STAR FORMATION IN NORMAL IRREGULAR GALAXIES

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Normal, non-interacting irregular galaxies can be quite successful at forming stars. Therefore, spiral density waves are not necessary to a vigorous production of stars. Nevertheless, there is a large range in star-formation rates among irregular galaxies. Irregulars with common characteristics can have different overall levels of star-formation activity, so that the level of activity does not seem to be simple related to observable global properties of galaxian systems. The constant star formation rates of most normal irregulars also imply the existence of regulatory processes.

Irregulars have plenty of gas with which to form stars although the role of the extended outer gas is not known. Compared to spirals, irregulars are more metal poor and have lower relative CO luminosities, lower apparent dust contents, and fewer high column-density optically dark clouds. Yet normal stellar products and similarities in at least giant star-forming region characteristics argue that star formation in normal irregulars is not significantly different from that in other morphologically different galaxies.

THOMPSON: It would appear that the indicators of star formation (Hα, blue, IR flux) are all very highly weighted toward high mass, high luminosity objects. A region similar to Taurus might well be missed by this technique. How good a star formation indicator do you think these are?

HUNTER: Yes, that is a big problem and is related to the question of the IMF. In these galaxies we cannot observe individual stars, so we turn to the Magellanic Clouds. Studies there by Stryker, Butcher, and others indicate that, at least down as far as can be observed, the IMF is not drastically different from that in the Milky Way. So we take that as evidence that the global IMFs in irregulars are "normal".

STROM: Your work clearly shows that *same* irregular galaxies have at a given time, the same star-forming efficiencies as spirals. No one here doubts that density waves are required for star formation and

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indeed your data amply demonstrate this point. The issue is, do they play a role in promoting more vigorous star formation where they exist. Hence, it is important to compare the star-forming rates in a *representative* sample of grand design spirals of a fixed luminosity with a *representative* sample of irregular galaxies at fixed luminosity. Representative means: all systems of a fixed red luminosity, independently of whether they are forming stars vigorously and with adequate total gas content, make stars. Could you comment on the selection criteria used in defining your sample and whether you believe these criteria really admit a critical test?

HUNTER: The actively star-forming irregulars were simply chosen because they are blue and/or because they contain many star-forming regions; the dwarfs were chosen from Fischer and Tully's list on the basis of classification as irregular. They do not represent a complete sample. However, the fact that there are irregular galaxies at all which are just as successful as spirals in forming stars shows that spiral density waves are not necessary in a global sense.

DOWNES: In your papers, you have pointed out that some of these irregular galaxies have long "arcs" or "chains" of large H II regions. Do you think these may be related to large-scale, organized velocity patterns (possibly not yet detected for reasons of resolution or sensitivity)?

HUNTER: In NGC 4449, for example, there are several loops of H II regions and in NGC 4214 there is a nice chain of about 4 regions. In the case of NGC 4449 van Gorkom has a velocity map obtained with the VLA which shows no obvious connection between the velocity field and the star formation activity.

STAR FORMATION IN BARRED GALAXIES

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Examination of IRAS results for a sample of nearby galaxies with RC2 types between S0/a and Scd (inclusive) suggests that the only galaxies in which the IRAS colours are dominated by emission from warm dust in star formation regions are barred (Hawarden *et al.* 1985). Figure 1 is a 2-colour diagram of all Shapley-Ames spiral galaxies of the above types detected by IRAS in all four wavebands. It shows the ratio of fluxes in the IRAS 25 and 12 micron bands as a function of the ratio of fluxes in the 100 and 25 micron bands. On this diagram the SA systems, with the exception of a few Seyferts, have small 25/12 ratios and large

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