COMMISSION J: Radio Astronomy
(November 2016 – October 2020)

Edited by Nario Kuno (University of Tsukuba)

Activity of meetings

- **Japan SKA consortium local meeting for "Development" in Kagoshima**
  Date: December 17, 2016
  Venue: Inamori Hall, Kagoshima University, Kagoshima, Japan
  Topics: Technical Development for Square Kilometre Array (SKA)

- **ALMA/45m/ASTE Users Meeting 2016**
  Date: December 19-20, 2016
  Venue: NAOJ Mitaka, Japan
  The users meeting is hosted by the Chile Observatory and Nobeyama Radio Observatory of the National Astronomical Observatory of Japan (NAOJ).

- **SKA Workshop "Galaxy Evolution and Distant Universe" 2017**
  Date: January 7 – 9, 2017
  Venue: Arden Hotel Aso, Kumamoto, Japan
  Topics: Cosmic Reionization, Cosmology, Galaxy Evolution, and Square Kilometre Array (SKA)

- **ALMA Band 1 Science Workshop**
  Date: January 16-18, 2017
  Venue: ASIAA, Taipei (Taiwan)
  The ALMA Band 1 Science Workshop will take place at the ASIAA (Academia Sinica, Institute for Astronomy and Astrophysics) in Taipei (Taiwan) from January 16 to 18 2017. It will consist of a few invited talks on the main scientific goals of ALMA Band 1, plus contributed talks. We also plan to have poster sessions. The ALMA Band 1 Science workshop will provide the first opportunity to show the exciting new science ALMA Band 1 can deliver and to start preparing for the first observing proposals in the ALMA lowest frequency band. The two days after the workshop, 19-20 January, will be dedicated to the discussion and planning of the upcoming Band 1 Science Verification phase.

- **ALMA Workshop for Proto-Planetary Disks**

Date: January 27, 2017

Venue: Mitaka, NAOJ, Tokyo, Japan

Topics: ALMA proposal Cycle 5, Summary of current works

- **ALMA Workshop "Nearby galaxy M83 2017"**

  Date: February 20 – 21, 2017

  Venue: Mitaka, NAOJ, Japan

  Topics: Observation of fine structure of M83, ISM evolution, Chemical evolution, Star formation

- **Japan Radio Science Forum Symposium 2016**

  Date: February 22 – 23, 2017

  Venue: NAOJ, Mitaka, Japan

  Topics: Dialogue between Senior and Young Scientists

- **17th "Millimeter/Submillimeter Receiver Workshop" and 3rd "RIKEN and NICT Joint THz Workshop"**

  Date: February 27 – 28, 2017

  Venue: NICT, Koganei, Japana

  Topics: Detection Devices, Optics, Antenna, HEMT, Cooling, Integration, Calibration and Science, Future Projects

- **Workshop: 30m THz telescope in Antarctica**

  Date: March 2 – 3, 2017

  Venue: The National Institute of Polar Research (NIPR), Tachikawa, Japan

  Topics: THz astronomy, THz telescope

- **ALMA Workshop for Solar System**

  Date: March 6, 2017

  Venue: Mitaka, NAOJ, Japan

  Topics: Millimeter and Submillimeter observation and Solar System

- **Workshop "Why does the Universe accelerate? -Exhaustive study and Challenge for the future"**

  Dates: March 8 – 10, 2017

  Venue: Kobayashi Hall, KEK, Japan

  Because gravity is an attractive force, the expansion speed of the Universe should be

decreasing. However, observational data accumulated over the years strongly support that the present Universe is in the phase of the accelerated expansion and there was also another phase of the accelerated expansion in the very early Universe. The physical mechanism that makes the Universe undergo the accelerated expansion is not known yet. Some “repulsive force” is necessary. The purpose of this innovative area is to clarify the origin of the accelerated expansion. In order to achieve this goal, it is necessary to investigate the interplay between the repulsive force causing the accelerated expansion and the attractive force sourced by dark matter which triggers the formation of the cosmic structures such as the galaxies and clusters of galaxies. In this innovative area, researchers from different fields join together and form nine sub-groups: inflation in the early Universe (A01), decelerated expansion by dark matter (A02), accelerated expansion by dark energy in the present Universe (A03), cosmic microwave background (B01), galaxy imaging (B02), galaxy spectroscopy (B03), direct measurement of the cosmic expansion (B04), ultimate data analysis (D01), and ultimate theory of the Universe (C01). Not only collaborations within each individual sub-group but also collaborations among the different sub-groups are essential to obtain scientific achievements we desire.

- **East-Asian ALMA Science Workshop 2016-Taiwan**

  Date: March 10-12, 2017

  Venue: National Tsing Hua University, Hsinchu, Taiwan

  In the past few cycles of ALMA scientific operations, we see great success from the EA community in producing remarkable results. We are also excited by the expansion of the ALMA community into Korea. To maintain the momentum and to promote regional collaboration, we hold regular science workshops in the three EA-ALMA countries. We are pleased to announce the 2016 East-Asian ALMA Science Workshop, to be held by National Tsing Hua University in Hsinchu, Taiwan, on March 10-12, 2017. Like the previous EA-ALMA Science Workshops, we invite ALMA users to present their recent results. Furthermore, we would like to enhance the workshop functions on promoting discussion and regional collaborations, by adjusting the workshop format. We will split part of the workshop into two parallel sessions on Galactic and extragalactic studies. We will have special sessions for prospective projects to call for collaborators, for archival science, and science that require multi-wavelength observations. The workshop will be timely to develop proposal ideas and form collaborations for the upcoming Cycle-5 deadline for PI programs. On the other hand, we encourage teams that plan to submit large proposals to hold meetings in advance, and present their ideas in the EA ALMA Science Workshop.

