*New Views of the Magellanic Clouds*
*IAU Symposium, Vol. 190, 1999*
*Y.-H. Chu, N.B. Suntzeff, J.E. Hesser, and D.A. Bohlender, eds.*

# The Kinematic Structure of the Supergiant Shell LMC 2

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## 1. Introduction

LMC 2 was one of the first supergiant shells in the Large Magellanic Cloud (LMC) to be identified, based on the detection of long, curved H$\alpha$ filaments extending over 900 pc (Goudis & Meaburn 1978). LMC 2 is located to the east of the active star formation region south of 30 Doradus. LMC 2 is a spectacular supergiant shell in the LMC, having the most coherent filamentary structure and the highest X-ray surface brightness. As shown in Fig. 1, the diffuse X-ray emission from LMC 2 is bounded by the H$\alpha$ filaments in the north and east. A bright X-ray arc is seen in the southwest quadrant, extending from N 158 and N 159.

The kinematic structure of LMC 2 has been investigated by various groups with conflicting results. Caulet et al. (1982) studied the kinematics of the $10^4$ K ionized gas and concluded that LMC 2 was a coherently expanding shell-like structure. Meaburn et al. (1987) obtained profiles of the H I 21-cm emission line toward LMC 2. They detected no evidence that LMC 2 was coherently expanding. We have obtained high-resolution echelle spectra of the H$\alpha$ line and Austrailia Telescope Compact Array (ATCA) aperture synthesis maps of the H I 21-cm line emission of LMC2 to study its dynamics.

## 2. Kinematic Structure of LMC 2

Our echelle spectra along three cuts toward LMC 2 (designated E I, E II, & E III in Fig. 1) reveal two major velocity components of the ionized gas at $V_{hel} \sim 250$ and 275 km s$^{-1}$. The velocity structure of these components across the echelle cuts does not show a velocity variation conforming to that expected in an expanding hemisphere (Points et al. 1999).

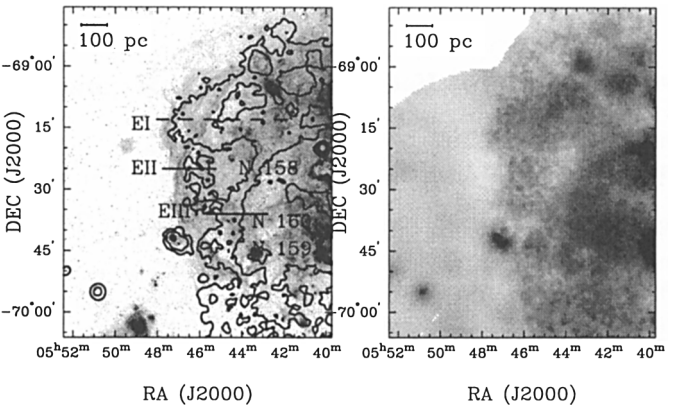


Figure 1. **Left:** H$\alpha$ image of LMC 2 overlaid with *ROSAT* PSPC contours. **Right:** Grayscale *ROSAT* PSPC mosaic of LMC 2.

The ATCA aperture synthesis maps of the H I 21-cm line show the neutral hydrogen toward LMC 2 to be distributed in the form of long filaments and discrete clouds. The H I filaments show clear correspondence with the filaments seen in the H$\alpha$ image. The H I filaments at the periphery of LMC 2 have velocities of 250, 275, and 300 km s$^{-1}$. If LMC 2 were a coherently expanding shell, we expect that the velocity extremes would be observed toward the interior of the shell, not the edge. Thus, the H I channel maps provide further evidence that LMC 2 is not coherently expanding.

## 3. Conclusions

We have investigated the kinematic structure of the supergiant shell LMC 2 using high-resolution echelle spectra of the H$\alpha$ line and ATCA aperture synthesis maps of the H I 21-cm line. High-velocity gas is detected toward X-ray bright regions. In the northern region, this high-velocity gas is indicative of localized heating by a supernova remnant. Along the western boundary, the high-velocity gas may be associated with an outflow of material from the adjacent star-forming region. However, we detect no evidence of a global expansion pattern.

## References

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