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A KINEMATIC STUDY OF N 119 IN THE LMC: A ROTATING NEBULA WITH SPIRAL SHAPE?

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The nebula N 119 is located $\sim 15'$ southeast from the kinematic center of the LMC (Kim et al. 1998a). This nebula shows a conspicuous spiral morphology which remains an enigma. The aim of this paper is to present new data and to suggest possible explanations for the formation and the evolution of N 119.

We have made a kinematical study by using Hα and [O III] $\lambda\, 5007\,$Å observations performed with a scanning Fabry-Perot interferometer attached at the 36-cm telescope in the ESO of La Silla and operated under the same conditions as described in Ambrocio-Cruz et al. (1997). With a field of view of $38' \times 38'$ and an angular sampling of $9''$, we have obtained monochromatic images and spectral information with a spectral sampling of 16 km s^{-1} for the Hα line and 7 km s^{-1} for the [O III] line. Its kinematic field is intricate with one component which covers the total field of the complex and is very probably systemic, and with properties of a rotating system.

One kind of event that can be occurring in a star-forming site is a cloud-cloud collision. In the surrounding area of the stellar bar of the LMC, such an event does not seem impossible because studies of other nebulae (Ambrocio-Cruz 1999), have shown that two gas velocity components are very close to each other to the North-West of the LMC bar. Moreover cool atomic gas in the LMC and sodium absorption components along stellar lines of sight in this same area (Silvy 1997) have led to the conclusion that the low velocity component is located at the rear. It implies that the two components are coming nearer and nearer, and that a few collisions may happen.

Cloud-cloud collisions are thought to occur frequently in the Giant Molecular Cloud complexes of our Galaxy (e.g., Turner 1984). Hydrodynamic calculations have been made mainly for head-on collisions (e.g., Smith 1980; Lattanzio et al. 1985). Lattanzio & Henriksen (1988) have made simulations of head-on and off-centre collisions between rotating interstellar clouds. In all cases the resulting structures of head-on collisions without rotation do not show spiral features while some of the off-center and head-on collisions with rotation show a spiral structure. A rotation is imparted to the resulting structure and a bar-like spiral structure forms (see Fig. 9 in Lattanzio et al. 1985). The similarity of both morphology and kinematics with the features observed in N 119 lends support to this picture. However, some difficulty arises with the size of the structures: in the model the collisional clouds have a radius of 10 pc and the resulting structures have a diameter of 20 pc, whereas the size of spiral structure of N 119 is ~ 130 pc.

Other arguments in favor of the cloud-cloud collision to explain the morphology and kinematics of N 119 are found in the H I map. First, N 119 is located near a very steep velocity gradient, situated just to the north of the center of the stellar bar of the LMC (Kim et al. 1998). Second, another argument is the existence of a neutral hydrogen complex in the N 119 area (McGee & Milton 1966), with dimensions of 375×490 pc (at a distance of 50 kpc to the LMC), and made up of several clouds with an average velocity of 256 km s^{-1}. The velocities observed at the same position by Kim et al. (1998) are 250 km s^{-1}, 263 km s^{-1}, 270 km s^{-1}, 280 km s^{-1} and 290 km s^{-1}. So it seems possible that two clouds of this H I complex have collided.

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