- **ALMA Workshop on Stars： At the Age of Full Band Availability**

Date: March 24 – 25, 2017

Venue: Okayama University of Science, Okayama, Japan

Topics: Evolved Stars, Molecule/Dust, Full-band observation

- **Workshop: Black Hole Astrophysics with VLBI: Past, Present, and Future**

Date: March 27 - 29, 2017

Venue: Mitaka campus of NAOJ, Tokyo, Japan

The workshop "Black Hole Astrophysics with VLBI: Past, Present, and Future", will be held in Tokyo next March. We are organizing this workshop on the occasion of Professor Makoto Inoue's retirement to honor and celebrate his leading and foundational contributions to the field. We aim to share our fond memories of Professor Inoue's scientific career, and we also intend to encourage the younger generation to succeed and exceed the future prospects in the advancing field of radio astronomy. Anybody interested in the workshop is welcome.

- **ALMA Cycle 5 Town Meeting**

Date: April 5, 2017

Venue: Mitaka, National Astronomical Observatory of Japan

ALMA Observatory was announced the ALMA Cycle 5 Call for Proposals (CfP) for scientific observations. We use Observing Tool (OT) for proposal preparation (parameter setting, estimation of observing time etc.) and submit an ALMA proposal. In Town Meeting, we, East Asia ALMA Regional Center (EAARC), will explain capability of ALMA Cycle 5 and we will have an opportunity to consult about proposal preparation through Q&A.

- **The 16th　IVS NICT Technology Development Center Symposium**

Date: June 21, 2017

Venue: NICT Kashima Space Technology Center, Main Building

As an activity of Technology Development Center of IVS （International VLBI Service for Geodesy and Astrometry）, NICT has been organizing annual symposium focused on Technology development related with space geodetic techniques. Proceedings of the symposium have been published as IVS NICT-TDC News (http://www2.nict.go.jp/sts/stmg/ivstdc/news-index.html) and delivered to domestic and international institutes and individuals working on VLBI and space geodesy.

One of the recent research subject of technology development in VLBI and in radio astronomy is broadband observation. NICT is conducting a new broadband observation technique named GALA-V for a target of distant frequency comparison. This broadband observation system is intended to be compatible with the next generation geodetic VLBI system VGOS. The subject

of symposium is not limited only VLBI, but also single dish observation technique for radio astronomy, space geodetic technique and research result including GNSS, SLR and, local tie observations. We welcome contributions from broad field of view in these research subject.

- **Symposium "Evolution of Molecules in Space"**

  Date: June 27-29, 2017

  Venue: Institute of Low Temperature Science, Hokkaido University

  We try to approach the answer to the question of how the molecule evolved and the planet, the earth, and the life were formed in the solar system that was born 4.6 billion years ago in the universe where various structures were formed since Big Bang. Focusing on ice and organic matter composed of the most abundant elements (H, C, O, N), the whole picture of molecular evolution from the interstellar molecular cloud to the protoplanetary system will be explored in both experiment and theory.

- **Workshop 'Formation of high mass star and cluster in Magellanic Clouds'**

  Date: July 26-27, 2017

  Venue: I-site Namba, Osaka

  Recent observations of molecular clouds in the Milky Way and Magellanic Clouds reveal that the interaction between molecular clouds has a major influence on the formation of high mass stars and clusters. In this workshop, through the results of detailed observations of molecular cloud and HI in the Magellanic clouds where large clusters are still being formed, through consideration of environmental differences such as heavy element quantity, the formation process of high mass star formation will be discussed. High resolution observation of nearby galaxies and comparison with theoretical studies are also important themes.

- **NRO45m/ASTE Single Dish Science Workshop 2017**

  Date: August 1-2, 2017

  Venue: Nobeyama Radio Observatory

  At Nobeyama Radio Observatory, a new phase of 45m radio telescope is going to start. Now, three legacy program is finishing, and it is expected that world-leading preeminent results will come. Furthermore, we are entering the phase to achieve cutting-edge scientific output through new observations using receivers including FOREST.

  In the southern hemisphere, ASTE is offering 345 GHz and 450 GHz receiver capabilities, and new and unique results are being published, including those leading to ALMA observations. It is also expected that the new detector Deshima (On-chip Filterbank Spectrometer for Submillimeter Wave Cosmology) will open our view to high-z universe.

In this workshop, we focus on scientific results from single-dish radio telescopes. (1) We introduce up-to-date scientific results with Nobeyama 45 m telescope and ASTE. (2) We discuss future requirements from the scientific point of view. We invite oral and poster presentations. Possible topics include; scientific results with Nobeyama 45m telescope, ASTE, or other single-dish telescopes, possibilities of new instrumental development, theoretical studies based on observational results, etc.

- **Radio Astronomy Forum meeting 2017**
  Date: September 11, 2017
  Venue: Hokkaido University
  Topics: Business meeting

- **Workshop "Star formation with ALMA: Evolution from dense cores to protostars"**
  Date : October 26, 2017
  Venue : National Astronomical Observatory of Japan, Mitaka

- **15th Mizusawa VLBI observatory Users' Meeting.**
  Date : November 3-4, 2017
  Venue : Conference Room, Mizusawa Kita Hotel

- **East Asian ALMA Science Workshop 2017**
  Date : November 27-29, 2017
  Venue : Korea Astronomy and Space Science Institute, Daejeon, Republic of Korea

- **2nd SKA Workshop for Technology**
  Date : December 18, 2017
  Venue : Kagoshima University

- **NAOJ Science Meeting "A Role of Magnetic Field in Star Formation and Galactic Structure"**
  Date : December 20-22, 2017
  Venue : Kagoshima University

- **VLBI Consortium Symposium 2017**
  Date : December 23-25, 2017
  Venue : Teikyo University of Science

- **2017 ALMA/45m/ASTE Users Meeting**
  Date : December 26-27, 2017
  Venue : National Astronomical Observatory of Japan, Mitaka

- **Workshop "An overview of achievements and future of radio astronomy"**
  Date : December 28, 2017
  Venue : University of Tokyo, Institute of Astronomy

- **The 5th Workshop for Supermassive Black Hole**
  Date : January 8-9, 2018
  Venue : Tohoku University, Katahira

- **Workshop "Star formation with ALMA: Evolution from dense cores to protostars"**
  Date : January 17-18, 2018
  Venue : I-site Namba (Osaka prefecture university)

- **ALMA Star Workshop : What can we really do with ALMA?**
  Date : January 18-19, 2018
  Venue : Tohoku University, Aobayama

