An Mid-infrared View of the Highway for Galaxy Evolution in Compact Groups

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Stephan's Quintet, Hickson Compact Group 92
Compact Groups of Galaxies: Densest Galaxy Systems

- High Galaxy number density
  \[10^{3.5} \text{ Mpc}^{-3} \gg 10^2 \text{ Mpc}^{-3} \text{ (clusters)}\]

- Low Velocity dispersion
  \[200 \text{ km/s (CGs)} \ll 500\sim1000 \text{ km/s (clusters)}\]

- High Fraction of ETGs
  \[> 60\% \approx \text{clusters}\]

- Small size
  \[< 150 \text{ kpc} \approx \text{typical size of the BCGs}\]

“Compact groups are a fascinating laboratory for studying galaxy interactions and evolution.”

(Sohn et al. 2015, JKAS)
Compact Groups of Galaxies

<μ> ≤ 26 mag arcsec² (compactness)

3μθ
No bright (Δm<3) galaxy (isolation)

μθ (~ few arcmin)

N (Δm≤3) ≥ 4 (population)

Only photometric constraints!!!

Selection criteria suggested by Hickson (1982)
Compact group catalogs

- Hickson 1982: 100 compact groups
- McConnachie et al. 2009: 77,088 tentative compact groups (SDSS DR6)
- Sohn et al. 2015: 332 compact groups with complete spectroscopic redshifts (SDSS DR12, FLWO/FAST, & literatures)
- Sohn et al. (in prep.): ≥ 2000 compact groups selected with a FOF algorithm (SDSS DR12)
Member galaxies in compact groups evolve ( ).

Graduate students are getting old ( ).

① rapidly
② rapidly x 2
③ rapidly x 5
④ rapidly x 10
⑤ rapidly x $10^{10.5}$
Compact groups are dominated by red sequence galaxies (Bitsakis et al. 2010, 2011; Walker et al. 2013; Sohn et al. 2013; Coenda et al. 2015).

MIR colors are powerful tools to peer into the late-stage of galaxy evolution (G.-H. Lee et al. 2015).
Galaxy transition in compact groups occurs much faster than in clusters.