

non-equilibrium ionization cooling behind SNR shock, and discuss the implications of our result.

### [7 IM-02] Near-infrared Extinction due to Cool Supernova Dust in Cassiopeia A

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We present the results of extinction measurements toward the main ejecta shell of the Cassiopeia A supernova (SN) remnant using the flux ratios between the two near-infrared (NIR) [Fe II] lines at 1.26 and 1.64  $\mu\text{m}$ . We find a clear correlation between the NIR extinction (E(J-H)) and the radial velocity of ejecta knots, showing that redshifted knots are systematically more obscured than blueshifted ones. This internal “self-extinction” strongly indicates that a large amount of SN dust resides inside and around the main ejecta shell. At one location in the southern part of the shell, we measure E(J-H) by the SN dust of  $0.23 \pm 0.05$  mag. By analyzing the spectral energy distribution of thermal dust emission at that location, we show that there are warm ( $\sim 100\text{K}$ ) and cool ( $\sim 40\text{K}$ ) SN dust components and that the latter is responsible for the observed E(J-H). We investigate the possible grain species and size of each component and find that the warm SN dust needs to be silicate grains such as  $\text{MgSiO}_3$ ,  $\text{Mg}_2\text{SiO}_4$ , and  $\text{SiO}_2$ , whereas the cool dust could be either small ( $\leq 0.01 \mu\text{m}$ ) Fe or large ( $\geq 0.1 \mu\text{m}$ ) Si grains. We suggest that the warm and cool dust components in Cassiopeia A represent grain species produced in diffuse SN ejecta and in dense ejecta clumps, respectively.

### [7 IM-03] Multi-band imaging of the H<sub>2</sub>O and SiO masers around the late-type stars using KVN

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We present the results of simultaneous observations of the H<sub>2</sub>O and SiO masers emitted from the circumstellar envelopes (CSEs) of the late-type stars. These observations have been carried out at the four frequency bands (K, Q, W and D bands) using KVN to apply the source frequency phase referencing (SFPR) analysis to the maser lines. We obtain the relative positions between the H<sub>2</sub>O and the SiO maser spots by using the SFPR method, which are very important to study the physical links between the inner and the outer parts of the CSEs of the late-type stars. The relative positions between the SiO maser spots of the different transitions are also obtained very accurately, which are very crucial to investigate the pumping mechanism of the SiO maser lines. From our results, the capability of the simultaneous multi-band observation of KVN is proved to be powerful to study the complicated physical environments of the CSEs and the stellar evolution of the late-type stars.

### [7 IM-04] Evolution of the central molecular zone in interacting barred galaxies

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The central molecular zone (CMZ) is a region of rich molecular gas located in the inner few hundred parsecs in barred spiral galaxies. We study the size and morphology evolution of the CMZ of Milky Way-like galaxies both in isolation and in interaction by using N-body/hydrodynamic simulations. Specifically, we examine the gas flows and star formation activities in the central region of the galaxies. We focus in particular on the effects of galaxy interactions, including flybys and minor mergers, on the evolution of the CMZ.

### [7 IM-05] Inner disk properties of a Class I young stellar object revealed by IGRINS

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Gaseous inner disks are the main controller of the final structure of planetary systems as well as the building place of planets, especially of terrestrial planets. However, the inner disk of <5AU is still difficult to be spatially resolved even at the closest star forming regions. Resolving velocity structure in the disk with high resolution infrared spectroscopic study is the best approach to study the inner disk at this moment. Here, we present the IGRINS (Immersion GRating INfrared Spectrometer) result of the Class I young stellar object, ESO Ha 279a, in the Serpens molecular cloud region. IGRINS has a resolving power of  $R=40,000$ , corresponding to the velocity resolution of 7 km/s at K-band, which is perfect to study the hot inner disk structure. We report that NaI and CO overtone emission lines are indeed good tracers of the rotating inner warm disk tracing from  $\sim 0.04$  to  $\sim 7$  AU of this source. We also report the disk properties using other emission lines.

#### [구 IM-06] POLYCYCLIC AROMATIC HYDROCARBON (PAH) MOLECULES IN THE DISKS AROUND LOW MASS STARS

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We present 5-14  $\mu\text{m}$  Infrared Spectrograph spectra of 14 T Tauri stars which show Polycyclic Aromatic Hydrocarbon (PAH) features and reside in 0.7 pc from  $\theta^1$  Ori C. The spectral types of nine out of 11 stars have spectral type information, with types ranging from K7-M5. These stars do not supply strong enough UV photons to excite PAH emission in their disks. Therefore, we consider the detection of PAH emission in disks around low mass stars illuminated by an external source of UV photons, namely, from Trapezium OB association, including  $\theta^1$  Ori C. The morphological features of PAH emission from most disks around K-M type host stars are unique, not belonging to any known classes of PAH features. We found that the PAH emission strengths decrease as the projected distance of the objects from  $\theta^1$  Ori C increase. We suggest future far-IR and submm/mm observations for better understanding of the characteristics and distribution of PAHs in these disks.

### AGN

#### [구 AGN-01] First Detection of 350 Micron Polarization from 3C 279

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We report the first detection of linearly polarized emission at an observing wavelength of 350  $\mu\text{m}$  from the radio-loud active galactic nucleus 3C 279. We conducted polarization observations for 3C 279 using the SHARP polarimeter in the Caltech Submillimeter Observatory on 2014 March 13 and 14. For the first time, we detected the linear polarization with the degree of polarization of  $13.3\% \pm 3.4\%$  (3.9 $\sigma$ ) and the electric vector position angle (EVPA) of  $34.7^\circ \pm 5.6^\circ$ . We also observed 3C 279 simultaneously at 13, 7, and 3.5 mm in dual polarization with the Korean very long baseline interferometry (VLBI) Network on 2014 March 6 (single dish) and imaged in milliarcsecond (mas) scales at 13, 7, 3.5, and 2.3 mm on March 22 (VLBI). We found that the degree of linear polarization increases from 10% to 13% at 13 mm to 350  $\mu\text{m}$  and the EVPAs at all observing frequencies are parallel within  $<10^\circ$  to the direction of the jet at mas scale, implying that the integrated magnetic fields are perpendicular to the jet in the innermost regions. We also found that the Faraday rotation measures RM are in a range of  $-6.5 \times 10^2 \sim -2.7 \times 10^3$  rad  $\text{m}^{-2}$  between 13 and 3.5 mm, and are scaled as a function of wavelength:  $|RM| \propto \lambda^{-2.2}$ . These results indicate that the millimeter and sub-millimeter polarization emission are generated in the compact jet within 1 mas scale and affected by a Faraday screen in or in the close proximity of the jet.

#### [구 AGN-02] Morphological research on radio loud AGN 4C39.25 using KaVA observation

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4C39.25 (0923+392) is a distant radio loud AGN placed at redshift 0.695. The motivation of our work is peculiar properties 4C39.25. Firstly, it has a conspicuous distinction of jet direction between kilo-parsec scale observation made by VLA (Kollgaard et al. 1990) and the parsec scale