- **Workshop on Proto-planetary Disk**
  Date : February 1, 2018
  Venue : National Astronomical Observatory of Japan, Mitaka

- **Workshop for Science Cases with Takahagi/Hitachi 32m Radio Telescopes**
  Date : February 20-21, 2018
  Venue : Ibaraki University

- **18th millimeter/sub-millimeter receiver workshop**
  Date : February 22-23, 2018
  Venue : National Astronomical Observatory of Japan, Mitaka

- **Science Workshop 2018 on FUGIN: The Galactic Plane Legacy Survey for Molecular Clouds**
  Date : February 26-27, 2018
  Venue : Nagoya University

- **Workshop on the Solar System Science with ALMA**
  Date : March 7-8, 2018
  Venue : National Astronomical Observatory of Japan, Mitaka

- **Radio Astronomy Forum of Japan Symposium FY2017 “Development of New Observation Technology”**
  Date : March 19-20, 2018
  Venue : National Astronomical Observatory of Japan, Mitaka

- **Workshop for High Mass Star Formation 2018 “High Spatial/Time Resolution Observation for the Study of High Mass Star Formation”**
  Date : March 22-23, 2018
  Venue : Yamaguchi University

- **Workshop on the Antarctica 30m THz Telescope**
  Date : March 27, 2018
  Venue : Tsukuba University

- **Workshop "Star Formation Triggered by Cloud-Cloud Collision"**
  Date : May 28-29, 2018
  Venue : Nagoya University

- **The Power of Faraday Tomography: towards 3D Mapping of Cosmic Magnetic Fields**
  Date May 28-June 2, 2018
  Venue : Seagaia Resort, Miyazaki

- **VLBI Science in SKA Age**
  Date: July 22-23, 2018
  Venue: NAOJ, Mitaka

  Since VLBI observation techniques can achieve ultra-high spatial resolution (micro to milliarcsecond) that can not be realized with any other method. Many of Scientific results have been obtained by VLBI, such as motions of matter around AGN jets, proto-stars or late-type stars are captured as moving images. On the other hand, they have always been plagued by poor sensitivity. To realize VLBI observation on a global scale by adding a VLBI function to SKA1 (aperture: 0.1 million square meters, construction will start from 2020, scientific verification in

2024 and public observation in 2027), it will be possible to far surpass the existing VLBI observation network in terms of both sensitivity and spatial resolution. Therefore, as part of the future plan study at the VLBI conference, we will hold a study conference focused on the science realized by Japan contributing to the addition of the VLBI network to SKA1.

- **NOEMA/30m Workshop**

  Date: July 24-25, 2018

  Venue: NAOJ, Mitaka

  The NOEMA (NOrthern Extended Millimeter Array) interferometer is currently the most advanced millimeter array in the Northern Hemisphere. The maximum angular resolution of NOEMA is ~0.5 arcsecs at an observing wavelength of 1.3 mm (230 GHz), with receivers operating at 3mm, 2mm, and 1mm. The number of antennas is expected to reach 12, and the sensitivity of the full NOEMA is expected to be 45-65% of ALMA. The 30-meter single dish telescope is equipped with a series of heterodyne receivers and continuum cameras operating at 3, 2, 1, and 0.9 millimeters. The main goal of this 2-day workshop is to introduce NOEMA/30m to the Japanese community and to discuss possible science cases through a series of invited/contributed talks given by our community members. Speakers are invited to express their opinion on how NOEMA/30m time will enhance their immediate and long term science productivity, based on the assumption that NAOJ gains access to NOEMA/30m time in the near future. We encourage young scientists to take advantage of this opportunity and actively voice their opinion.

- **SNR workshop 2018**

  Date: September 9-10, 2018

  Venue: Nagoya University

  Supernova remnants (SNRs) are the most energetic objects not only in our Galaxy, but also in external galaxies, and have been observed at various wavelengths from radio to gamma-rays. One of the most spectacular features of SNRs is the fast moving expanding shells whose velocity is measured as ~3000-10000 km/s. Recent observations of the shells in X-rays as well as radio continuum emission have provided a wealth of information on their physical and kinematical properties. It is also remarkable that the dense interstellar medium interacting with the shocks is likely playing a key role to produce X- and gamma-rays as shown by comparisons with HI/CO and dust emission. Theoretical works on acceleration and escape of cosmic rays in SNRs are unveiling details of cosmic-ray acceleration/propagation by magneto-hydro-dynamical numerical simulations, which will be compared with observations. In the present workshop, we invite observers and theorists to stimulate active interaction and exchange of ideas on SNRs.

- **Science Workshop on the 30-m THz Telescope in the Antarctica ~Star-Planet formation~**

  Date: September 12, 2018

  Venue: NIPR, Tachikawa

  The Antarctic Astronomical Consortium is promoting a plan to construct a 30m class THz telescope in the inland part of Antarctica where the observation conditions are the best on the ground. For this time, with the support of the National Institute of Polar Research Research Meeting, we will hold a research meeting focusing on the formation of star and planet systems with the THz telescope.

- **General Meeting of the Radio Astronomy Forum**

  Date: September 19, 2018

  Venue: Hosei University, Koganei

- **16th Mizusawa VLBI Observatory Users Meeting in 2018**

  Date: September 25-26, 2018

  Venue: NAOJ, Mitaka

  Mizusawa VLBI Observatory has proceeded astrometric observations with VERA to unveil 3-D spatial/velocity structures in the Milky Way Galaxy and its dynamical evolution. On the basis of the activity, we have accelerated a development of KaVA (KVN and VERA Array) and EAVN (East-Asian VLBI Network), and as a result an open-use of EAVN has been initiated since 2018B semester (observations will be allocated from 2018 September). We emphasize that the development of EAVN will promote the KaVA Large Programs in research fields of Star, AGN, and High-mass star formation, which have been initiated since 2016. In this users meeting, we will discuss about not only exciting scientific results with VERA/KaVA/EAVN but also future prospects of Mizusawa VLBI Observatory especially in 2022 and beyond. We hope that references below will be helpful to accelerate these discussions: EAVN will be further developed on the basis of future collaborations with JVN (Japanese VLBI Network), FAST 500-m (China), and TNRT 40-m (Thailand) radio telescopes, leading improvement of sensitivities and observable frequencies; Synergy with Gaia DR2 (opened in 2018 April) and SKA (now constructed and its operation will be initiated in 2027) has been expected.

