THREE-DIMENSIONAL SIMULATIONS OF THE PARKER INSTABILITY UNDER A UNIFORM GRAVITY

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Using a newly developed isothermal MHD code, we have performed three-dimensional simulations for the nonlinear evolution of the Parker instability. The initial system is composed of exponentially-decreasing isothermal gas and magnetic field(along the y-direction) under an externally-given uniform gravity (along the z-direction). The size of the computational domain is set to be $12H \times 12H \times 12H$, Here, H is the e-folding scale height. 12H is close to the horizontal wavelength of the maximum growth in linear analysis. Random velocity perturbations have been added to the initial equilibrium state.

The evolution of the Parker instability can be divided into three stages: linear, nonlinear, and relaxed stages. 1) During the linear stage, the perturbations grow by accumulating gas in magnetic valley regions. In addition, small scale structures form along the x-direction. The agree with the predictions from linear analyses. 2) During the nonlinear stage, the structures become turbulent. In early epoch the main activity occurs close to the upper boundary, but later it moves towards the equatirial plane. Magnetic reconnection is accompanied, which allows mass flow across the field lines. This, in turn, results in the re-distribution of field lines. 3) In the relaxed stage, the system approaches a new equilibrium state. The flux-to-mass ratio has decreased in the region close to the equatorial plane, but increase in the region close to the upper boundary. So the relaxed system is stable against the Parker instability.

VARIABLE STARS IN THE INTERMEDIATE-AGE OPEN CLUSTER Mel 71

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We present the results of time-series CCD photometry for the intermediate-age open cluster Mel 71. Observations were carried out for four nights on February 1997 using the 1.8m telescope at Bohyunsan Optical Astronomy Observatory(BOAO). We have collected 160V frames and 2~3 U, B, I frames The light curves for 429 stars in the central field of the clluster were examined to search for variable star candidates.

Four, maybe five, δ Scuti variable stars and one eclipsing binary were newly discovered in the observed field of the cluster. These variable stars have relatively short and multiple periods from $1^h.6$ to $3^h.5$, and low amplitudes from $0^m.02$ to $0^m.08$. Using results of new

UBVI photometry(Park et al., 1997, in preparation), we found that they are located at the δ Scuti instability strip in a color-magnitude diagram and obey the empirical period-luminosity relation of δ Scuti stars(Fernie, 1994, MNRAS, 271, L19). The period of the binary star is estimated to be $0^{d}.678$.

산개성단 Mel 71의 CCD UBVI 측광관측

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보현산천문대의 1.8m 망원경과 CCD 카메라를 이용하여 산개성단 Mel 71에대한 UBVI 측광 관측을 수행하였다. 색-등급도와 색-색도에 대하여 영년 주계열 맞추기 방법을 적용한 결과 Mel 71의 거리지수 $(m-M)_0$=11.4±0.1, 성간적색화량 E(B-V)=0.20±0.03, 나이 7.9×10^8 년을 추정하였다.

이러한 관측 결과의 해석을 통한 보다 자세한 연구 결과에 대하여 논의할 예정이다.

구상성단 NGC6397의 UBVI CCD 측광관측

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호주국립대 1m망원경을 이용하여 남반구 구상성단인 NGC6397에 대해 CCD 측광 관측을 수행했다. NGC6397은 전향점이 16등급보다 밝은 가까운 구상성단으로서 많은 BHB 별과 다수의 청색낙오성이 있으며 최근에 여러 개의 식쌍성이 발견되기도 하였다.

표준화를 위해 E-region 표준성(Menzies 등, South African Astron. Obs. Circ no. 13, pp.1-13, 1989)을 이용하였다. NGC6397의 중심부를 포함한 20′×20′ 영역을 측광하여 약 20,000개별에 대해 등급과 색지수를 얻었다. 색등급도와 색색도등으로부터 성단의 거리와 나이 등을 추정하였다. 성단의 중심거리에 따른 C-n 도의 변화 등을 논의할 것이다.