Hydrodynamic Schemes In Numerical Simulations

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We studied the metal-distribution of isolated Milky-way mass galaxy using various hydrodynamic solvers and investigated the difference of the result between AMR and SPH codes.

In particle-based codes, physical quantities like mass or metallicity defined in each particle are conserved unless being injected explicitly by the effect of the supernova, whereas in the Eulerian codes the diffusion is simply accomplished by hydro-equation. Therefore, without including explicit physics of diffusion on the SPH- codes, the metal mixing in the galaxy or CGM only can be accomplished by the direct motion of the particles, however, the standard-SPH codes depress the instability of the turbulent fluid mixing.

In this work, we simulated under common initial conditions, common gas-physics like cooling-heating models, and star-formation feedback using ENZO(AMR) GIZMO and GADGET-2 codes. We additionally included a metal-diffusion algorithm on the SPH-codes, which follows the subgrid-turbulent mixing model investigated by Shen et al. (2010) and compared the effect of the metal-outflow on the halo region of the galaxy in different hydro-solvers.

We also found that for the implementation of the diffusion scheme in the SPH-codes, the existence of a sufficient number of the gas-particles, which is the carrier of the metals, is necessary. So we tested a new initial condition for proper implementation of the diffusion scheme on the SPH simulations.

By comparing the metal-contamination of the circumgalactic medium with different hydrodynamics models, we quantify the diffusion strength of AMR codes using diffusion parameterization of the SPH codes and also suggest the calibration solutions in the different behavior of codes in metal-outflow.

[초 IM-07] Asymmetric Mean Metallicity Distribution of the Milky Way's Disk

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I present the mean metallicity distribution of stars in the Milky Way based on photometry from the Sloan Digital Sky Survey. I utilize an empirically calibrated set of stellar isochrones developed in previous work to estimate the metallicities of individual stars to a precision of 0.2 dex for reasonably bright stars across the survey area. I also obtain more precise metallicity estimates using priors from the Gaia parallaxes for relatively nearby stars. Close to the Galactic mid-plane ($|Z| < 2$ kpc), a mean metallicity map reveals deviations from the mirror symmetry between the northern and southern hemispheres, displaying wave-like oscillations. The observed metallicity asymmetry structure is almost parallel to the Galactic mid-plane, and coincides with the previously known asymmetry in the stellar number density distribution. This result reinforces the previous notion of the plane-parallel vertical waves propagating through the disk, which have been excited by a massive halo substructure such as the Sagittarius dwarf galaxy plunging through the Milky Way's disk. This work provides evidence that the Gaia phase-space spiral may continue out to $|Z| \sim 1.5$ kpc.

[석 IM-08] 2 – 4 μm Spectroscopy of Red Point Sources in the Galactic Center

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We present results from our long-term observing campaign, using the NASA IRTF at Maunakea, to obtain 2 – 4 μm spectra of 118 red point sources in the line of sight to the Galactic Center (GC). Our sample is largely composed of point sources selected from near- and mid-infrared photometry, but also includes a number of massive young stellar objects. Many of these sources show high foreground extinction as shown by deep 3.4 μm aliphatic hydrocarbon absorption feature, which is a characteristic of the diffuse ISM and comes from the long line of sight through the diffuse medium toward the Central Molecular Zone (CMZ), the central 300 pc region of the GC. The deep 3.1 μm H_2O ice absorption band coming from the local, dense material in the GC CMZ suggests that most sources are likely located in the GC CMZ. A few of these sources show weak CH_3OH ice absorption at 3.535 μm, which can provide a strong constraint on the CH_3OH ice formation in the unique environment of the CMZ. From the best-fitting models, the optical depths of these features are determined and used to generate a well-rounded view of the ice composition across the GC CMZ and the spectral characteristics of massive YSOs in the GC.