- **Workshop on Interstellar Matter 2018 (ISM2018)**

  Date: November 14-16, 2018

  Venue: The Institute of Low Temperature Science, Hokkaido University

  The aim of this compact workshop is to offer an opportunity for exchange of current research

results of physics and chemistry of astronomically-relevant atoms, molecules, and ions in both gas and condensed phases. Toward the development of interactive activation among astronomical observations, theoretical calculations, and laboratory experiments, participants from wide fields, physics, chemistry, planetary sciences, and astronomy, are welcome to this workshop.

- **ALMA Workshop: From Disk to Solar System**
  Date: November 21-22, 2018
  Venue: WTC Conference Center Tokyo

- **VLBI Consortium Symposium 2018: VLBI in SKA Age**
  Date: December 1-2, 2018
  Venue: Kumamoto University

- **19th East Asia Submillimeter-wave Receiver Technology Workshop &**
  5th Riken-NICT Joint Workshop on Terahertz Technology
  Date: December 11-13, 2018
  Venue: Kwansei Gakuin University

- **East Asian ALMA Development Workshop 2018**
  Date: December 14-15, 2018
  Venue: Osaka Prefecture University

  The main goal of the workshop is to discuss and identify development items that are critical in the long term development and operation of the ALMA telescope. The topic of this year's workshop is “wide IF”. Since the hardware/software development is intimately connected to future science requirements, active participation by scientists is highly encouraged.

- **East Asian ALMA Science Workshop 2018**
  Date: December 17-19, 2018
  Venue: I-site Namba (Osaka Prefecture University)

  The main aim of this workshop is to continue to promote and stimulate international collaboration among the researchers in the EA partners, by reviewing and sharing the most recent ALMA science results in all relevant fields of astronomy. We plan to hold discussion sessions to promote closer communication among the researchers in related fields.

- **Radio Astronomy Forum Symposium 2018: Future Science of Radio Astronomy**
  Date: December 20-21, 2018

Venue: NAOJ, Mitaka

- **2018 ALMA/45m/ASTE Users Meeting**
  Date: December 26-27, 2018
  Venue: NAOJ, Mitaka

- **Ibaraki University Workshop: Transient/Variable Event and Radio Follow-up**
  Date: February 27-28, 2019
  Venue: Ibaraki University

- **First circular of SOKENDAI-UST Asia Winter School (SAWS) 2019: Star and Planet Formation: Key Questions and Challenges**
  Date: February 27-March 1, 2019
  Venue: NAOJ, Mitaka

- **Star formation with ALMA: Evolution from molecular clouds to protostars**
  Date: March 4-6, 2019
  Venue: Nagoya University

- **International Workshop on EAO Futures: Future Science and Instrumentation**
  Date: March 20-23, 2019
  Venue: Najing, China

  May 20th - 23rd 2019 the East Asian Observatory will host a four day (two half days and two full days) meeting looking at the future of science drivers and instrumentation needs of Sub-mm EAO astronomers. The meeting will discuss a range of topics including the Namakanui instrument at JCMT, the design of a new 850 micron camera for use at the JCMT, the East Asian VLBI project, and instrumentation in polar climates. Talks will cover both the technology involved in these programs and the science cases for such instrumentation.

- **Workshop: Polarimetry in the ALMA era: a new crossroads of astrophysics**
  Date: March 25-29, 2019
  Venue: NAOJ, Mitaka

- **Galactic Center Workshop 2019**
  Date: June 10, 2019
  Venue: Nagoya Univeristy

The galactic center is a unique region of the galaxy where stars and gases are densely packed. The gas in this region shows non-circular motion at high temperature and high density with large velocity dispersion. Further, it is said that the magnetic field strength in the central portion is one order of magnitude higher than that in the disk region. Research on the star formation process in such a peculiar environment is an important subject of star formation research. In recent years, sensitive X-ray and gamma-ray observations have revealed several outflow-like objects that blow out from the center to the north and south. Therefore, it can be said that the closest core, the center of the galaxy, is the most important target for understanding the evolution and activity of the core. In order to study interstellar phenomena and core activity in such a strong magnetic field environment, theoretical approaches such as magnetohydrodynamic calculations are indispensable. In this study group, observation researchers and theoretical researchers from various wavelengths and research fields will meet together to provide a place for concrete and close discussions with a view to future observation equipment.

- **The 17th IVS NICT-Technology Development Center Symposium**

  Date: June 27, 2019

  Venue: NICT Kashima Space Center

  We will hold a symposium on research and development of VLBI technology and space geodesy technology, so we would like to invite you to participate. In the field of geodetic VLBI, IVS (International VLBI Service for Geodesy & Astrometry), which leads the international geodetic VLBI, is a next-generation wideband geodetic VLBI system that enables ultra-wideband observation of 2-14 GHz. (VGOS) is being promoted, and countries around the world (US, Germany, Spain, Japan, Russia, China, South Africa, Norway, etc.) have installed new antennas and observation systems, and observations have begun. NICT has developed a 3-14GHz wideband VLBI observation system along with the guideline of VGOS, and is conducting international observations of intercontinental frequency comparisons using wideband small antennas. At the symposium, we would like to exchange information on VLBI technology, space surveying technology such as GNSS, SLR, single radio telescope observation, time / frequency related technology, and observation results, aiming for further development of the VLBI field.

- **Sub-mm Spectroscopy and Large-Scale Science with ASTE**

  Date: August 19, 2019 10:30-17:30

  Place: Lecture Room at NAOJ Mitaka Campus

  ASTE is a 10-m class submillimeter-wave single-dish telescope which enables to carry out large programs and surveys with its operational flexibility and superb atmospheric conditions. There are demands on large scale [CI] and CO (3-2) and (4-3) mapping of the Galactic Center

region, Galactic Plane, molecular clouds in the far outer galaxy, high-latitude molecular clouds, LMC/SMC and local group galaxies.

