

CG J1720-67.8:

Dynamics of the Interaction through the Group's Velocity Field

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Introduction - Groups whose members are caught in the act of merging are extremely rare to observe. In fact, within the famous Hickson's sample of compact groups, only one group is thought to be presently in such a state (HCG 31, Amram et al. 2004). CG J1720-67.8 is another example of this kind (Temporin et al. 2003a,b). This group is a very dense system characterized by strong ongoing tidal interactions and widespread star-formation activity. To gain a global view of CG J1720-67.8 we observed it with the integral field unit SPIRAL mounted on the Anglo-Australian Telescope and composed a mosaic of 6 pointings of the lenslet+ fibre array in a wavelength range centred on the redshifted H α emission-line (Fig. 1).

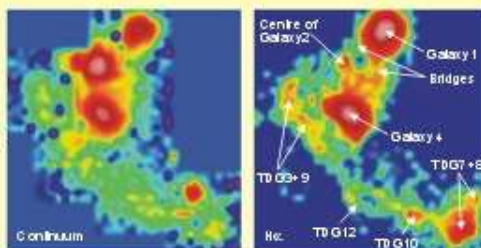


Fig. 1: Continuum (left) and H α (right) mosaic of 6 emission maps reconstructed from SPIRAL arrays of spectra obtained at the AAT on June 2002, 2003.

New information - with the new dataset we analysed the distribution of star-formation activity across the group (Fig.1), disentangled various kinematic components (Fig.2), studied the gradient of radial velocity (Fig.3) and gas velocity dispersion (Fig.4) across the system, and obtained a velocity curve of Gal.4 (Fig.5). We found that 31% of the H α luminosity stems from the main tidal tail. The group shows global kinematics with the axis coincident with that of Gal.4. The offset of the kinematic centre w.r.t the photometric centre of Gal.4 is likely consequence of the merging process under way. We estimated a mass of $2 \times 10^{10} M_{\odot}$ for Gal.4.

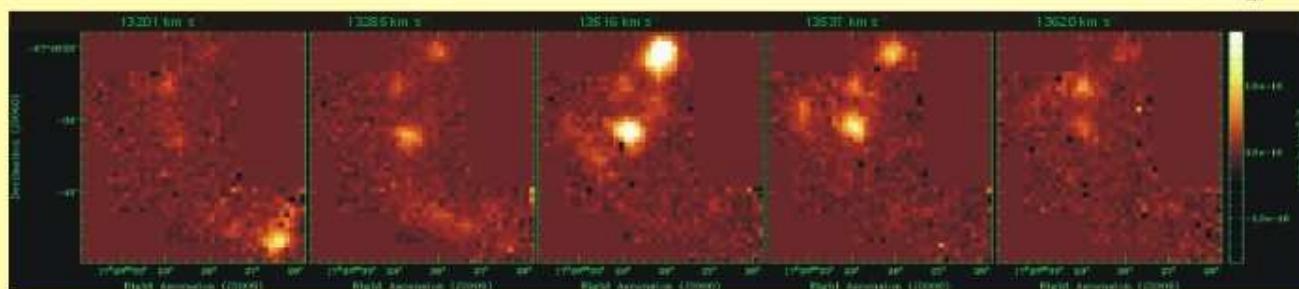


Fig. 2: First moment maps of the group in the H α emission-line. Differing velocity components are clearly seen.

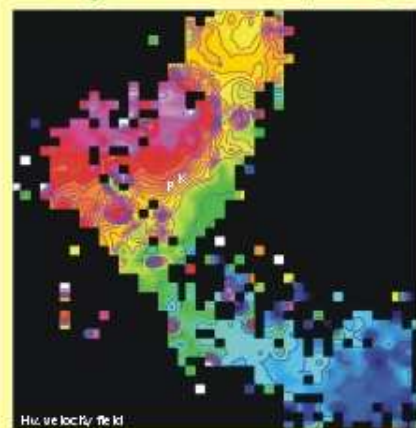


Fig. 3: H α -velocity field overlapped with isovelocity contours. Velocities increase from blue to red. 'K' and 'P' mark the position of the kinematic and photometric centre of Gal.4.

3D configuration - The results of the analysis of our database, together with the structure of tidal debris (Fig.6), gave us a view of the 3-dimensional configuration of the galaxy-system (as shown in Fig.7) and allowed us to put some constraints on the interaction/merging processes which brought CG J1720-67.8 to its present configuration. Although dedicated numerical modelling is needed to determine with reasonable reliability the history of the group and predict its future evolution, we could hypothesize some evolutionary scenarios. In particular we favour a scenario in which Gal.4 and Gal.1 experienced a prograde-retrograde close encounter < 200 Myr ago, giving origin to the tidal features shown in Fig.6. Enhanced star-formation activity was triggered in the galaxies and (more recently) in the tail. There are evidences of

Fig. 4: Map of the σ_{gas} (gaseous velocity dispersion). Values increase from blue to red.

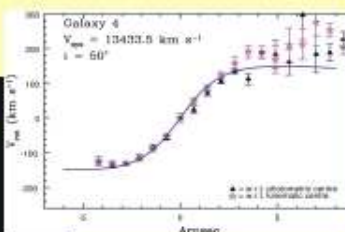


Fig. 5: Velocity curve of Gal.4, obtained by fitting isovelocity tilted rings to the vel. field on a 50°-wide cone about the major axis.

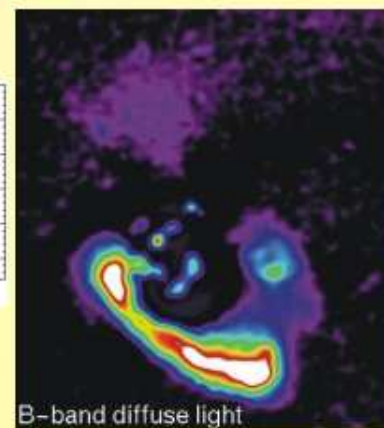


Fig. 6: Tidal features on the ESO 3.6m tel. B-image after subtraction of stars and model-galaxies. A bright and a faint tidal tail, and a cone-like plume are visible.

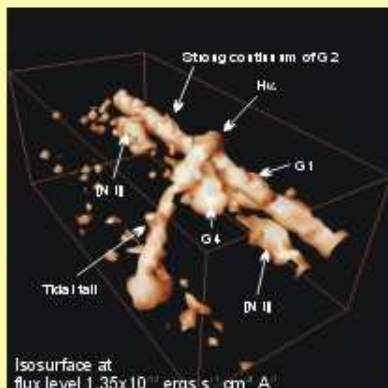


Fig. 7: 3D view of the H α +continuum components obtained from the data-cube with the software AMIRA (kind concession of W.E. Kapferer, Institute of Astrophysics, Innsbruck).

a recent/ongoing interaction among Gal.2 and both other galaxies. We also suggest that Gal.2 might be already the outcome of a merger between two (likely gas-poor) galaxies. A thorough discussion on the evolutionary state of CG J1720-67.8 is presented in Temporin et al. 2004.

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References

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