CLOUD DISRUPTION AND FORMATION

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Star formation is responsible at least for a part of radiation coming from central regions of active galaxies. Violent bursts of star formation yield rapidly evolving massive stars, which transform in metal-rich environments into so called Warmers / Terlevich et al., 1987 / changing nebular spectra to Seyfert or Liner type.

Luminous infrared galaxies provide another evidence. The intense star formation within 1 kpc from their centers produces a large fraction of infrared irradiance / Mirabel and Sanders, 1988 /. HI absorption is likely to arise in clouds associated with a central rotating disc. However, the broadening of absorption profiles reaching 1000 km s^{-1} means that large turbulent motions are superimposed on a smooth rotation / Baan et al., 1987 /.

Stars form within molecular clouds. But the massive stars disrupt the parent cloud soon. They emit UV photons forming expanding ionization fronts. Mass-loss and stellar winds are also important and after some time the massive stars explode like supernovae. The energy, which is released in these processes, is deposited in the surrounding medium, partly in expanding shells / Bodenheimer and Tenorio-Tagle, 1988 /.

A shell in supersonic expansion agglomerates the ambient gas and decelerates due to conservation of momentum. The swept up gas in the front continues in expansion even with a subsonic velocity. At that time the galactic differential rotation becomes important and influences the shape and density of the shell. / See Tenorio-Tagle and Palouš, 1987, for a more detailed description of this model./

Fig. 1 shows the evolution of the shape. Initially round shell becomes elliptical. The ellipse is gradually more and more distorted and it flattens progressively. What about the column density distribution within the shell? This is shown in Fig. 2. The swept up mass concentrates after a certain time of evolution to the tips of the shell,

D. E. Osterbrock and J. S. Miller (eds.), Active Galactic Nuclei, 314–315.

https://doi.org/10.1017/S0074180900141166 Published online by Cambridge University Press

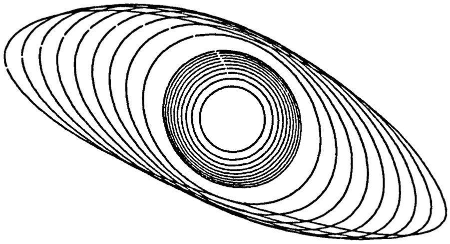

Figure 1. The evolution of the shape of an expanding shell in a differentially rotating galactic disc.

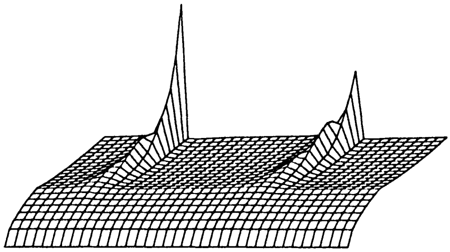

Figure 2. The evolution of the column density as a function of the phase angle within the expanding shell and time.

where the next generation clouds are pressumably formed.

The above model has been tested numerically with rotation curves of Sa - Sc galaxies /Franco et al.,1988/. One of our conclusions is that the rate of evolution of a shell is proportional to the epicyclic frequency $\kappa = 2\omega(1 + R/2\omega \; d\omega/dR)^{1/2}$, where ω is the angular rotation speed around the galactic center and R is galactocentric distance.

The epicyclic frequency peaks for any rotation curve in the central part of the galaxy and declines outwards. This implies that the shell evolution and induced formation of clouds from the ambient medium proceed much more quickly near the galactic center than outside. This may be even amplified due to a density dependence of this process.

We conclude that we may have an idea how to explain why clouds are concentrated towards centers of many spiral galaxies. If the cloud formation, which is connected with the disruption of the last generation clouds, initiates the next generation of star formation, we may have a hint for bursts of star formation in the regions near the galactic center. However, many more simulations of expanding shells in the high density enviroment are needed.

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