ASTE also serves as a test bench of astronomical instrumentation to explore new areas of technology with an expected positive impact on science. DESHIMA (Deep Spectroscopic High-redshift Mapper) is a new type of submillimeter wave spectrometer, which uses a superconducting filterbank on a chip to achieve a very wide instantaneous bandwidth. DESHIMA prototype was installed on the ASTE in 2017 and has successfully detected multiple astronomical sources, in both continuum and line emission. In this year, installation and commissioning of a new receiver with ALMA Band 10 frequency coverage (787-950 GHz) is planned including pilot observations to obtain [CI] (2-1) and CO (7-6) and (8-7) lines.

Therefore, there is no doubt that ASTE can proceed its own unique science in the ALMA era. The main objective of this workshop to discuss and identify future Sub-mm Spectroscopy and Large-Scale Science with ASTE by our community members. We look forward to the participation by researchers who are interested in sub-mm astronomy and related fields.

- **Nobeyama Science Workshop Reiwa 1st**

  Date: September 4-6, 2019

  Venue: Nobeyama Radio Observatory

  The Nobeyama 45m radio telescope has been playing an active role as the leading telescope in Japanese radio astronomy since 1982. Since then, it has brought many important results, but due to changes in the environment and needs, open use observation will be finished by March 4th year of this year. It even gives the impression that the science itself with single-dish is shirinking. However, many active users are young researchers who will lead the next generation. This workshop provides a place for users to gather and discuss about the latest achievements and research prospects, and to think about the possibilities of science with a single-dish in the new era.

- **General Meeting of Japan Radio Astronomy Forum**

  Date: September 11, 2019

  Venue: Kumamoto University

- **The 1st circular of the next generation VLA workshop**

  Date: September 17-20, 2019

  Venue: NAOJ, Mitaka, Japan

  The next generation Very Large Array (ngVLA) project, which is led by the National Radio Astronomy Observatory in the USA, is one of the most ambitious on-ground radio astronomy

projects for the next decades. This new on-ground cm/mm-wave radio telescope will be composed of 214 18-m antennas placed around the current VLA site in New Mexico and extending into other states in the US, and even into Mexico, complemented with a short baseline array composed of 6-m and Total Power antennas, and a long baseline array extending from Hawaii to the US Virgin Islands. This will provide a large collecting surface with baselines up to 9000 km, which will translate into unprecedented sensitivity and milli arcsecond angular resolution at frequencies from 1.2 to 116 GHz.

- **The 12nd East Asia VLBI Workshop**

  Date: September 24-26, 2019

  Venue: Mito Campus, Ibaraki University

  Since the release of the first EAVN call for proposal in April 2018, the EAVN array is now in its real operation with 10 stations (KaVA, Tianma, Nanshan and Nobeyama). The EAVW-2019 will be the first meeting after this milestone, while an increasing number of exciting results are coming out with KaVA, the core array of EAVN. We will discuss and highlight various science topics studied by EAVN/KaVA as well as by individual VLBI facilities VERA/KVN/CVN/JVN. This will include active galactic nuclei, star formation, evolved stars, astrometry, micro quasars, pulsars, transients, multi-messenger science etc. We will also highlight various ongoing developments of the array capability and instruments as well as the near-future expansion of the network into Ibaraki, Yamaguchi, Kunming, Thailand, Italy, Australia etc. Moreover, the VLBI community in East Asia is increasingly involved with EHT and SKA. Therefore, we will also discuss how EAVN can play a unique role in the era of such huge facilities. This will include "EAVN-high" that includes JCMT/GLT and "EAVN-low" that includes FAST, as well as joining a global VLBI network.

- **The 10th Galactic Center Workshop (GCWS 2019): New Horizons in Galactic Center Astronomy and Beyond**

  Date: October 21 (Monday) to 24 (Thursday), 2019 (Reiwa 1)

  Venue: Keio University Hiyoshi campus

  The central few hundred parsecs of the Milky Way Galaxy, which is often referred to as the central molecular zone (CMZ), is characterized by a strong concentration of stars and interstellar matter. Many surveys in various wavelengths, from radio to gamma-rays, as well as pointed observations have revealed a variety of astrophysical phenomena, most of which remain elusive: i.e., the three-dimensional distribution of gas; suppressed star formation despite the abundance of dense molecular gas; a currently inactive supermassive black hole but rich signatures of past central activities, the high-energy diffuse gamma-ray emission from GeV up to TeV energies, etc.

These unsolved issues span wide ranges of spatial scale, time scale, and energy scale and are likely related to each other. Current key issues in Galactic center studies include: (1) the triggering mechanism of central activity; (2) the formation process of the central supermassive black hole; (3) existence proof of the supermassive black hole at Sgr A*; (4) star formation properties in the CMZ; and (5) the properties of stellar remnants and their binaries, which would be gravitational wave progenitors. These issues are common to studies of extragalactic nuclei.

- **VLBI Consortium Symposium 2019: VLBI Crosses National Borders**

  Date: November 23-25, 2019

  Venue: Otsuma Women's University

  The VERA project, which has been the core of Japan's astronomical VLBI observations, has reached the stage of compiling the results, the number of users of EAVN, in which VERA / JVN, Nobeyama, South Korea, and China participate, is increasing, and results are being produced. Joint experimental observations with Italy are under active research in both astronomy and geodetic / time transmission VLBI. A Japanese group also contributed to EHT, which is a large-scale international joint research, and succeeded in shooting a black hole shadow. A 230GHz VLBI experimental observations in East Asia are also being conducted through joint research by Japan, Taiwan, South Korea, and China. SKA, which is closely related to VLBI, is about to start construction. It can be said that international VLBI collaboration is now providing a new research framework. Research themes have expanded from classic AGN jets and maser to accretion disks, transient objects, black holes in the galaxy, and further expanded into new areas of multi-messenger astronomy and time domain astronomy through multi-wavelength collaboration. At the VLBI Consortium Symposium 2019, we plan to focus on discussions aimed at building a new research framework through international collaboration, entitled "VLBI Crosses Borders." The purpose of this is to draw out new research themes of the VLBI community and discuss and share the future image.

