

## Activity Report of Commission J August 2014 to December 2014

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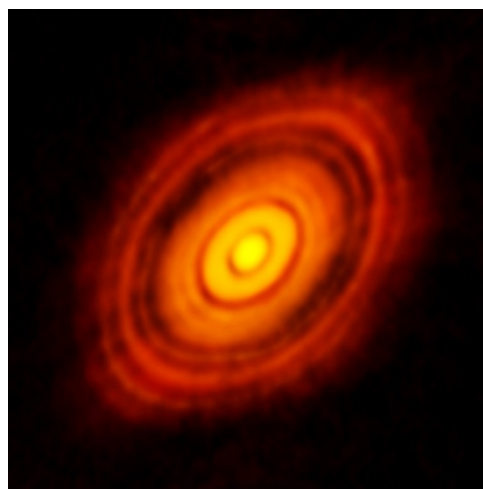
### ALMA project

- Latest scientific topics:

*November 5, 2014 Revolutionary ALMA Image Reveals Planetary Genesis*

A new image from ALMA, the Atacama Large Millimeter/submillimeter Array, reveals extraordinarily fine detail that has never been seen before in the planet-forming disc around a young star. ALMA's new high-resolution capabilities were achieved by spacing the antennas up to 15 kilometers apart. This new result represents an enormous step forward in the understanding of how protoplanetary discs develop and how planets form.

ALMA has obtained its most detailed image yet showing the structure of the disc around HL Tau, a million-year-old Sun-like star located approximately 450 light-years from Earth in the constellation of Taurus. The image exceeds all expectations and reveals a series of concentric and bright rings, separated by gaps (from ALMA website).



### Activities of meetings

- **Workshop on the formation of high-mass stars: from the Galaxy to the nearby galaxies in the ALMA era**

Date: 18-19 September, 2014

Place: Ibaraki University

High-mass star forming region is the place which forms the matter and structure of our galaxy. However studies on this regions have been limited relative to that of low and mid-mass star formation due to the low resolution of present observation systems. It is important to understand the high-mass star formation to understand the star formation in nearby galaxies. However the discussion on the connection between the star formation in the Galaxy and nearby galaxies has been missed. Now it became possible to observe such regions at high resolution using ALMA in recent years. The combination with VLBI observations will let us discuss the dynamics of gas in the circumference of young stars in detail. The high-mass star formation

region in relatively distant place could be observed now at high resolution. And the connecting study of high-mass star formation in our Galaxy and nearby galaxy became possible.

Since a workshop "high-mass star formation and ALMA" held in 2009, high-mass star formation has not been considered actively in Japan. We would like to grasp the status of recent study of high-mass star formation and star formation in nearby galaxy by this workshop and also pay attention to the ALMA data which becomes open in particular.

- **JCMT Science workshop**

Date: 1-2 September, 2014

Place: National Astronomical Observatory of Japan

James Clerk Maxwell Telescope (JCMT) is a sub-millimeter wave telescope of 15 meter diameter. It has made observations on the top of MAUNAKEA in Hawaii since 1987. JCMT has been managed by UK and Canada up to now, but it is decided to suspend practical use in September, 2014. After that the telescope will be gifted to Hawaii University. JCMT is an excellent equipment, so Hawaii University would like to continue using JCMT. The East Asia core observatory association (EACOA) by which Japan, China, Korea and Taiwan cooperated is going to take practical use of JCMT. We would like to discuss what kind of study to do using JCMT at this workshop.

- **Mizusawa VLBI Observatory User's Meeting**

Date: 24-15 September, 2014

Place: National Astronomical Observatory of Japan

VERA project is promoted by Mizusawa VLBI observatory. Maser sources are observed by VERA with phase-referencing technique to determine the precise location so that to make three-dimensional map of the Galaxy and to study the Galactic dynamics. Common use of combined VLBI observation network KaVA of Japan and the Korea has started from year 2013. A users meeting is held for the purpose of getting maximum excellent results in VERA. We would like to discuss the current state of the observation system, the former observation outcome and the present problem. We also welcome the proposal and discussions on the future of VLBI astronomy.

