여 왔고, 최근 2017년 2월 13-14일에는 한국천문연구원에서 <The 5th We Love Galaxies Workshop: A Dialogue between Present and Future>을 개최하였습니다. 본 발표에서는 지난 5번의 We Love Galaxies Workshop들을 되돌아보며, 그 성과와 한계에 대한 이야기를 하고자 합니다. 또한, We Love Galaxies의 앞으로의 계획과 함께 대학원생이 중심이 되는 워크숍이 지속되어야 하는 이유에 대하여 말씀드리고자 합니다.

성간물질/우리은하

[구 IM-01] TRAO Multi-beam Legacy Survey of Nearby Filamentary Molecular Clouds : Progress Report

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To dynamically and chemically understand how filaments, dense cores, and stars form under different environments, we are conducting a systematic mapping survey of nearby molecular clouds using the TRAO 14 m telescope with high (N_2H^+ 1-0, HCO^+ 1-0, SO 32-21, and NH_2D v=1-0) and low (^{13}CO 1-0, $C^{18}O$ 1-0) density tracers. The goals of this survey are to obtain the velocity distribution of low dense filaments and their dense cores for the study of their origin of the formation, to understand whether the dense cores form from any radial accretion or inward motions toward dense cores from their surrounding filaments, and to study the chemical differentiation of the filaments and the dense cores. Until Feb. 2017, the real OTF observation time is 460 hours. We have almost completed mapping observation with four molecular lines (^{13}CO 1-0, $C^{18}O$ 1-0, N_2H^+ 1-0, and HCO^+ 1-0) on the five regions of molecular clouds (L1251 of Cepheus, Perseus west, Polaris south, BISTRO region of Serpense, California, and Orion B). The maps of a total area of 7.38 deg^2 for both ^{13}CO and $C^{18}O$ lines and 2.19 deg^2 for both N_2H^+ and HCO^+ lines were obtained. All OTF data were regridded to a cell size of 22 by 22 arcseconds. The ^{13}CO and $C^{18}O$ data show the RMS noise level of about 0.22 K and N_2H^+ and HCO^+ data show about 0.14 K at the velocity resolution of 0.06 km/s. Additional observations will be made on some regions that have not reached the noise level for analysis. We are refining the process for a massive amount of data and the data reduction and analysis are underway. This presentation introduces the overall progress from observations to data processing and the initial analysis results to date.

[구 IM-02] Multiple Molecular Line Analysis in the Planck Cold Clumps with KVN Follow-up Observations.

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Stars form in dense core within the molecular clouds. The prestellar cores provide information of the physical characteristics at the very early stages of star formation. The low dust temperature (<14K) of Planck cold clumps/cores (PGCCs) make them likely to be prestellar objects or at the very initial stage of protostellar collapse. We have been conducting the legacy surveys of Planck cold clumps with the JCMT, the TRAO 14-m and many other telescopes. We aim to study of the initial conditions of star formation and chemical evolutions of the cores in the different environments. From JCMT SCUBA-2 850 μm survey (SCOPE), we have already identified hundreds of dense cores, which may be at the earliest phase of star formation. Therefore in order to explore the chemical evolution of these dense cores, we used KVN telescopes in order to observe 75 well selected SCUBA-2 cores in many molecules as the follow-up project of KVN Pilot Observation of SCUBA-2. These observations will help advance our understanding of the propoerties of these SCUBA-2 cores in PGCCs.

[구 IM-03] Discovery of a Cloud Collision with the OMC-1

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Utilizing both the existing observational data for Orion A and the TRAO ^{13}CO, ^{12}CO data for 1°×1° region centered on M42 collected in 2012, we found a clear piece of evidence for a collision of a cloud with the OMC-1. This cloud has a shape like a long cylinder of ~0.1 pc × 2 pc in size, and has a well

developed train of clumps of about a few solar masses, and is situated in the dark dust complex between M42 and M43. The cloud's motion is analysed to be moving at about 2.6 km s^{-1}, and is calculated to transverse the Orion Nebula ~2 pc above from the nebula center, toward the direction of about 60° to the line of sight. This cloud had undergone a tidal splitting about a million years ago and had formed a very thin and long cylindrical core well before being engaged in the collision. General implications of this phenomenon are discussed in relation to star formation mechanisms in the GMC.

[구 IM-04] Turbulent Properties in Two Molecular Clouds: Orion A and ρ Ophiuchus

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Molecular clouds are the sites of stellar birth, and conditions within the clouds control the mode and tempo of star formation. In particular, turbulence largely determines the density and velocity fields, and can affect the gas kinetic temperature as it decays via shocks. However, despite its central role in star formation and many years of study, the properties of turbulence remain poorly understood. As a part of the TRAO key science program, "Mapping turbulent properties of star-forming molecular clouds down to the sonic scale (PI: Jeong-Eun Lee)", we mapped the northern region of the Orion A molecular cloud and the L1688 region of the ρ Ophiuchus molecular cloud in 2 sets of lines (13CO 1-0/C18O 1-0 and HCN 1-0/and HCO+ 1-0) using the Taeduk Radio Astronomy Observatory (TRAO) 14-m telescope. We analyze these maps using a python package 'Turbustat', a toolkit which contains 16 different turbulent statistics. We will present the preliminary results of our TRAO observations and various turbulence statistical analyses.

[구 IM-05] Escape of Lyβfrom Hot and Optically Thick Media

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Symbiotic stars and quasars show strong far UV resonance doublets including O VI 1032 and 1038, which are known to be major coolants of astrophysical plasma with high temperature $T > 10^5$ K. We investigate the transfer of Hα and Lyβ in an emission nebula of temperature $T \sim 10^5$, where n=2 population is significant. Line photons of Hα and Lyβ are transferred in the medium through spatial and frequency diffusion altering their identity according to the branching ratios. We adopt a Monte Carlo technique to describe the transfer of Hα and Lyβ in an emission nebula with a uniform density and a simple geometrical figure. We find that the temperature of the emission nebula is the major controlling parameter to produce a nonnegligible flux of Lyβ. In particular, when T exceeds 10^5 K the number flux ratio may reach ~ 25% with line center optical depth of a few. We discuss the formation of broad Hα wings from Raman scattering of Lyβ emergent from a hot emission nebula.

[구 IM-06] Early Dynamical Evolution of Star Clusters Near the Galactic Centre

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현재 관측되는 대부분의 성단들은 구형의 구조를 보이는 반면, 별탄생 지역은 구형의 구조와는 다른 프랙털(fractal) 구조를 보이고 있다. 본 연구에서는 초기에 프랙털 구조를 가지는 성단이 우리 은하 중심부근에서 어떻게 진화하는지 N-body 시뮬레이션을 이용해 연구하였다. 그 결과, 프랙털 구조의 성단이 우리 은하 중심부근의 강력한 조석력장 내에서 살아남기 위해서는 초기 밀도가 높아야 한다는 것을 발견하였다. 성단의 초기 밀도가 높기 때문에 프랙털 구조의 성단은 빠른 역학적 진화를 보이며 구형의 성단으로 진화한다. 플러머 (Plummer) 구조의 성단도 프랙털 구조의 성단과 같이 초기 밀도가 높아야 살아남지만 프랙털 구조보다는 역학적인 진화가 느렸다. 이러한 결과들은 Arches 성단처럼 우리 은하 중심부근에서 관측되는 성단들의 형성과 진화에 제약조건을 줄 수 있을 것으로 예상된다.

천문관측기술

[구 AT-01] New Radome Installation for the