

Mini-symposium B17

Global Observatories and New Discoveries in Time-Domain Astronomy and Astrophysics

Organizer:

Bryan Penprase
Yale-NUS College, Singapore
Email: bryan.penprase@yale-nus.edu.sg

B17-01 Invited

Transients in the Local Universe: Today and Tomorrow

Mansi Kasliwal

California Institute of Technology, Pasadena, CA, USA

The advent of wide-field synoptic imaging has re-invigorated the venerable field of time domain astronomy. Our framework of optical transients no longer has a wide six-magnitude luminosity "gap" between the brightest novae and faintest supernovae. Multiple new and distinct classes of very rare explosions have been uncovered just in the past few years. I review the surge of excitement (and debate) on the physics of these transients with unprecedented explosion signatures. I will give an overview of the next generation Zwicky Transient Facility, which when combined with a global network of follow-up telescopes has the potential to revolutionize optical time-domain astronomy.

B17-02 Keynote

Operation and Science Highlights for Lulin Observatory (Taiwan)

Chow-Choong Ngeow

National Central University (300, Zhongda Rd, Zhongli City, Taoyuan County 32001, Taiwan)

The Lulin Observatory is the only research-oriented astronomical observatory in Taiwan. The Lulin Observatory is located at the central part of Taiwan, with an elevation of 2862m. It is currently owned and operated by the Graduate Institution of Astronomy at National Central University (IANCU). The main workhorse for Lulin Observatory is a one-meter telescope with Cassegrain F/8 design – the Lulin One-meter Telescope (LOT). Instrumentations available for LOT include a standard CCD imager (Apogee U42), a low resolution spectrograph (R=333,1333) and a tri-color polarization imager (TRIPOL2). Besides LOT, two smaller telescopes at the Lulin Observatory have also been used for research study – the 40cm SLT and the 35cm L35 telescopes. Unlike LOT, these two telescopes only equipped with CCD imagers and a set of standard filters. The LOT, together with SLT and L35, has been used in a wide variety of research topics, including Solar System objects, variable stars monitoring and cosmological transients. A dedicated survey has been carried out at Lulin Observatory for searching new asteroids. At the end of this survey ~800 asteroids (mostly main-belt asteroids) have been discovered, as well as the Lulin Comet. Lulin Observatory also hosted four dedicated wide-field telescopes for the Taiwan-America Occultation Survey (TAOS) Project. These 0.5m telescopes monitor patches of the sky along the ecliptic plane in order to detect occultation events caused by the Kuiper-Belt objects. In this talk I will present the operation of the Lulin Observatory, mainly focused on the LOT, as well as some scientific highlights based on the observations carried out at Lulin Observatory. I will end my talk with a prospect to join the global telescopes network for rapid follow-up of transients and time-domain astronomical phenomena.

B17-03 Invited

Observational Study of Transients at Seoul National University.

Myunghsin Im

CEOU/Astronomy Program, Dept. of Physics & Astronomy, Seoul National University, Seoul, Republic of Korea

With the advancement of new technology, time domain study of

astronomical objects is getting more popularity than ever before. Since 2007, our group at Seoul National University has been carrying out follow-up observations of Gamma Ray Bursts (GRBs). More recently, we also started performing time series observation of supernovae (SNe) and Active Galactic Nuclei (AGNs), and have been involved in a collaborative activity of the optical identification of the gravitational wave sources. We summarize these programs and our observational facilities which include telescopes in Korea and the facilities in the United States, Uzbekistan, and Australia. We will also present highlights of our research activities, such as studies of a tidal disruption event and high redshift GRBs, showing a long-term near-infrared decay of the light and supermassive black hole mass of a tidal disruption event, Swift J1644+57, and a clue for the dust produced by supernovae from GRB 071025 at $z \sim 5$.

B17-04 Invited

Observing Resources and Time Domain Activities in India

Varun Bhalerao

Inter University Centre for Astronomy and Astrophysics (IUCAA), India

I will introduce the different observatories operated by various institutes in India in different parts of the electromagnetic spectrum. These include 2-m class optical and infrared telescopes at Hanle, Girawali and Kavalur, and 1-m class telescopes at Mt. Abu and Nainital; and the Giant Meterwave Radio Telescope at low frequency wavelengths. In the coming year, this suite of telescopes will be further complemented by a 3.6-m optical telescope at Devasthal; and ASTROSAT – a multi-wavelength satellite that will give simultaneous broadband coverage in Optical, UV, Soft X-ray and Hard X-ray bands. I will discuss some time-domain activities pursued with this telescope, with emphasis on coordinated global follow-up of fast transients.

B17-05 Invited

Astrophysics in the seconds to milliseconds time domain: selected results from the Thai 2.4m telescope equipped with ULTRASPEC.

