

COSPAR Capacity Building Workshop 2019 on Broadband spectral and timing studies with AstroSat, Chandra and XMM-Newton

[Report by K. P. Singh and J. S. Bagla]

The COSPAR Capacity Building workshop was held at the Indian Institute of Science Education and Research, Mohali (IISER-M), Punjab, India from March 9 to March 20, 2019. The objective of the workshop was to train young and upcoming scientists (graduate students, fresh post-docs and some advanced masters students) in the geographical region of Asia to use AstroSat's multi-wavelength spectral and timing capabilities and to teach them how to use these capabilities in conjunction with data from Chandra and XMM-Newton.

A total of 135 applications were received and 35 of the 36 students selected from all over India (30), China(1), Turkey(2), Nigeria(1) and Sweden(1) attended the workshop. The students were selected by a committee consisting of D. Altamirano (Southampton Univ., UK), M. Mendez (Univ. of Groningen, The Netherlands), J.S. Bagla (IISER-M) and K.P. Singh (IISER-M) based on the criteria of (a) academic merit, (b) research proposal, (c) previous experience & track record, (d) appropriate field of research, (e) likelihood of benefitting from the workshop, and (f) likelihood of applying the knowledge in later career.

The workshop was extremely project oriented. Lectures comprised 33 contact hours and the projects 41 contact hours. There were 16 lecturers and 15 tutors (10 common) - all of them being experts in the area of X-ray and UV astronomy from universities and research institutes in USA, UK, The Netherlands, Spain, Italy and India. The lecturers and tutors were invited by the SOC.

The Lecturers were: Diego Altamirano (Southampton Univ.), Shah Alam (IUCAA), H M Antia (TIFR, Mumbai), Keith Arnaud (NASA), Tomaso Belloni (INAF - OA di Brera), Dipankar Bhattacharyya (IUCAA, Pune), Sudip Bhattacharya (TIFR, Mumbai), Gulab Dewangan (IUCAA, Pune), Carlos Gabriel (ESA/XMM-Newton), S K Ghosh (TIFR, Mumbai), Matteo Guainazzi (ESA/XMM-Newton), Mariano Mendez (Kapteyn, Groningen), M C Ramadevi (ISAC-ISRO, Bengaluru), S Seetha (SSPO-ISRO, Bengaluru), K P Singh (IISER Mohali), Annapurni Subramaniam (IIA, Bengaluru), S N Tandon (IUCAA, Pune), Santosh Vadawale (PRL, Ahmedabad), Lynne Valencic (NASA), J S Yadav (TIFR, Mumbai)

The Tutors were: Diego Altamirano (Southampton Univ.), Keith Arnaud (NASA), Tomaso Belloni (INAF - OA di Brera), Aru Beri (Southampton University), Manoneeta Chakraborty (IIT Indore), Sunil Chandra (North-West University, S. A.), Gulab Dewangan (IUCAA, Pune), Carlos Gabriel (ESA/XMM-Newton), Matteo Guainazzi (ESA/XMM-Newton), Mariano Mendez (Kapteyn, Groningen), Sachindra Naik (PRL, Ahmedabad), Pramod Pawar (IUCAA, Pune), C S Stalin (IIA, Bengaluru) and Lynne Valencic (NASA).

The SOC consisted of Annapurni S., (IIA), J. S. Bagla (IISER), D. Bhattacharya (IUCAA), G. Dewangan (IUCAA), M. Mendez (Groningen/COSPAR), R. Misra (IUCAA), J. Murthy (IIA), A. R. Rao (TIFR), S. Seetha (ISRO), K. P. Singh (IISER), C. S. Stalin (IIA), S. N. Tandon (IUCAA).



Group Photo. Credits: T. Belloni

The lectures covered topics in high-energy astrophysics, description of instruments aboard the three observatories, data analysis techniques and usage of the software. Each student was given an independent project and data were provided from XMM-Newton, Chandra and AstroSat observatories for the projects. Each student learnt to install the software required for their project. The projects ranged from the study of galactic sources, like X-ray Binaries, supernova remnants and star clusters, to extragalactic sources, AGN and cluster of galaxies, with X-ray binaries and AGN being the most popular topics. The students were also trained in how to write a successful observation proposal and how to make a presentation. On the last day of the workshop, each student made a 7-minute presentation on the project carried out. All the students made presentations and were given a certificate of completion from COSPAR.

The tutors and students were all very happy with the completion of the projects and the learning experience gained through close interactions provided at the workshop. It was not all work and no play during the workshop, however. One of the highlights was a new magic trick by Mariano Mendez every morning before the start of the session, which ensured attendance on time. A one day trip was arranged to 2 museums in neighbouring cities: Virasat-E-Khalsa, <https://virasat-e-khalsa.net/>, and Indus Valley Museum <http://www.transindiatravels.com/punjab/ropar/places-to-visit-in-ropar-rupnagar/>. Half a day was left free for the participants. A special dinner was arranged on the 18th of March at Choki Dhani near Chandigarh. “Holi”, a festival of colour, was celebrated by the participants after the end of the workshop.

Co-habitation of the students, tutors and lecturers was an essential part of the workshop. All attendees were housed in the Visitors’ Hostel of IISER Mohali. We are very grateful to all the

tutors who stayed for the entire duration of the workshop providing guidance to the students for their projects round the clock. Based on the feedback received the organisers and the participants were happy with the facilities provided at IISER Mohali.



Glimpses from the Workshop. Credits: K. A. Arnaud and J. S. Bagla

Acknowledgements: We thank the sponsors: COSPAR (Committee on Space Research of the International Council for Science (ICSU)), IISER Mohali, ISRO, ESA, NASA and Chandra X-ray Centre for their generous financial support for the travel and stay of the students, lecturers and tutors. The LOC at IISER-Mohali: J. S. Bagla, A. Beri, H. K. Jassal, S. Mahajan, K. P. Singh and J. Tiwari and the leadership of J. S. Bagla, the convener, worked tirelessly to make the things as smooth as possible. Facilities like the lecture halls, computer labs and the conference room at the visitor hostel that made it possible for participants to work at night were made available by the institute. Many staff members of the institute contributed considerable time and effort to make the event possible. Several graduate students assisted the LOC in making all the arrangements for the smooth running of the workshop from food to travel:

Avinash Singh, Ashish Meena, Ranbir Sharma, Manvendra Pratap Rajvanshi and Juhi Tiwari.



Celebrating Holi and the Dinner at Choki Dhani. Credits: T. Belloni

The conference dinner was co-sponsored by Canara Bank. The one day trip and the special dinner were sponsored by Netweb Technologies, Delhi.