Optical and Near-IR study of LMC HII Region N11AB

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I. Introduction

N11 (DEM 34), complex HII region located about 4 degrees from the center of the LMC bar, is very interesting giant interstellar shell. It has a complicated structure and motion (Meaburn *et al.* 1989, preprint). It is located on the edge of an HI concentration. This is the progress report of our study of its two components, A and B at the optical and near-IR wavelengths to investigate stars, dust and ionized gas associated with them. N11A is a compact high-excitation blob (Heydari-Malayeri 1985, *A. Ap.*, **144**, 98.) and N11B is a bright HII region in this complex, which embeds OB association Lucke-Hodge 10.

II. Observations and Data Reduction

We obtained Hα, Hβ, [SII 6717/31], blue and red continuum, and UBV CCD frames by using CTIO 0.9-m plus TI CCD chip in Dec. 1987 and Jan. 1989. J, H, K, 1.99 μm, Brγ, and 2.20 μm images of N11A were obtained by using CTIO 1.5-m plus IR-imager in Jan. 1989. Flux calibration was done by using standard stars observed at the same night. Standard transformation error of UBV photometry is smaller than 0.03. UBV photometry of stars was derived by using DAOPHOT and ALLSTAR.

III. Results

1. Comparison of the $(U-B)-(B-V)$ diagram with the intrinsic relation of V and Ib gives the mean reddening value, $E(B-V) = 0.16 \pm 0.02$. There is a large scatter in the reddening.

2. By using the $V-(B-V)$ diagram, the $V-(U-B)$ diagrams, and the isochrones based on Maeder and Meynet (1989, *A. Ap. Suppl.*, **76**, 411), we estimated that the age of this area is 5 ± 5 Mys. $(m-M)_o = 18.5$, $E(B-V) = 0.16$, and $A_V = 3E(B-V)$ were assumed (Fig. 1a and 1b).

3. Stellar initial mass function for 9 $m_\odot < m <$ 60 $m_\odot$ was derived from the comparison of the evolutionary tracks (Maeder and Meynet 1989) and the $V-(U-B)$ diagram. The slope of the logarithmic IMF ($\Gamma = d\ log\ N/d\ log\ m$) is -1.8 ± 0.3, which is very similar to that for Lucke-Hodge 117 and 118 associations (Massey *et al.* 1989, *A. J.*, **97**, 107).

4. Continuum-subtracted Hα and Hβ maps of N11B show several peaks of emission around the inner boundary, while [SII 6717/31] emission is dominant at the outer boundary with a peak of emission at the NE boundary (Fig. 2a and 2b). The peak of [SII 6717/31] emission at the NE boundary is $\sim$ 5" away toward NE from the peak of Hα and Hβ emission. These points show that the outer area is expanding outward colliding with surrounding material and that the curved feature at the NE is probably due to the interaction between N11B and the surrounding dust, instead of due to the neaby bright

star, Sk -6636. Note that [SII 6717/31] image of N11A blob shows a distinguishable spiral feature at the outer area, while Balmer emission line images do not.

5. Brγ map of N11A shows horizontally elogated emission, while J image shows a normal stellar profile. The second peak is $\sim$ 4" east of the stellar peak (Fig. 3a and 3b). We derived $K = 9.56$, $J - K = 1.05$, and $H - K = 0.46$ for N11A. The comparison of near-IR maps with optical maps is still in progress.

Figure Captions

Fig. 1 : (a) $V-(B-V)$ diagram of N11AB. Dashed lines represent evolutionary tracks of 40, 20, 12, 7, 4, and 2.5 $m_{\odot}$ for Z=0.02 (Maeder and Meynet 1989), shifted according to $(m-M)_o = 18.5$, $E(B-V) = 0.16$ and $A_V = 3E(B-V)$. Filled cirlces represent the stars with photometric error smaller than 0.05. (b) $V-(U-B)$ diagram.

Fig. 2 : (a) Blue continuum (4650 Å) image overlapped with the contour map of continuum-subtracted and flux-calibrated Hα image. The scale is 0.494 "/pixel. North is at the top and east is at the left. (b) Continuum-subtracted and flux-calibrated [SII 6717/31] image.

Fig. 3 : (a) J image of N11A. The scale is 0.92 "/pixel. (b) Continuum-subracted Brγ image.

