



Editorial

It gives us great pleasure to present this Special Issue on “AstroSat: Five Years in Orbit”. The first Indian multi-wavelength space observatory, AstroSat, has been the realisation of the dream of many scientists and engineers. This issue is a compendium of articles on the recent science results based on the observations made with this observatory, while also providing a glimpse of the methods adopted to operate the satellite.

AstroSat, the first dedicated astronomy mission of the Indian Space Research Organisation (ISRO), was launched from the Satish Dhawan Space Centre, Sriharikota, India on 28 September, 2015, by the PSLV-C30 launch vehicle into a 650-km circular orbit with an inclination of 6 degree. It is the first satellite to combine both NUV and FUV capabilities along with broad spectral coverage in X-rays. It has many more firsts in the Indian context—the first time several major Indian scientific institutes and international partners have contributed to the design, development, testing and qualification of the payloads in addition to conducting scientific research with the observations, the first Indian satellite to have a payload mass fraction greater than 50%, the first time the PSLV was used to launch a 1500 kg class satellite in a near-equatorial orbit, and the first Indian spacecraft operated as a proposal-driven space observatory.

AstroSat was in performance verification mode for the first six months in orbit, followed by one year of observations for Guaranteed Time observers, primarily from the instrument developing teams. After this the observatory time was gradually opened up for researchers from India and abroad, and with the completion of five years in orbit, there have been more than 150 refereed publications using observations from AstroSat.

On the completion of five years of AstroSat, the *Journal of Astrophysics and Astronomy* circulated an invitation to contribute articles to mark the occasion.

It was wonderful to receive a very enthusiastic response to this call, which has enabled us to assemble this bouquet of over sixty peer-reviewed articles addressing various aspects of the mission and its science outcome.

This issue begins with an article tracing the history of initiation of the idea of AstroSat, and a brief overview of some of the results from the first five years of operation. This is followed by four review articles providing an overview of the unique aspects and the major science achievements of the LAXPC, UVIT and SXT instruments.

A series of nearly twenty articles that follow provide a broad perspective of various aspects of the project implementation and new developments that were undertaken to operate this spacecraft as an observatory, present several new calibration results including that of the UV grating and describe a variety of data analysis pipelines.

Wide-ranging original science results are presented in the subsequent forty articles or so. The largest group of papers is devoted to UV studies of galaxies in different environments, their structure and star formation—including the Milky Way, its satellites and the neighbouring Andromeda galaxy. Several papers also report multi-wavelength studies of Active Galaxies, providing new constraints on their central engines. Stellar populations in different open and globular clusters are studied in a number of contributions, revealing their evolutionary history. Fascinating new details of Planetary Nebulae, and interesting results from the studies of individual stars are also presented.

Fast, broadband X-ray timing capability is a key strength of AstroSat and several articles in this issue employ this to study diverse aspects of stellar mass compact objects—white dwarfs, neutron stars and black holes—in binary systems. Some of the articles also discuss the detection and detailed study of fast high energy transient sources with AstroSat.

The success of AstroSat has contributed to a major growth in the Indian Space Astronomy community. The resulting maturity and confidence has generated a slew of ideas for future Indian astronomy missions. This volume concludes with a discussion of the exciting prospects of future growth in this area.

Finally, words are insufficient to acknowledge the help we have received from a large number of contributors, without whom this issue would not have been possible. We are extremely thankful to Chairman ISRO, Dr. K. Sivan, for providing the Foreword. We also express our sincere thanks to the Chief Editor of *Journal of Astrophysics and Astronomy*, Prof. Annapurni Subramaniam, who has been instrumental in not only guiding us through, but also contributing significantly to the editorial activities of this issue. We would also like to take this opportunity to express our

heartfelt gratitude to all the contributors for enthusiastically agreeing to write for this issue despite their other commitments. We are also grateful to all the team members of ISRO, and the various institutions, who have made AstroSat what it is today. Special thanks are due to the contributors for the cover page, and to Ms. Shylaja, Ms. Cicilia and Ms Srimathi and the entire editorial team at the Indian Academy of Sciences for their invaluable help in bringing out this issue.

We believe this is only the beginning. We look forward to many more interesting results from AstroSat in the years to come.

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Guest Editors