산개성단 NGC 1907과 NGC 1912에 대한 UBV CCD측광

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이중성단 후보로 알려진 산개성단 NGC 1907과 NGC 1912(Subramanian et al. 1995)에 대하여 서울대학교 천문대의 60cm망원경을 이용한 UBV CCD측광을 수행하였다. NGC 1907에 대해서는 8′×8′의 영역 안에 있는 62개의 별에 대한 측광을 하였고, NGC 1912에 대해서는 15′×15′의 영역 안에 있는 203개의 별에 대하여 측광하였다.

두 성단의 색-색도와 색-등급도를 얻었고, NGC 1907에 있는 32개의 별과 NGC 1912에 있는 26개의 별에 대한 차등소광 값을 구하여 색-등급도 상에서 이 별들에 대한 성간소광을 보정하였다.

두 성단에 대하여 거리와 나이를 구하였다. 주계열 맞추기 방법으로 구한 NGC 1907까지의 거리는 1.5±0.15kpc, NGC 1912까지의 거리는 1.2±0.10kpc이다. 등년령 곡선 맞추기 방법으로 구한 NGC 1907의 나이는 400±50Myr, NGC 1912의 나이는 250±30Myr이다. 본 연구에서 측정된 두 성단 사이의 거리는 300±160pc인데, 이 값은 Subramanian et al.(1995)이 제시한 20pc에 비해 매우 큰 값이다. 두 성단의 나이차는 150±60Myr인데, 이것은 산개성단의 생성 시간 척도인 10Myr에 비해 크다. 따라서 이 두 성단은 동일한 기원으로 생성된 성단이 아니라는 사실을 말해준다. 또한 두 성단 NGC 1907과 NGC 1912는 색-등급도상에서 각각 독립적인 특성을 가진 성단들로 보였다. 이러한 사실들로 미루어 볼 때 두 성단은 동일한 기원을 가진 이중성단일 가능성은 희박하다.

Metallicities of the Old Open Clusters : NGC 1245 and Tombaugh 2

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We present a study of the metallicities of two old clusters, NGC 1245 amd Tombaugh 2, based on the Washington CCD photometry obtained using the 0.6-m telescope at the Sobaelsan Observatory and the 0.9-m telescope at the Cerro-Tololo Interamerican Observatory. NGC 1245 is a unique cluster in the sense that the previous metallicity estimate for this cluster is much larger thatn the value expected from the relation of the metallicity and the galactocentric distance of old open clusters, and Tombaugh 2 is a remote old open cluster for which the metallicity and distance are poorly known.

We have estimated the metallicity of the cluster red giants using thd color-color diagram. The reddening, distance, and age of the two clusters have been also derived using the iterative method.

The results are summarized in the following.

NGC 1245 : the mean metallicity [Fe/H] = -0.04±0.14 dex ; the reddening E(B-V) = 0.28 ; the distance d = 2.5±0.2kpc ; the galactocentric distance RGC = 10.7kpc ; the distance from the galactic plane z = -0.4kpc, and the age t = 1.1±0.1Gyrs.

Tombaugh 2 : the mean metallicity [Fe/H] = -0.48±0.14 dex ; the reddening E(B-V) = 0.30 ; the distance d = 7.9±0.8kpc ; the galactocentric distance RGC = 14.7kpc ; the distance from the galactic plane z = -0.9kpc, and the age t = 2.0±0.4Gyrs.

The metallicity estimates of these two clusters we obtained in this study are consistant with the relation of the metallicity and the galactocentric distance of old open clusters.

Spectra of Isotopic Molecules in Comets

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Bright comets, such as Hyakutake(C/1996 B2) and Hale-Bopp(C/1995 O1), may provide opportunities to detect weak isotopic lines of ^{18}OH, $C^{34}S$, and CD near strong cometary emission lines of ^{16}OH, $C^{32}S$, and CH. Expected line positions and intencities of the delectronic bands of these isotopic molecules have been calculated using molecular constants available in literature. Detectability of these molecules with various spectral resolutions will be discussed.

On the Temperature Structure of Jupiter's Auroral Thermosphere

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Recent observations of Jupiter's aurora at UV and IR wavelengths have revealed remarkable structures of auroral ovals around both poles. The observed UV emissions consist of H_2 Lyman and Werner band systems excited by auroral particle precipitation, while the most-pronounced IR emissions are from H_3^+ ν_2 fundamental vibration band around 3.5 micron. These emissions are considered to originate from different altitudes, thereby providing complementary information on auroral thermosphere/ionosphere of Jupiter. Especially, temperature information has been successfully sounded from high resolution spectra of both H_2 and H_3^+ emissions. Spectral observations of the auroral H_2 and H_3^+ emissions are briefly reviewed, and an empirical temperature profile of the auroral thermosphere is constructed with inferred temperatures and altitudes from the observations. The temperatures seem to increase rapidly around the methane homopause, resulting in more vertically-extended thermosphere than for non-auroral regions. Cooling rates by hydrocarbon, H_3^+, and H_2 IR emissions are calculated from the empirical temperature profile and are compared with heating rates from auroral electron precipitation and solar UV absorption. It is found that the required heating rates to balance the IR cooling rates are 180 - 200 erg/cm^2/sec, orders of magnitude greater