- **The ALMA Workshop: Early Planet Formation in Embedded Disks**

  Date: December 8-10, 2019

  Venue: University of Tokyo.

  Previous high-resolution ALMA observations of protoplanetary disks around Class II sources, such as DSHARP, have shown that substructures in those disks are ubiquitous, mostly in the form of concentric rings and gaps, implying the presence of planets in these disks. The ubiquitous detection of substructures in protoplanetary disks raises the intriguing possibility that at least some planet formation may have started already during the embedded stages of protostellar evolution. In order to address exactly how and when planet formation might begin,

we will start an ALMA large program to systematically observe a large sample of Class 0 and I objects with an angular resolution of 0.04" (5 au) in 1.3 mm dust continuum and CO emission lines at 230 GHz to investigate how early substructures indicative of planet formation arise in disks in the evolution of young stars. In the workshop, we will invite several overseas experts in this field, and will review recent observations of disks around protostars as well as class II sources. We will also discuss data analysis technique of disks at high angular resolutions, and strategy how to understand possible early planet formation in embedded disks.

- **EA ALMA Development Workshop 2019**

  Date: December 10-11, 2019

  Venue: Large Seminar Room, NAOJ, Mitaka

  The Atacama Large Millimeter/Submillimeter Array (ALMA) is now routinely producing groundbreaking scientific results in almost all fields of astronomy and astrophysics. In order to maintain ALMA as the most advanced (sub)mm-wave array in the coming decades, all ALMA partners are now striving to realize the goals presented in the ALMA Development Roadmap. The East Asian ALMA has been holding the EA ALMA Development Workshop every year, with the main aim to present the latest technological advancement and exchange ideas which are relevant to the upgrade of ALMA. This annual workshop is intended to become an effective forum for interaction and discussion between the technical and scientific communities, and the input from the community is key in the establishment of the EA ALMA Development Program. Last year, the main focus of the workshop was “wide IF”, which is recognized as the highest priority in the ALMA Development Roadmap. This year, we would like to invite talks and discussion related to high frequency (bands 8, 9 and 10) observations of ALMA and related hardware and software development. Apart from this major focus, we will welcome contributions in the fields of antennas, front-ends, back-ends, and software development and related talks in science, science operations and/or commissioning of new capabilities.

- **17th Mizusawa VLBI Observatory Users Meeting in 2019: 1st circular**

  Date: December 13 - 14, 2019

  Venue: Mizusawa VLBI observatory, NAOJ

  Mizusawa VLBI Observatory has proceeded astrometric observations with VERA to unveil 3-D spatial/velocity structures in the Milky Way Galaxy and its dynamical evolution. On the basis of the activity, we have accelerated a development of KaVA (KVN and VERA Array) and EAVN (East-Asian VLBI Network). As a result an open-use of EAVN has been initiated since 2018B semester (observations will be allocated from 2018 September). From 2019B semester, astrometric mode of KaVA open-use has been opened. We emphasize that the development of

EAVN will promote the KaVA Large Programs in research fields of Star, AGN, and High-mass star formation, which have been initiated since 2016. On the other hand, Budget cut for Mizusawa VLBI Observatory will be expected based on the long term plan of NAOJ management. It is necessary that we discuss with community members how efficiently we conduct observational research in such situation. Based on that situation, we will discuss about not only exciting scientific results with VERA/KaVA/EAVN but also future prospects of Mizusawa VLBI Observatory especially in 2022 and beyond. EAVN will be further developed on the basis of future collaborations with JVN (Japanese VLBI Network), FAST 500-m (China), and TNRT 40-m (Thailand) radio telescopes, leading improvement of sensitivities and observable frequencies; Synergy with Gaia DR2 and SKA has been expected.

- **ALMA Grant Fellow Symposium 2019**

  Date: December 17, 2019

  Venue: NAOJ Lecture Room

  The NAOJ ALMA project will host the "ALMA Grant Fellow Symposium 2019" on December 17, 2019 at the NAOJ Lecture Room in Mitaka. The symposium will host 12 researchers hired through the ALMA Joint Scientific Research Program, and they will be presenting the latest science results related to ALMA. Anybody is welcome to join and hear the talks.

- **2019 ALMA/45m/ASTE Users Meeting**

  Date: December 18 - 19 (Wednesday - Thursday), 2019

  Venue: National Astronomical Observatory of Japan (Mitaka Campus, Subaru building 1F large seminar room)

- **New View of the Universe opened by THz Observation**

  Date: December 21, 2019

  Venue: National Institute of Polar Research

  The terahertz band, which is the new horizon of ground observation, is an undeveloped area and is expected to develop significantly in the future. Currently, site survey and equipment development are underway to open up terahertz astronomy. The purpose of this study group is to discuss what kind of new science can be developed by utilizing the terahertz band, which is the only wavelength region that large terrestrial telescopes have not been able to reach.

- **Molecular gas observations toward the Local Group and the outer Milky Way**

  Date: January 16-17, 2020

Venue: Nagoya University

Research of the formation and evolution of astronomical objects (molecular gas, stars / clusters, galaxies) from the early universe to the present is one of the greatest challenges in astronomy. The outer edge of the galaxy is an optimal target that can cover parameter spaces that cannot be filled by the system alone with high-resolution observations. In particular, observations of low heavy-element content environments are very useful for understanding the formation and evolution of celestial bodies in the early universe. From recent observations of the large Magellan cloud and M33, gas motion on the kpc scale due to galaxy interaction and spiral arm motion may create a molecular cloud filaments width of about 0.1 pc. The possibility of inducing formation is being clarified, and it is rapidly becoming more important to have a bird's-eye view of the entire galaxy with a high spatial dynamic range using multiple devices such as ALMA. Observations of outflows to primordial stars and surveys of hot cores are also being energetically advanced, and it is expected that statistical verification of the physical / chemical properties of massive star formation in low-heavy element environment will progress.

