environments. For example, NcE galaxies are formed by tidal stripping by massive galaxies as suggested by previous studies, but DcE galaxies could be linked with high-redshift spheroids (e.g. red nuggets) which have not evolved into present-day elliptical galaxies because of the environmental influences.

[초 GC-10] Long lived spiral structures in galaxies

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Spiral structure in disk galaxies is modeled with ncollisionless N-body simulations including live disks, halos, and bulges with a range of masses. Two of these simulations make long-lasting and strong two-arm spiral wave modes that last for about 5 Gyr with constant pattern speed. These two had a light stellar disk and the largest values of the Toomre Q parameter in the inner region at the time the spirals formed, suggesting the presence of a Q-barrier to wave propagation resulting from the bulge. The relative bulge mass in these cases is about 10%. Models with weak two-arm spirals had pattern speeds that followed the radial dependence of the Inner Lindblad Resonance. In addition to these, we also report a few more cases where two-armed spirals are developed and are maintained for a several rotation time scales.

[구 GC-11] Gas structures and star formation in the central region of barred-spiral galaxies in self-consistent 3D simulations

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The central regions of barred-spiral galaxies contain interesting gaseous structures such as dust lanes and nuclear rings with intense star formation. While our previous studies were useful in understanding the formation of these structures star formation history, they were limited to 2D isothermal galaxies in which the stellar disk and halo are modeled by fixed gravitational potentials . To study the effects of bar growth as well as the vertical dimension, we use the mesh-free hydrodynamic code named GIZMO and run 3D simulations by treating the stellar disk and halo as being live. We find that the new 3D models form the gaseous features similarly to the previous 2D models, although the detailed formation processes are quite different. For example, a ring has a large radius when it first forms and shrinks over time in the previous 2D models,. In the 3D live-potential models, however, a ring forms small and grows in size with time. We present the results of the new simulations and discuss them in comparison with the previous 2D results.

[구 GC-12] Cosmic Evolution of Disk Galaxies seen through Bars

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The presence of a bar in disk galaxies indicates that galaxies reached their dynamical maturity,

and secular evolution has started to play key roles in the evolution of disk galaxies. Numerical simulations predicted that as a barred galaxy evolves, the bar becomes longer by capturing its immediate neighbor disk stars. We test the hypothesis by exploring bar lengths and measuring the light deficit around the bar at various redshift. Supplementing already classified barred galaxies in later type disk galaxies (T≧2, Sheth et al. 2008), we classify barred galaxies among earlier type disk galaxies (T<2) up to z~0.8 using F814W images from the Cosmic Evolution Survey (COSMOS). We estimate the length of bars analytically for ~400 galaxies, and find that there is a slight decrease in bar length with redshift. We also find that longer bars show more prominent light deficit around the bar and this trend is stronger for nearby galaxies. Our results are consistent with the predictions from numerical simulations, and imply that the bar induced secular evolution is already in place since z~0.8.

[구 GC-13] To Be or Not To Be: "We Love Galaxies" Workshop

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"We Love Galaxies"는 외부은하를 연구하는 국내 대학원생들을 위해 마련된 학술 교류의 장입니다. 2014년 여름에 첫 워크숍을 개최한 이래로 꾸준히 워크숍을 개최하

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