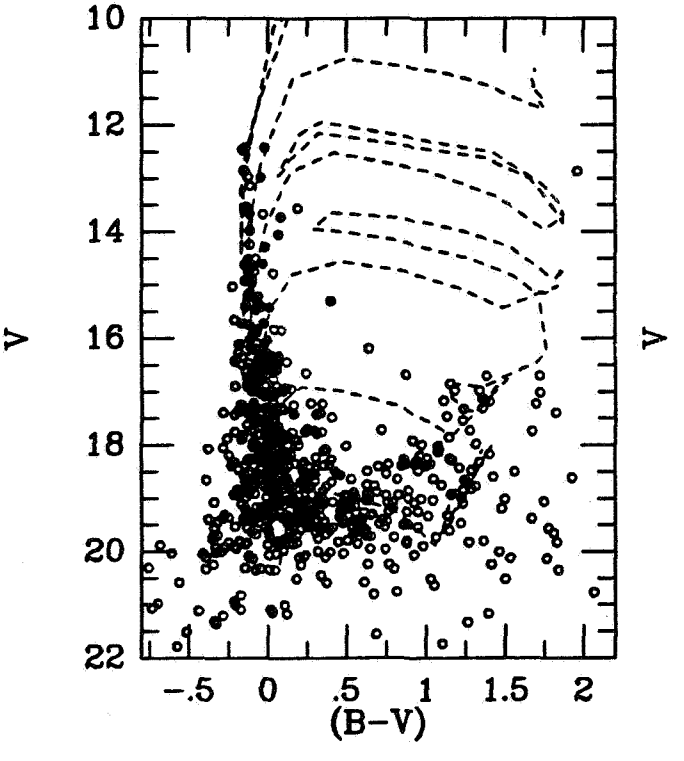

Fig. 1 (a)

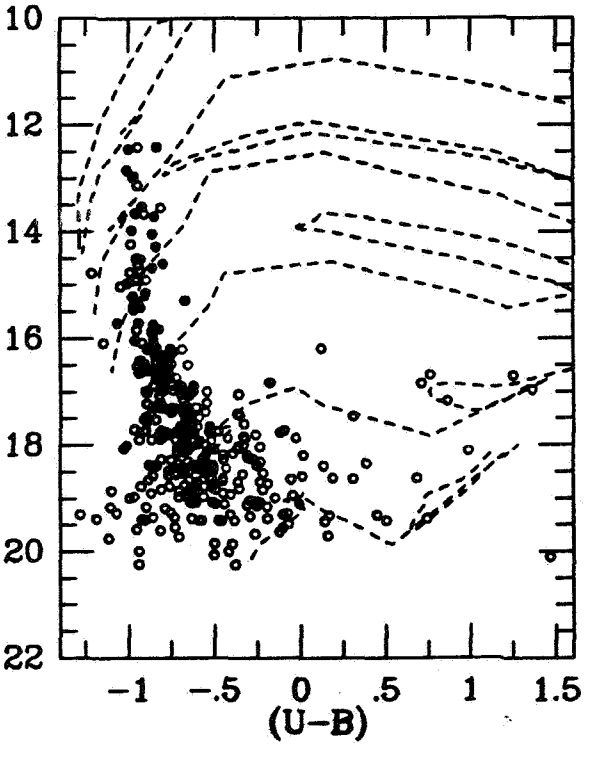

Fig. 1 (b)

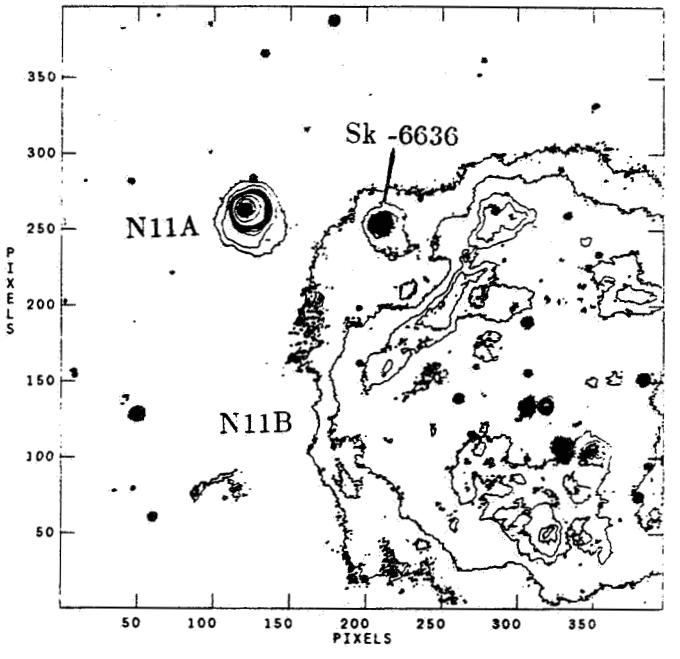

Fig. 2 (a)