A. Richichi¹, P.Irawati¹, V. Dhillon², T.R. Marsh³, B. Soonthornthum¹

¹National Astronomical Research Institute of Thailand, Chiang Mai, 50300 Thailand;

²University of Sheffield, Sheffield S3 7RH, United Kingdom

³University of Warwick, Coventry CV4 7AL, United Kingdom

The new Thai National 2.4m Telescope (TNT) is equipped, among other instruments, with ULTRASPEC. This visitor instrument, built by a Consortium of UK institutes, is based on a low-noise, frame-transfer EMCCD with high-quality optics specifically designed to offer a superb image quality over the 300-1000nm range at TNT matched to the best seeing conditions at Doi Inthanon. ULTRASPEC data are accurately time-stamped thanks to a dedicated GPS receiver. First observations started in November 2013, and ULTRASPEC has been the most requested instrument at TNT in Cycle 1 and Cycle 2. Among the capabilities offered by ULTRASPEC, high-time resolution features as a special niche since no other observatory is similarly equipped in the longitude range of TNT. By using a highly flexible scheme of subarray reading, sampling rates as fast as 400Hz can be achieved. We describe the instrument and provide examples of new exciting results in areas such as eclipsing binaries, cataclysmic variables, flickering, and occultations by the Moon and other solar system bodies. Accurate light curves with sampling rates below 1s (down to few milliseconds in the special drift mode employed for occultations) can be routinely obtained. We outline the opportunities for joint observations and collaborations.

B17-06 Invited

The ZTF undergraduate program, and using the 1-meter and Brackett Observatories for Transient Followup

Bryan Penprase

Yale-NUS College, Singapore and Pomona College, USA

In this talk I will review some elements of the ZTF (Zwicky Transient

Program) as it relates to undergraduate education, and some of the specific plans for involving students in observing and data analysis using time-domain astronomy. The talk will review some of the programs to date from Pomona College in time-domain astronomy and astrophysics, which includes solar system monitoring projects, and local ISM spectroscopy. A new observational astronomy course, offered in parallel at several institutions including Caltech, Pomona College, and several other colleges will be described, and some of the key datasets and sources for new student research will be reviewed.

B17-07 Invited

KAPAO: Design, Construction and First-light Observations of a Low-Cost, Natural Guide Star Adaptive Optics Instrument

Philip Choi

Pomona College, 610 North College Ave., Claremont, CA, 91711, USA

KAPAO is a natural guide star adaptive optics system for the Pomona College Table Mountain Observatory 1-meter telescope. The KAPAO system is a facility instrument that has dual science channels with visible and near-infrared cameras, and uses a Shack-Hartmann wavefront sensor and a commercially available 140-actuator MEMS deformable mirror for wavefront characterization and correction. We present here the instrument design along with first-light, on-sky images and performance characterization. KAPAO is notable for both its low-cost design and the extensive involvement of undergraduate students in all phases of the project.

B17-08 Invited

A Study of Cyclones and Anticyclones in Jupiter's North Tropical Zone, 2003-2013

Franklin Marsh¹, Bryan Penprase²

Pomona College

In our study, the behaviors and characteristics of Northern Tropical Zone storms are characterized over the time period of 2003-2013. Over 5,000 ground-based observations from small telescopes, and Cassini data products are used to analyze 80 storms in the study time period, revealing subtle changes in storm behavior, as well as general storm characteristics. We found that after the year 2009, the dark storms in the 15-16N latitude band were forming further south than before. Because these storms form in an area of lower zonal wind speed, they also drift at a slower velocity relative to System III. We hypothesize that small changes in the differential zonal wind velocity in 2009 caused this more southerly zone to be favored for storm formation.

B17-09 Invited

The Malaysian Langkawi National Observatory and its Capabilities

Mohammad Redzuan¹, Farahana Kamarudin^{1,2}, Karzaman Ahmad¹

¹Langkawi National Observatory, National Space Agency, Empangan Bukit Malut, 07000 Langkawi, Kedah, Malaysia

Established in 2006, the Langkawi National Observatory is equipped with a 20" or 0.5 meter telescope with the goal of serving the needs from the astronomy community for a facility to conduct astronomical observations. The observatory is situated on the tourist island of Langkawi, which is the most northern and eastern tip for Malaysia. It has seen multiple usages from some local Malaysian universities and also from abroad ever since it opened. Stellar observations conducted range from stars, galaxies, nebulae, asteroid and planetary, each for their own research purposes and also sometimes for stunning photos to be shared with the general public.

There is also a solar observatory which continuously records daily sunspot whenever the weather permits, since 2007. Data in the form of images for Calcium-K and H-alpha are also recorded as this observatory is equipped with telescopes for all 3 wavelengths. We welcome future requests to use our facilities either for research or training/educational purposes as this will also support our role within the small astronomical community.