

literature. The mean value of the differences between the mean velocity of the GC systems in each galaxy and the nucleus velocity of their host galaxies, is almost zero except the M86 GC system. But the scatter of the differences in the blue GC system is larger than that in the red GC system. We will discuss these results in the context of GC formation in ETGs.

[구 GC-18] Globular Clusters in the Brightest Coma Spiral Galaxy NGC 4921 and the Distance to the Coma Cluster

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Deep archival V and I image data taken with Hubble Space Telescope have been used to investigate compact stellar objects in an anemic spiral galaxy NGC 4921 in the Coma cluster. We resolve a significant fraction of globular clusters based on the reconstructed master drizzled image data. The color distribution of globular clusters (GCs) shows a clear bimodal distribution. The blue and red GC populations show significantly different radial number density profiles. We derive the turnover magnitudes of globular cluster luminosity functions (GCLFs) for the blue and red GCs in the bulge and halo of NGC 4921. We also derive the GCLFs of two Coma cD galaxies, NGC 4874 and NGC 4889, and one coma S0 galaxy, NGC 4923. Turnover magnitudes of GCs in four galaxies agree well within uncertainties. A mean distance of four Coma galaxies is derived from turnover magnitudes of GCLFs. A value of the Hubble constant is determined from this distance estimate and radial velocity of the Coma. We discuss implications of our results in relation with the recent determinations of the Hubble constant.

[구 GC-19] Formation and evolution of mini halos around a dwarf galaxy sized halo - Candidate sites for the primordial globular clusters

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We aim to investigate the formation of primordial globular clusters (GCs) in the isolated

dwarf galaxy ($\sim 10^{10} M_{\text{sun}}$) with cosmological zoom-in simulations. For this, we modified cosmological hydrodynamic code, GADGET-3, in a way to include the radiative heating/cooling that enables gas particles cool down to $T \sim 10\text{K}$, reionization ($z < 8.9$) of the Universe, UV shielding ($n_{\text{shield}} > 0.014\text{cm}^{-3}$), and star formation. Our simulation starts in a cubic box of a side length $1\text{Mpc}/h$ with 17 million particles from $z = 49$. The mass of each dark matter (DM) and gas particle is $M_{\text{DM}} = 4.1 \times 10^3 M_{\text{sun}}$ and $M_{\text{gas}} = 7.9 \times 10^2 M_{\text{sun}}$, respectively, thus the GC candidates can be resolved with more than hundreds particles. We found the following results: 1) mini halos with the more interactions before merging into the main halo form the more stars and thus have the higher star mass fraction ($M_{\text{star}}/M_{\text{total}}$), 2) the mini halos with the high $M_{\text{star}}/M_{\text{total}}$ can survive longer and thus spiral into closer to the galactic center, 3) the majority of them spiral into bulge, but some of them can survive until the last as baryon-dominated system, like the GC.

성간물질

[구 IM-01] Infrared Supernova Remnants and Their Infrared to X-ray Flux Ratios

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Recent high-resolution infrared space missions have revealed supernova remnants (SNRs) of diverse morphology in far infrared (FIR), often very different from their X-ray appearance. This suggests that the FIR emission from SNRs could be of different origins. For a sample of 20 Galactic SNRs, we examine the correlation between their FIR and X-ray properties and explore the origin of the FIR emission. We find that the SNRs with very different FIR and X-ray morphology have relatively large infrared-to-X-ray (IRX) flux ratios. We argue that the FIR emission in these SNRs is likely mainly from dust grains radiatively-heated by shock radiation. For SNRs with similar IR and X-ray morphology, the FIR emission of which is probably mostly from dust grains collisionally heated by hot plasma, we compare their IRX flux ratios with theoretical ratios from a model incorporating time-dependent dust destruction and

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 μm . 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 ± 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 MgSiO_3 , Mg_2SiO_4 , and 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 H₂O and SiO masers around the late-type stars using KVN

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We present the results of simultaneous observations of the H₂O 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 H₂O 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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