- **Japan SKA science conference 2014 "Cosmic Magnetic Field"**

Date: 13-14 November, 2014

Place: National Astronomical Observatory of Japan

Preparations of Square Kilometre Array (SKA) which is the only international large project at meter-wave and centimeter-wave is getting into full swing increasingly. It is expected by this equipment that origin and evolution of magnetic fields in the Sun, interstellar matter, galaxy, cluster of galaxies and cosmology. So in this workshop, we would like to call researchers who has interest on these field. Inviting the researcher who takes the leading role in worldwide on

various study fields, we aim to overlook the future magnetic field study. Possibilities of joint research and equipment development will be considered by discussions from various viewpoint on SKA.

- **ALMA workshop for high-z and nearby galaxies**

Date: 20-21 October, 2014

Place: National Astronomical Observatory of Japan

About 3 years have passed after scientific observation of ALMA was begun. Data release of Cycle 2 also started, and it is expected from now on that results come out one after another. It was becoming clear that at the millimeter/sub-millimeter wave which are observation bands in ALMA, and at other observing bands, high resolution data of distribution and velocity structure of stars, gas and dust of nearby galaxy has been available. Moreover one can see the internal structure of distant galaxies. However, understanding on relation with the distribution of form evolution, chemical evolution and star formation, or physical interpretation of these objects are still poor. The next call for proposal (Cycle 3) of ALMA is scheduled for spring in 2015. Based on the situation of Cycle 0-2, at this workshop, the strategy pointed on and after Cycle 3 is discussed.

- **Workshop on Interstellar Matter 2014**

Date: 16-18 October, 2014

Place: Hokkaido University

The universe has provided many new problems to the wide field of the science as "laboratory" of the extreme environment. Chemical and physical viewpoints are now recognized to be necessary for study of universe. This workshop is planned for researchers, graduate students and students who have the interest in space chemistry and materials by the wide meaning as a chance to share the respective study results and problem consciousness. We would like to focus on the development of experimental and theoretical studies on the material level and an atomic molecular level, and look for the connection with present's or the future exploration of universe in particular. Participants of wide fields of astronomy, planetary science, chemistry and physics are welcomed.

- **NAOJ will hold 2014 ALMA/ASTE/Mopra Users Meeting.**

Date: October, 27 - 29, 2014

Location: National Astronomical Observatory of Japan

In this meeting, we will have presentations and discussions of latest ALMA/ASTE/Mopra results. We will introduce the current and anticipated status of ALMA, the observation procedure, data analysis / reduction processes, and next proposals (Cycle 3 and beyond), and also discuss the operations of ASTE/Mopra. We will also have a tutorial session to learn about the usage of CASA with real ALMA data.

● **15th Workshop on Submillimeter-Wave Receiver Technologies in Eastern Asia**

Date: 15-18 December, 2014

Place: AQUAVILLA ISE-SHIMA

The object of this workshop to discuss the new topics on the technology of high-sensitivity receivers such as heterodyne receiver for millimeter-tera Hertz region, superconductive photon detector, low-noise amplifier, oscillator and refrigeration machine.

So far, many of receiver related technology discussed in this workshop have been installed into various telescopes, and a lot of observation outcomes were being obtained. For example the band 10 receiver of ALMA was developed under collaboration of Japan China and Taiwan. Recently, the observing frequency is reaching to tera Hertz region with the aid of development of a device fabrication method and development of new material.

Radio astronomers in East Asia and South Asia of various countries participate in this year's workshop. We would like to strengthen the international competitiveness of Asia by this and to spread a basic technology. The next new topics are also treated.

- (1) THz detector (SIS, HEB and superconductive photon detector/camera)
- (2) THz local oscillator
- (3) Super-low noise IF amplifier
- (4) Possibility of the multibeam receiver
- (5) Possibility of the (multi-) octave receiver
- (6) The current state and the future of large scale and high-speed spectrometer
- (7) ALMA joint session (the current state, the future and receiver future plan)
- (8) Radio astronomy in Asian countries, the current state of the related technical development and the future

We will have two special sessions. Several timely invitation lectures related to a next generation receiver are also scheduled.