(b) Discussion and Conclusions

Several approaches were done to generalize a differential velocity theory including a final convolution (Bruning 1981). In the case of high rotational velocities differential rotation effects could be negligible compared to surface distortion or temperature and gravity effects (Collins & Truax 1995). In this case, it would not be possible to detect differential rotation. We show (this work) that some particular cases of differential rotation involving a convolution can be solved, but in general, numerical methods must be used. Other developments are in progress in view of future observations with very large telescopes.

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FROM ULTRACOMPACT TO EXTENDED H II REGIONS

Guillermo García-Segura[1] and José Franco[1]

The dynamical evolution of H II regions and wind-driven bubbles in dense clouds is studied. In particular, we address the conditions in which ultracompact H II (UCH II) regions can reach pressure equilibrium with their surrounding medium, and thereby stall their expansion. At pressure equilibrium the ionized regions become static and, as long as the ionization sources and the ambient gas densities remain about constant, the resulting UCH II regions are stable and long lived. The equilibrium sizes and densities are similar to those actually observed in UCH II regions. Similarly, ultracompact wind-driven bubbles can reach pressure equilibrium and the resulting final sizes are similar to those of UCH IIs. The same is true for a combined ultracompact structure consisting of an interior wind-driven cavity and an external H II region. For non-moving stars in a constant density medium, the lifetimes for all types of ultracompact objects only depend on the stellar lifetimes. For cases with a density gradient, depending on the core size and slope of the density distribution, some regions never reach the static equilibrium condition. For H II regions, or for the external photoionized region in a combined wind-H II region structure, the inclusion of cooling in the leading, swept-up neutral gas, shocked region results in the appearance of a powerful dynamic instability. This instability was first studied by Giuliani (1979), and is associated with the thin-shell instability described by Vishniac (1983). The internal ionization front exacerbates the growth of the thin-shell instability, creating a rapid shell fragmentation, and our numerical simulations confirm the linear analysis of Giuliani. The fragments tend to merge as the evolution proceeds, creating dense and more massive clumps, and are slowly eroded by ionization fronts. Thus, the resulting structures have a variety of shapes, sizes, densities, and lifetimes. Intriguing features such as "elephant trunks" and cometary-like globules can be easily explained as a result of this instability.

[1]Instituto de Astronomía, Universidad Nacional Autónoma de México

A SYNCHROTRON NEBULA ASSOCIATED WITH THE PULSAR PSR1853+01 IN W44

Elsa Giacani[1], Dale Frail[2], Gloria Dubner[1], and Miller Goss[2]

It is known that young pulsars efficiently transfer their rotational spin-down energy $\dot{E}$ into relativistic wind, therefore all energetic pulsar should produce a syncrotron nebula that might appear as a difusse source in its vicinity.

We have imaged a region around the pulsar PSR 1853+01 in the supernova remnant W44, with the VLA at 0.3, 1.4, 4.8 and 8.4 GHz. The pulsar lies at the apex of a synchrotron nebula with cometary morphology. Based on these current observations a spectral index $\alpha = -0.12 \pm 0.04$ was calculated for the mentioned feature, this value is substantially flatter than $\alpha \sim -0.4$ estimated for the rest of W44. The emission is polarized with a degree of polarization at 4.8 and 8.4 GHz of approximately 17%.

On the basis of the morphology, spectral index and polarization properties for the synchrotron nebula, we argue that this feature is produced by the spin down energy of the pulsar.

[1]Instituto de Astronomía y Física del Espacio, Argentina
[2]National Radio Astronomy Observatory, USA