although the moment of the outburst was not caught. The embedded protostar IRAS 16316-1540 observed with the Immersion Grating Infrared Spectrograph (IGRINS, R = △λ/λ～45000) shows the broad absorption features in atomic and CO transitions, as seen in FU Orionis objects (FUors), indicative of an outburst event. We examine whether the spectra of IRAS 16316-1540 arise from the rotating inner hot gaseous disk. Using the IGRINS spectral library, we show that the line profiles of IRAS 16316-1540 are more consistent with an M1.5 V template spectrum convolved with a disk rotation profile than the protostellar photosphere absorption features with a high stellar rotation velocity. We also note that the absorption features deviated from the expected line profile of the accretion disk model can be explained by a turbulence motion generated in the disk atmosphere. From previous observations that show the complex environment and the misaligned outflow axes in IRAS 16316-1540, we suggest that an impact of infalling clumpy envelope material against the disk induces the disk precession, causing the accretion burst from the inner disk to the protostar.

[구 IM-06] The JCMT Transient Survey: Examination of Periodic Variability in nearby Star-forming Regions

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We perform the Lomb-Scargle Periodogram analysis to protostars identified by the JCMT Transient Survey, which monitors 8 nearby star forming regions. The observations have been done monthly for over 3 years using SCUBA-2 (the Submillimetre Common User Bolometer Array 2) in two wavelengths, 450 and 850 μm. Under the threshold of 1% False Alarm Probability, we found 16 variable sources including EC53, which is the first variable protostar detected by the JCMT Transient Survey. Most of the variable sources are cataloged as protostars (classified via the Spitzer data, Megeath et al. 2012; Dunham et al. 2015), but SerpS-MM19, which has a clear 1-year period, is a candidate of a first hydrostatic core (Maury et al. 2011; Young et al. 2018).

[구 IM-07] Removing Large-scale Variations in Regularly and Irregularly Spaced Data

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In many astrophysical systems, smooth large-scale variations coexist with small-scale fluctuations. For example, a large-scale velocity or density gradient can exist in molecular clouds that have small-scale fluctuations by turbulence. In redshifted 21cm observations, we also have two types of signals - the Galactic foreground emissions that change smoothly and the redshifted 21cm signals that fluctuate fast in frequency space. In many cases, the large-scale variations make it difficult to extract information on small-scale fluctuations. We propose a simple technique to remove smooth large-scale variations. Our technique relies on multi-point structure functions and can obtain the magnitudes of small-scale fluctuations. It can also be used to design filters that can remove large-scale variations and retrieve small-scale data. We discuss how to apply our technique to irregularly spaced data, such as rotation measure observations toward extragalactic radio point sources.

[구 IM-08] The distribution of magnetic field strength in Orion A region

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Magnetic fields play an important role in supporting molecular clouds against gravitational collapse. The measured magnetic field strengths in molecular clods enable us to see the effect of magnetic fields in star-forming regions. People have used the Chandrasekhar and Fermi (CF) method to estimate magnetic field strength from observational quantities of molecular cloud density, turbulent velocity and polarization angle dispersion. However, previous studies obtained just one magnetic field strength over the quite large region of a molecular cloud by using the CF method. We here suggest a way to estimate magnetic field strength distribution in Orion A region. We used 450 and 850-micron polarization data of James Clerk Maxwell Telescope (JCMT). Magnetic field strengths were estimated in two wavelengths with 4 pixel resolutions of 16, 20, 24 and 28″. Through statistical analysis, we proved the difference of magnetic field strengths between two wavelengths were caused by the difference of their beam sizes. Additionally, we calculated the radii of curvature of polarization segments to

select a best pixel resolution for estimating the magnetic field distribution. The pixel resolution should be larger than a radius of curvature. We selected that 20 or 24″ pixel resolutions are good choices towards Orion A region.

[구 IM-09] Effect of turbulence driving and sonic Mach number on Davis-Chandrasekhar-Fermi method

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Davis-Chandrasekhar-Fermi (DCF) method is a tool that is widely used to obtain the strength of the mean magnetic field projected on the plane of the sky. When there are independent eddies along the line of sight, the variation of polarization angle will decrease by the averaging effect. Therefore, the measured strength of the magnetic field can be overestimated. Cho & Yoo (2016) proposed a modified DCF method considering such effect. By using this, we quantitatively compared the results from the conventional DCF and the modified DCF methods for various sonic Mach numbers and driving schemes (the solenoidal and compressive driving).

Here, we present that the modified DCF method does not show a strong dependence on the sonic Mach number or driving schemes either, while the conventional DCF method depends on the sonic Mach number for the compressive driving scheme.

[구 IM-10] Study of Magnetohydrodynamic Turbulence Using Multi-frequency Synchrotron Polarization Observations

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Turbulent motions perturb magnetic field lines and produce magnetic fluctuations. The perturbations leave imprints of turbulence statistics on magnetic field. Observation of synchrotron radiation is one of the easiest ways to study turbulent magnetic field. First, we obtained the spatial spectrum of synchrotron polarization so that shows how the spectrum is affected by Faraday rotation and how to recover the statistics of underlying turbulence magnetic field. Since polarized synchrotron intensity arising from magnetized turbulence are anisotropic along the direction of mean magnetic field. Secondly, we studied quadrupole ratio to quantitatively describe the degree of anisotropy introduced by magnetic field at multi-wavelengths. This work demonstrated that the spectrum and quadrupole ratio of synchrotron polarization can be very informative tools to get detailed information about the statistical properties of MHD turbulence from radio observations of diffuse synchrotron polarization.

[구 IM-11] Discovery of a New Mechanism of Dust Destruction in Strong Radiation Fields and Implications

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Massive stars, supernovae, and kilonovae are among the most luminous radiation sources in the universe. Observations usually show near- to mid-infrared (NIR-MIR, 1-5~micron) emission excess from H II regions around young massive star clusters (YMSCs) and anomalous dust extinction and polarization towards Type Ia supernova (SNe Ia). The popular explanation for such NIR-MIR excess and unusual dust properties is the predominance of small grains (size a<0.05micron) relative to large grains (a>0.1micron) in the local environment of these strong radiation sources. The question of why small grains are predominant in these environments remains a mystery. Here we report a new mechanism of dust destruction based on centrifugal stress within extremely fast rotating grains spun-up by radiative torques, namely the RAdiative Torque Disruption (RATD) mechanism, which can resolve this question. We find that RATD can destroy large grains located within a distance of ~ 1 pc from a massive star of luminosity L~ 10^4L_sun and a supernova. This increases the abundance of small grains relative to large grains and successfully reproduces the observed NIR-MIR excess and anomalous dust extinction/polarization. We show that small grains produced by RATD can also explain the steep far-UV rise in extinction curves toward starburst and high redshift galaxies, as well as the decrease of the escape fraction of Ly-alpha photons observed from HII regions surrounding YMSCs.

[구 IM-12] Near-infrared Spectroscopy of Metal-enriched Supernova Ejecta in Cassiopeia A

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The supernova remnant Cassiopeia A (Cas A) provides a unique opportunity to observe the fine