<<<CHANGED TO VIRTUAL MEETING, OCTOBER 14-16, 2020>>>

- **SNR Workshop 2020**

  Date: February 26-27, 2020

  Venue: Nagoya University

  Supernova remnants (SNRs) are the most energetic objects not only in our Galaxy, but also in external galaxies, and have been observed at various wavelengths from radio to gamma-rays. One of the most spectacular features of SNRs is the fast moving expanding shells whose velocity is measured as up to ~10,000 km/s. Recent observations of shells in X-rays as well as radio continuum emission have provided a wealth of information on their physical and kinematical properties. It is also remarkable that the dense interstellar medium interacting with the shocks is likely playing a key role to produce X-rays and gamma-rays as shown by comparisons with CO/HI and dust emission. Theoretical works on acceleration and escape of cosmic rays in SNRs are unveiling details of cosmic-ray acceleration/propagation by magneto-hydro-dynamical numerical simulations, which will be compared with observations. In the present workshop, we invite observers and theorists to stimulate active interaction and exchange of ideas on SNRs.

  <<<CANCELLED>>>

- **6th Riken-NICT THz Workshop & 20th Millimeter-Submillimeter Receiver Workshop**

  Date: Mrch 2-3, 2020

  Venue: Tohoku University

- **Star formation with ALMA 2020: Tracing pre/proto-stellar core evolution in nearby molecular clouds**

  Date: March 5 (Thu) 13:00- 6 (Fri) 17:00, 2020

  Venue: Rinko-shitsu (C5-112), NAOJ Mitaka champus

  Understanding the origin of diversity in star formation, from the initial mass function to the size and structures of protostellar disks, is one of the ultimate goals in star formation studies. Such diversity should be originated from the natal dense cores. Observational studies of such dense cores harboring Class 0/I objects, i.e., protostellar cores, or even cores before protostellar formation, prestellar cores, should provide us with crucial information on the initial condition of star formation. However, previous ALMA observations have not extensively explored such young objects but mainly targeted well-known protostellar and T-Tauri sources, which were discovered before the ALMA era using, e.g., other wavelength telescopes and low-resolution mm/sub-mm single-dishes. ALMA has the potential to improve this situation; for example, recent ALMA surveys, including the ACA (Atacama Compact Array) stand-alone mode, are trying to find new exciting objects without any bright infrared sources, such as candidates of the first hydrostatic core. Although single-dish telescope and other wavelength data still play an essential role as the first atlas, the era that ALMA itself can be one of the survey telescopes is likely upcoming. In this workshop, we will discuss the observational strategies on how to select the target objects using ALMA and to optimize the subsequent follow-up observations to reveal the initial condition of star formation, also by combining with the related theoretical simulation.

  <<<CANCELLED>>>

- The ALMA 2030 Vision: Design considerations for Digitizers, Backend and Data Transmission System

  Date: March 11-13, 2020

  Venue: NAOJ, Mitaka, Japan

  The ALMA Development Roadmap has identified the multiplication of the IF bandwidth of ALMA (at least by a factor 2) as one of the main priorities for ALMA upgrades in the 2020s. This increase of the instantaneous bandwidth will be realized with the coordinated upgrade of receivers in the Front End, the correlators, and last but not least, all electronics between them: digitizers, backend and Data Transmission System (DTS). This meeting aims to bring together experts on the ALMA system and digitizer, backend and data transmission system technologies, from within ALMA and from the community.

- **ALMA Lensing Cluster Survey Workshop**

  Date: March 13 - 14, 2020

Venue: Institute of Astronomy (IoA), University of Tokyo

ALMA lensing cluster survey (ALCS) is one of the cycle-6 large programs to observe high magnification regions of 33 lensing clusters spending 95 hrs. The ALCS covers 88 arcmin^2 in total, to a depth of ~60 uJy (1.2mm, 1 sigma), achieved by using a 15-GHz-wide spectral scan, to enlarge the survey volume of line-emitting galaxies. The sample comes from the best-studied massive clusters also imaged in HST programs, i.e., CLASH, HFF, and RELICS. The goals of the workshop are (1) to share the latest outcomes from ALCS and ALMA observations of blank fields, clusters/proto-clusters, and high-redshift lensed galaxies, and (2) to develop next ALMA (large) proposals and related multi-wavelengths follow-up plans using e.g., JWST. You are encouraged to join if you are interested in any of the topics below.

<<<CANCELLED>>>

- **General Meeting of the Japan Radio Astronomy Forum**

  Date: March 17, 2020

  Remote Meeting

- **Dynamics and physics of outflows in protostellar disks and Active Galactic Nuclei II**

  Date: March 23-25, 2020

  Loation: Kagoshima University

- **Japan Radio Astronomy Forum Symposium 2019: Radio astronomy that opens up with extreme performance**

  Date: March 23-25, 2020

  Venue: NAOJ, Mitaka

  The Japan Radio Astronomy Forum is an organization that represents the Japanese radio astronomy community. As part of its activities, a symposium is held every year for the purpose of sharing the science and observation technology of radio astronomy and discussing future plans. At the symposiums of the last two years, we have held multifaceted discussions over two days, focusing on technological development that will support future radio astronomy and future science in collaboration with other wavelengths and fields. Based on these results, this year, we will focus on various "extreme performances" regardless of projects and existing telescopes, and explore science that can only be done by radio astronomy and new methods to realize it in the entire community.

  <<<CANCELLED>>>

- **IAU Symposium 360: Astronomical Polarimetry 2020 -- New Era of Multi-Wavelength**

Polarimetry

Date: March 23-27, 2020

Venue: Hiroshima, Japan

Astronomical Polarimetry 2020 (Astropol 2020) is the next in a series of international conferences. The aim of this series of conferences is to bring researchers interested in astronomical polarimetry together to share and discuss recent results and advances in technical and scientific aspects in all relevant astronomical fields. This will be the first time that an Astropol symposium will take place in Asia.

<<<POSTPONED TO 2021 March 22-26>>>

- **Workshop on Carbon Observations - Toward understanding how to use Carbon -**

Date: March 25-26, 2020

Venue: The University of Tokyo

Atomic carbon observations have been started by using the Mt.Fuji Submillimeter-wave telescope in Japan. They have continuously been carried out by using ASTE and are now progressing toward various targets by using ALMA. In this workshop, we will share the recent results of carbon observations in galaxies, interstellar medium and star/planet formation, and also share the related theoretical studies. In addition, we would like to discuss a strategy for the usage of ALMA Band 8 and 10.