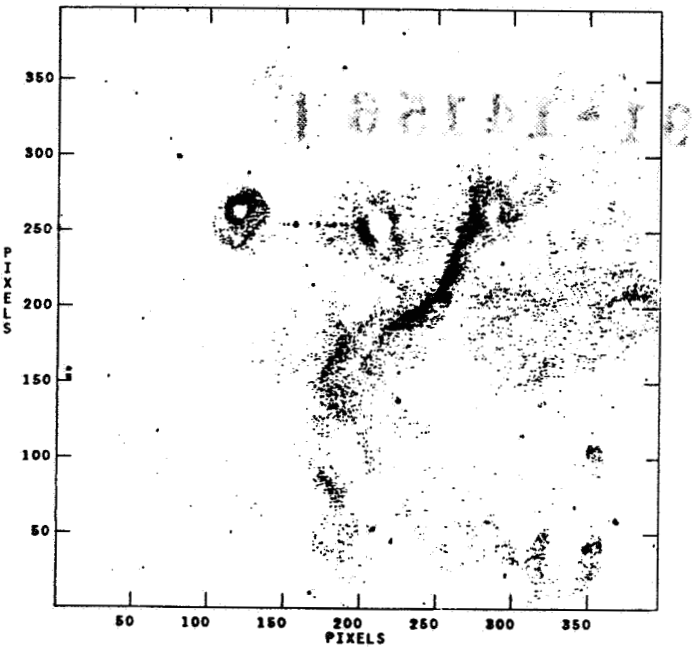

Fig. 2 (b)

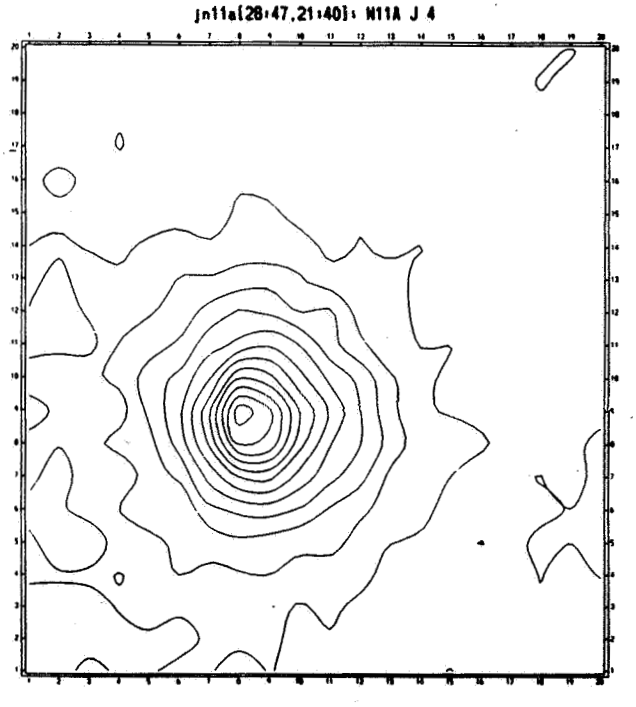

Fig. 3 (a)

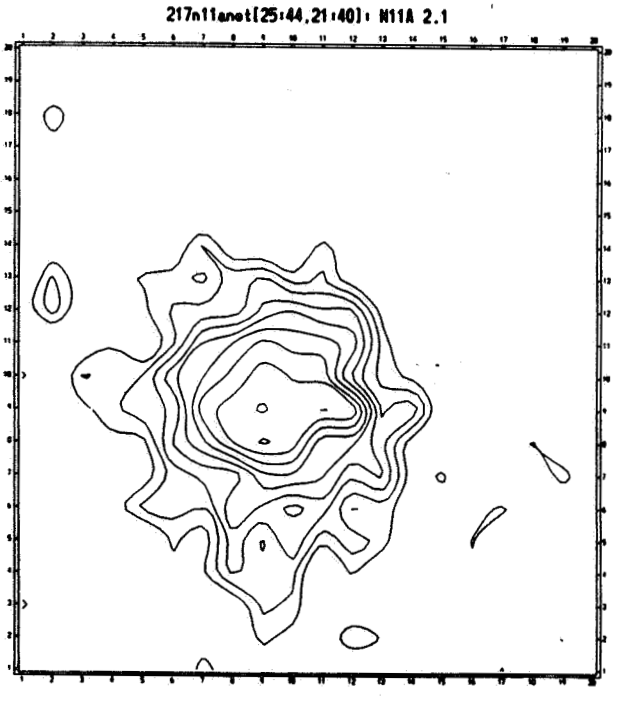

Fig. 3 (b)