fruits during lunch.
The lecture were so friendly and approachable and we had very nice
moments with you people. We enjoyed the night parties, trip, banquet etc.
Special thanks to the LOC. They were so caring and helpful.

Overall, the workshop was well conducted. But in my personal view, it will be more useful if have a hands-on sessions on the softwares. The accommodati

Every teacher is friendly and beneficial !

If possible please arrange similar type of workshop in India. It wil help young researcher like me from Indian sub-continent.

Thanks for the well-organized workshop, special thanks for Prof. Ji and the volunteers, who have devoted a lot to this workshop. Likewise, the lectures are

Hope for future consult Q. to all teachers in the workshop.

Carlos Gabr

## Appendix V - Some pictures



The crime scene



The daily transport

a (science) lecture ...



a (software analysis) lecture ...

this can be sometimes too much ...



working on the project – the AGN group ...

another project group – the galácticos…



and another project group, diffuse emission but crowdie space

project on extended sources ... with more extended space



the daily supper after more than 9 hours of work

Excursion to Nanjing on Sunday – to an old observatory of course



All the excursion participants…

and the Indian "section".



Not only astronomy in the excursion – visit to a nice garden

Reading a play (Copenhagen), singing, playing music, celebrating a birthday, making the clown, every activity was a good way to socialize, have a good time, make friends.

COSPAR Workshop Xuyi 2013 – the official photo