<<<CANCELLED>>>

- **ALMA Cycle 8 Proposal Preparation Workshop on March 26**

Date: Thursday, March 26, 2020, 11: 00-17: 00 JST

Place: ALMA Building 1F Room102 at National Astronomical Observatory of Japan, Mitaka Campus

A Call for Proposals on ALMA Cycle 8 (Main Call) will be issued on March 17 and the deadline for proposal submission will be on April 15, 2020. East Asia ALMA Regional Center (EA-ARC) will hold a Proposal Preparation Workshop for the ALMA Cycle 8 Main Call at the Mitaka Campus of National Astronomical Observatory of Japan on March 26. The morning session consists of explanatory talks such as on the schedule, new capabilities, Observing Tool for proposal preparation and submission for the Cycle 8 Main Call. The afternoon session focuses on the proposal writing with lectures on the tips to write competitive proposals based on the current writing style in EA. In addition, participants bring their own draft proposals and work on improving them with experienced tutors and an English editor in the hands-on session. We would like to recommend participants to roughly finish up the draft proposals before joining this workshop.

<<<SCALE DOWN, REMOTE MEETING>>>

- **ngVLA Science Working Group Kick-off Meeting**
  Date: March 31, 2020
  Remote Meeting

- **IVS NICT Technology Development Center Symposium**
  Date: April 24-25, 2020
  Venue: Kashima Space Technology Center of NICT

  Since IVS (International VLBI Service for Geodesy and Astrometry) was established, NCIT (former name CRL: Communications Research Laboratory) has been designated as one of the technology development centers (TDCs) of IVS. As one of the activities of TDC, we have regularly organized NICT-TDC symposium. Purpose of the symposium is exchanging information on activities and status on research & developments of VLBI technology, application, and radio observing techniques among individual researchers and institutes. In this time, meeting is going to be held as the international symposium with inviting IVS chairman Axel Nothnagel, Network station Coordinator Ed Himwich, Weimin Zheng and Fengchun Shu of Shanghai Astronomical Observatory, and Kosuke Heki of Hokkaido Univ. We encourage contribution not limited only VLBI technology but also observational results on geodesy and radio astronomy, status updates of radio telescope, observing system, and data processing system.

  Closing Ceremony of Kashima 34m Antenna

  Kashima 34m antenna was damaged by typhoon No.15(Faxai) on 9th Sep. 2019, and main reflector panels are removed in the same month to avoid extension of damage to surroundings by next coming typhoons. Dismantle of the Kashima 34m antenna was decided to be performed in 2020 not only by this damage, but also due to degradation of the multiple components of the antenna. We will have closing ceremony of Kashima 34m station in the afternoon of 25th April. Please feel free to contact LOC for inquiry on this ceremony.

  <<<CANCELLED>>>

- **ngVLA Sub-working Group for Planetary Formation and Proto-planetary Disk, 1st Meeting**
  Date: May 25, 2020
  Remote Meeting

- **New Developments of Planetary Sciences with ALMA in JpGU-AGU Joint Meeting 2020**
  Date: May 27, 2020
  Venue: Makuhari Messe in Chiba

We would like to invite contributed talks for the session of "New Developments of Planetary Sciences with ALMA" in JpGU-AGU Joint Meeting 2020 held on 27 May, 2020, at Makuhari Messe in Chiba. It has been about 5 years since the series of concentric rings has been discovered in the protoplanetary disk of HL Tau, and we will review the current understanding of planetary-system formation in our session. Recent results with ALMA on the Sun, solar-system planets, and extra-solar planetary systems will be presented and discussed among researchers in planetary science and astronomy.

- **ngVLA Sub-working Group for Black Hole Formation and Evolution, Time-domain/Multi-messenger Astronomy**
  Date: May 28, 2020
  Remote Meeting

- **ngVLA Sub-working Group for Galaxy Evolution in the Cosmic History, 1st Meeting**
  Date: June 2, 2020
  Remote Meeting

- **ngVLA Sub-working Group for Star Formation and Astro-chemistry at Multiple Layer**
  Date: June 11, 2020
  Remote Meeting

- **ngVLA Sub-working Group for Planetary Formation and Proto-planetary Disk**
  Date: August 12, 2020
  Remote Meeting

- **Technology for Next Generation Space-Earth Environmental Radio Science, a workshop by ISEE**
  Date: August Wednesday 26 and Thursday 27, 2020
  Venue: Full remote conference using the Zoom system

  Low frequency radio observations are used as one of the main research tools in space-earth environmental sciences and astronomy. Low-frequency radio observation devices are able to effectively obtain a large collecting area and a wide field of view by forming an array with many antennas. Indeed, there are such large radio telescopes and radars for space-earth environmental sciences. In radio astronomy, transient science attracts much attention due to the discovery of fast radio bursts, along with developments of new generation receivers such as ASKAP's PAF and Parkes' UWL. The construction of the world's largest low-frequency radio interferometer, SKA,

will start in 2021. Phased arrays and wideband receivers are very common and applicable technologies that benefit various research fields such as space science, geophysics, astronomy, meteorology, and so on. Meanwhile, such technologies have been developed in each field due to a historical background. Moreover, new problems such as radio frequency interference (RFI) and high data rate signal processing emerged along with the improvement of receivers. Therefore, in this conference, we invite experts of developing low-frequency radio instruments across research fields. We aim to provide exchange of the latest development information, clarify common technical elements and problems, and conduct interdisciplinary joint research and collaboration.

- **ngVLA Sub-working Group for Star Formation and Astro-chemistry at Multiple Layer**
  Date: September 1, 2020
  Remote Meeting

- **ngVLA Sub-working Group for Testing Gravitational Theories by Galactic Center Pulsars**
  Date: September 3, 2020
  Remote Meeting

- **ngVLA Sub-working Group for Black Hole Formation and Evolution, Time-domain/Multi-messenger Astronomy**
  Date: September 3, 2020
  Remote Meeting

- **General Meeting of the Japan Radio Astronomy Forum**
  Date: September 10, 2020
  Remote Meeting