

Young stellar clusters triggered by a density wave in NGC 2997

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Abstract. Bright knots along the arms of grand-design spiral galaxies are frequently seen on near-infrared K-band images. To investigate their nature, low resolution K-band spectra of a string of knots in the southern arm of the grand design, spiral galaxy NGC 2997 were obtained with ISAAC/VLT. Most of the knots show strong Br γ emission while some have H₂ and HeI emission. A few knots show indications of CO absorption. Their spectra and absolute K magnitudes exceeding -12 mag suggest them to be very compact, young stellar clusters with masses up to $5 \times 10^4 M_{\odot}$. The knots' azimuthal distance from the K-band spiral correlates well with their Br γ strength, indicating that they are located inside the co-rotation of the density wave, which triggered them through a large-scale, star-forming front. These relative azimuthal distances suggest an age spread of more than 1.6 Myr, which is incompatible with standard models for an instantaneous star burst. This indicates a more complex star-formation history, such as several bursts or continuous formation.

Keywords. galaxies: spiral, galaxies: star clusters, infrared: galaxies, techniques: spectroscopic

1. Conclusions

Several K-band emitting knots, aligned along the southern arm of NGC 2997, were observed by Grosbøl *et al.* (2006). The analysis of the low-resolution, near-infrared spectra gave the following main results:

- their absolute K magnitudes exceed -12 mag,
- K-band emission spectra are similar to cocoon-enshrouded star forming regions,
- age range is 7-10 Myr and masses are up to $5 \times 10^4 M_{\odot}$,
- sizes and masses are similar to that of W49A in our Galaxy,
- alignment with spiral pattern along almost 4 kpc is striking, and
- locations of the knots are consistent with being inside co-rotation of spiral pattern.

This suggest a well-synchronized mechanism of piling up the material of which they were formed and for the triggering of star formation similar to the scenario of density wave propagation. Agreement between large-scale, synchronously triggered star formation and knot age differences requires several bursts or continuum star formation instead of a single burst within the knots.

Reference

Grosbøl, P., Dottori, H. & Gredel, R. 2006, *A&A* 453, L25