subpopulations

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The presence of multiple stellar populations is now well established in most globular clusters (GCs) in the Milky Way. The origin of this phenomenon, however, is yet to be understood. In this respect, the study of NGC 2808, an intriguing GC which hosts subpopulations with extreme helium abundances, would help to resolve this problem. In order to investigate chemical abundance patterns among different subpopulations in this GC, we have performed low-resolution spectroscopy for the red-giant-branch (RGB) stars and measured CN & CH bands, and Ca line strength. We have identified at least three subpopulations from the CN abundance distribution. This GC shows CN-CH anti-correlation following the general trend among "normal" GCs. In addition, we have cross-matched our results with the high-resolution data in literature, and found a tight correlation between CN strength and sodium abundance. However, CN is anticorrelated with oxygen abundance, as expected from the well known N(&Na)-O anticorrelation. In this talk, we will discuss the implication of these results.

[박 ST-05] A Deep Optical Photometric Study of the Massive Young Open Clusters in the Sagittarius-Carina Spiral Arm

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The Sagittarius-Carina spiral arm in the Galaxy contains several massive young open clusters. We present a deep optical photometric study on the massive young open clusters in the Sagittarius-Carina arm, Westerlund 2 and the young open clusters in the η Carina nebula. Westerlund 2 is a less studied starburst-type cluster in the Galaxy. An abnormal reddening law for the intracluster medium of the young starburst-type cluster Westerlund 2 is determined to be $R_{V,cl}$=4.14±0.08. The distance modulus is determined from zero-age main-sequence fitting to the reddening-corrected color-magnitude diagrams of the early-type members to be V_0-M_V=13.9±0.14 mag. The pre-main sequence (PMS) members of Westerlund 2 are selected by identifying the optical counterparts of X-ray emission sources from the Chandra X-ray observation and mid-infrared emission sources from the Spitzer/IRAC (the Infrared Array Camera) observation. The initial mass function (IMF) shows a slightly flat slope of Γ =-1.1±0.1 down to 5 $M_\odot$. The age of Westerlund 2 is estimated to be . 1.5 Myr from the main-sequence turn-on luminosity and the age distribution of PMS stars. The η Carina nebula is the best laboratory for the investigation of the Galactic massive stars and low-mass star formation under the influence of numerous massive stars. We have performed deep wide-field CCD photometry of stars in the η Carina nebula to determine the reddening law, distance, and the IMF of the clusters in the nebula. We present VRI and Hα photometry of 130,571 stars from the images obtained with the 4m telescope at Cerro Tololo Inter-American Observatory (CTIO). RV,cl in the η Carina nebula gradually decreases from the southern part (~4.5, around Trumpler 14 and Trumpler 16) to the northern part around Trumpler 15 (~3.5). Distance to the young open clusters in the η Carina nebula is partly revised based on the zero-age main-sequence fitting to the reddening-corrected color-magnitude diagrams (CMDs) and the (semi-) reddening-independent CMDs. We select the PMS members and candidates by identifying the optical counterparts of X-ray sources from the Chandra Carina Complex Survey and mid-infrared excess emission stars from the Spitzer Vela-Carina survey. From the evolutionary stage of massive stars and PMS stars, we obtain that the northern young open cluster Trumpler 15 is distinctively older than the southern young open clusters, Trumpler 14 (≲2.5 Myr) and Trumpler 16 (2.5−3.5 Myr). The slopes of the IMF of Trumpler 14, Trumpler 15, and Trumpler 16 are determined to be -1.2±0.1, -1.5±0.3, and -1.1±0.1, respectively. Based on the $R_{V,cl}$ of several young open clusters determined in this work and the previous studies of our group, We suggest that higher $R_{V,cl}$ values are commonly found for very young open clusters with the age of < 4 Myr. We also confirm the correlation between the slope of the IMF and the surface mass density of massive stars.

[구 ST-06] Red supergiant stars in NGC 4449, NGC 5055, and NGC 5457

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