RevMexAA (Serie de Conferencias), **12**, 93–93 (2002)

Ionized Gaseous Nebulae (Mexico City, 21-24 November 2000)
Editors: William Henney, José Franco, Marco Martos, & Miriam Peña

IS THE SUPERNOVA REMNANT 3C400.2 THE RESULT OF A SINGLE SUPERNOVA EXPLOSION?

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Using numerical simulations carried out employing a new code *YGUAZÚ2D* (Raga, Navarro-González, & Villagrán-Muñiz 2000), we find that a single supernova explosion (SN) embedded in a dense medium, occurring close to an interface separating this medium from a less dense medium, is adequate for describing the morphology of the supernova remnant (SNR) 3C400.2.

By means of radio images (Dubner et al. 1994), the morphology of the SNR 3C400.2 can be described as two shells, partially overlapped with angular sizes of $11'$ and $7'$. The larger shell to the southeast is centered near J2000: $19^{\rm h}38^{\rm m}53^{\rm s}$, $17°12'55''$. The smaller shell to the northwest is centered close to J2000: $19^{\rm h}38^{\rm m}10^{\rm s}$, $17°17'52''$.

These double-shell structures have been reported in other SNR observations, and can be modeled considering two interacting SN explosions, or a single SN event, which takes place in a stratified medium (Tenorio-Tagle et al. 1985; Arthur & Falle 1991).

In order to reproduce the shape of the SNR 3C400.2, we employed the code *YGUAZÚ* (Raga et al. 2000) and have simulated several scenarios (two interacting SN explosions, a SN explosion occurring close to an interface between a dense and a more rarefied medium). Due to the symmetry of the problem, we have done a 2D simulation.

However, in the case of the SNR 3C400.2, a preliminary analysis of our Hα data (Velázquez et al. 2001) and the H I study carried out by (Giacani et al. 1998), reveal that the model of a single SN explosion occurring into a dense medium and close to the interface, is adequate to explain its morphology. We then initialize our numerical simulation considering two regions in pressure equilibrium and with a density ratio of 5 (according to the work of Giacani et al. 1998). After several tests, we choose the SN explosion site at 5×10^{18} cm from the interface, into the dense medium. The Sedov solution was used to simulate the SNR, with an initial energy $E_0 \simeq 10^{51}$ erg and an initial radius of 3×10^{18} cm. In Figure 1, we present density contours of the simulation of the SN explosion, occurring in a dense medium and close to the interface. When the SNR shock wave catches up with the interface, it produces a breakout of the SNR shell, giving the appearance of two partially overlapped shells. In the 18 000 yr frame, the relation between the radius of two apparent shells is in good agreement with the observational values.

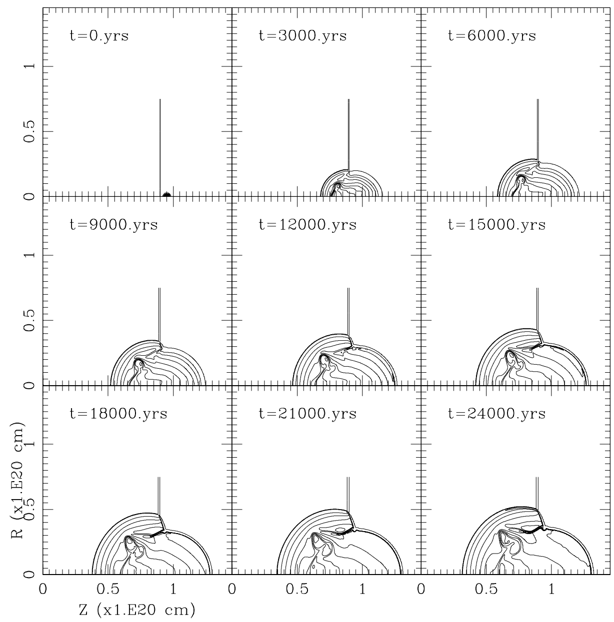

Fig. 1. Densities contours of the simulation of the SNR expanding in a dense medium, close to an interface, at different times.

E. de la F. wishes to acknowledge financial support from CONACyT-México grant 124449 and DGEP-UNAM. This work has been financed by grant IN104696 from DGAPA-UNAM.

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