

NASA's coronagraph-monitoring programs. Ground-based data show global-scale outflows of Na in contrast to small-scale data usually obtained near the orbits of spacecraft.

## 항성 및 항성계 / 고천문학

### [구 SH-01] Evolutionary properties of red supergiants with MESA

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We investigate the evolutionary properties of red supergiant stars (RSGs), using stellar evolution model of Modules for Experiments in Stellar Astrophysics (MESA). In this study, we calculate models with mass range of 9-39M<sub>sun</sub> and several different convection parameters (e.g. mixing length, overshooting, and semiconvection) at SMC, LMC, Milky Way, and M31 metallicities. We compare the calculated evolutionary tracks with observed RSGs in SMC, LMC, Milky Way and M31, and discuss appropriate input physical parameters in model calculation. We find that a larger mixing length parameter is necessary for M31 metallicity to fit the positions of RSGs in H-R diagram, compared to lower metallicity environments. Theoretically predicted numbers of yellow supergiant stars (YSGs) are also compared with the observed population. We find that Ledoux models with semiconvection can better explain the number of YSGs. Finally, we investigate the final radius, final star mass, and final hydrogen envelope mass of RSGs and discussed the their properties as type II-P supernova progenitors.

### [구 SH-02] The CN-CH positive correlation in the globular cluster NGC 5286

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We performed low-resolution spectroscopy for the red giant stars in the Galactic globular cluster (GC) NGC 5286, which is known to show intrinsic heavy element variations. We found that these stars are clearly divided into two subpopulations

by CN index. These two subpopulations also show significant differences in the HK' and CH indices, where the CN-strong stars are more enhanced in both indices. From the comparison with high-resolution spectroscopic data of Marino et al. (2015), we found that the CN- and HK'-strong stars are also increased in the abundances of s-process elements and Fe. It appears that, therefore, these stars are later generation stars probably affected by supernova enrichment. In addition, NGC 5286 shows the CN-CH positive correlation among the whole sample, which is only discovered in the GCs with heavy element variations such as M22 and NGC 6273. Therefore, these results strengthen our previous suggestion that the CN-CH positive correlation may be associated with the heavy element variations in the GCs.

### [구 SH-03] Origin of Low-mass Hypervelocity Stars in the Galactic Disk

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We present the analysis of chemical abundances and kinematics for six hypervelocity star (HVS) candidates. These objects are G/K-type low-mass stars in the Galactic disk, while other HVSs previously found are B-type high-mass objects in the Galactic halo. The stellar orbits and kinematics of our HVS candidates suggest that they do not originate in the Galactic center or in an accretion event, indicative of yet-unknown mechanisms that produce kinematically-extreme disk stars. In order to study in detail their origin, we obtained medium-resolution (R~6000) spectra of these stars and derived abundances of several chemical elements (Mg, Ca, Si, Ti, Cr, Fe, and Ni). From the comparison of the chemical abundances with the Galactic stellar components (disk, bulge, halo, and dwarf galaxies) and the kinematic properties of our HVSs, we conclude that two of them are likely ejected from the Galactic disk, one originated from the Galactic center as for the young B-type HVSs, and the other one might be ejected from either the Galactic disk or other regions.

### [구 SH-04] ANALYSIS OF LONG PERIOD RADIAL VELOCITY VARIATIONS FOR HD 18438 AND HD 158996

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