Session:	**[B2C-2] S2 : Interstellar Matter, Star Formation and the Milky Way**
Date:	August 19, 2014 (Tuesday)
Time:	16:00~17:25
Room:	Room B (Room 103)
Chair:	Bon-Chul Koo (Seoul National University)

[B2C-2-1] 16:00~16:20

[Invited] A Global View of Star Formation in the Milky Way

Karl M. Menten (Max-Planck-Institute for Radio Astronomy, Germany)

Stars with more than about ten solar masses dominate galactic ecosystems. Understanding the circumstances of their formation is one of the great challenges of modern astronomy. The spectacular HII regions they excite delineate the spiral arms of galaxies such as our own when seen face on – making it clear that star formation and Galactic structure are intimately related. We report on an ambitious program that consists of a powerful multi-pronged approach to study star formation over the whole Milky Way. Using VLBI observations of maser sources associated with young protostars, we are measuring distances by trigonometric parallax to most of the dominant star forming regions in the Galaxy, which will reveal its spiral structure and yield improved values of the rotation parameters and are crucial for determinations of luminosities and masses. Submillimeter emission from dust mapped by ATLASGAL, the APEX Telescope Large Area Survey of the Galaxy delivers the locations of deeply embedded protostars and protoclusters and their masses. In a comprehensive follow-up program we are studying the state of excitation, chemistry and kinematics of their gaseous content. At longer, radio wavelengths, in a very sensitive survey with the newly expanded Karl G. Jansky Very Large Array (JVLA) we find masers and hyper- and ultracompact HII regions, pinpointing the very centers of the earliest star-forming activity. We are also studying the infrared emission from more developed massive star clusters, deriving distances with the classic spectro-photometric method for the first time adapted to an extensive IR dataset and properly calibrated with trigonometric parallaxes. Our synoptic approach is using the world's premier observatories to create a coherent, unique dataset with true legacy value for a global perspective on star formation in our Galaxy.

[B2C-2-2] 16:20~16:40

[Invited] New Frontiers of Magnetized Turbulence in the Multiphase Interstellar Medium

Blakesley Burkhart (University of Wisconsin Madison, USA) and Alex Lazarian

The current paradigm of the ISM is that it is a multiphase turbulent environment, with turbulence affecting many important processes. For the ISM this includes star formation, cosmic ray acceleration, and the evolution of structure in the diffuse ISM. This makes it important to study interstellar turbulence using the strengths of numerical studies combined with observational studies. I shall discuss progress that has been made in the development of new techniques for comparing observational data with numerical MHD simulations in the molecular medium, in neutral gas as traced by HI, and warm ionized gas as traced by synchrotron polarization.

[B2C-2-3] 16:40~16:55

Cosmic Fountains Reveal the Birth and Death of Stars

Lisa Harvey-Smith (CSIRO Astronomy & Space Science, Australia), Jimi Green, Steven Longmore, Cormac Purcell, and Andrew Walsh

Water masers are bright, narrow-band sources of non-thermalradio emission that are generated in shocked molecular gas. They arecommonly found in regions surrounding young massive star formation andpost-AGB

stars with collimated outflows that are transitioning intoplanetary nebulae. As narrow spectral line sources, masers are extremelyuseful for measuring the structure and motion of gas in these regions.
We have used multi-frequency astronomical data to study ten Galactic watermasers that have an extremely high (200-400 km/s) spread in radialvelocity, indicating the presence very high-velocity outflows. Thesemasers were selected from the HOPS survey using theMopra radio telescope and re-observed at higher resolution using theAustralia Telescope Compact Array.
In nine of the ten cases, the ATCA data resolved the outflow andmulti-frequency dataenabled us to identify the state of stellar evolution of the region.Seven of the sources were identified as young stellar objects; two aspre-planetary nebulae and one remains unidentified. In this talk, I will present imagesof these fascinating sources, discuss the impact of this study on ourunderstanding of masers as signposts of stellar evolution and suggestfuture work.

[B2C-2-4] **16:55~17:10**

Inflows in Massive Star Formation Regions

Yuefang Wu (Peking University, China), and Tie Liu

How high-mass star form remains unclear currently. Calculation shows that the radiation pressure of a forming star can halt spherical infall, preventing its further growth when it reaches 8 $M_\odot$. Two major theoretical models on the further growth of such stars were proposed. One model suggests the mergence of less massive stellar objects, and the other is still through accretion but with the help of disk or outflow. Inflow motions are the key evidence of how forming stars further grow. Recent development in technology has boosted the search of inflow motion. A number of high-mass collapse candidates were obtained with single dish observations, mostly shown in “blue profile”. Physical parameters and correlations between inflow velocity and source masses were obtained and analyzed. The infalling signatures seem more common in regions with developed radiation than in younger cores, which opposes the theoretical prediction and is also very different from that of low – mass star formation. Interferometer studies so far confirm such tendency with more obvious “blue profile” or inverse P Cygni profile. Results seem to favor the accretion model. However, the direct evidence for the collapse processes is in monolithic or in competitive deeds to be searched. Future work is also needed to distinguish among infall, rotation and outflow regions, and to resolve the core peak and the young stellar objects.

[B2C-2-5] **17:10~17:25**

ALMA Results of the Pseudodisk, Rotating Disk, and Jet in the Very Young Protostellar System HH 212

Chin-Fei Lee (Academia Sinica Institute of Astronomy and Astrophysics, Taiwan), Naomi Hirano, Qizhou Zhang, Hsien Shang, Paul T. P. Ho, and Ruben Krasnopolsky

HH 212 is a nearby (400 pc) Class 0 protostellar system showing several components that can be compared with theoretical models of core collapse. We have mapped it in the 350 GHz continuum and HCO+ J = 4–3 emission with ALMA at up to ～ 0.4” resolution. A flattened envelope and a compact disk are seen in the continuum around the central source, as seen before. The HCO+ kinematics shows that the flattened envelope is infalling with small rotation (i.e., spiraling) into the central source, and thus can be identified as a pseudodisk in the models of magnetized core collapse. Also, the HCO+ kinematics shows that the disk is rotating and can be rotationally supported. In addition, to account for the missing HCO+ emission at low-redshifted velocity, an extended infalling envelope is required, with its material flowing roughly parallel to the jet axis toward the pseudodisk. This is expected if it is magnetized with an hourglass B-field morphology. We have modeled the continuum and HCO+ emission of the flattened envelope and disk simultaneously. We find that a jump in density is required across the interface between the pseudodisk and the disk. A jet is seen in HCO+ extending out to ～500 AU away from the central source, with the peaks upstream of those seen before in SiO. The broad velocity range and high HCO+ abundance indicate that the HCO+ emission traces internal shocks in the jet. In summary, our ALMA results show that HH 212 is a really textbook case for demonstrating the processes of in the early phase of star formation.