

The Influence of Cluster Mergers on Galaxy Formation



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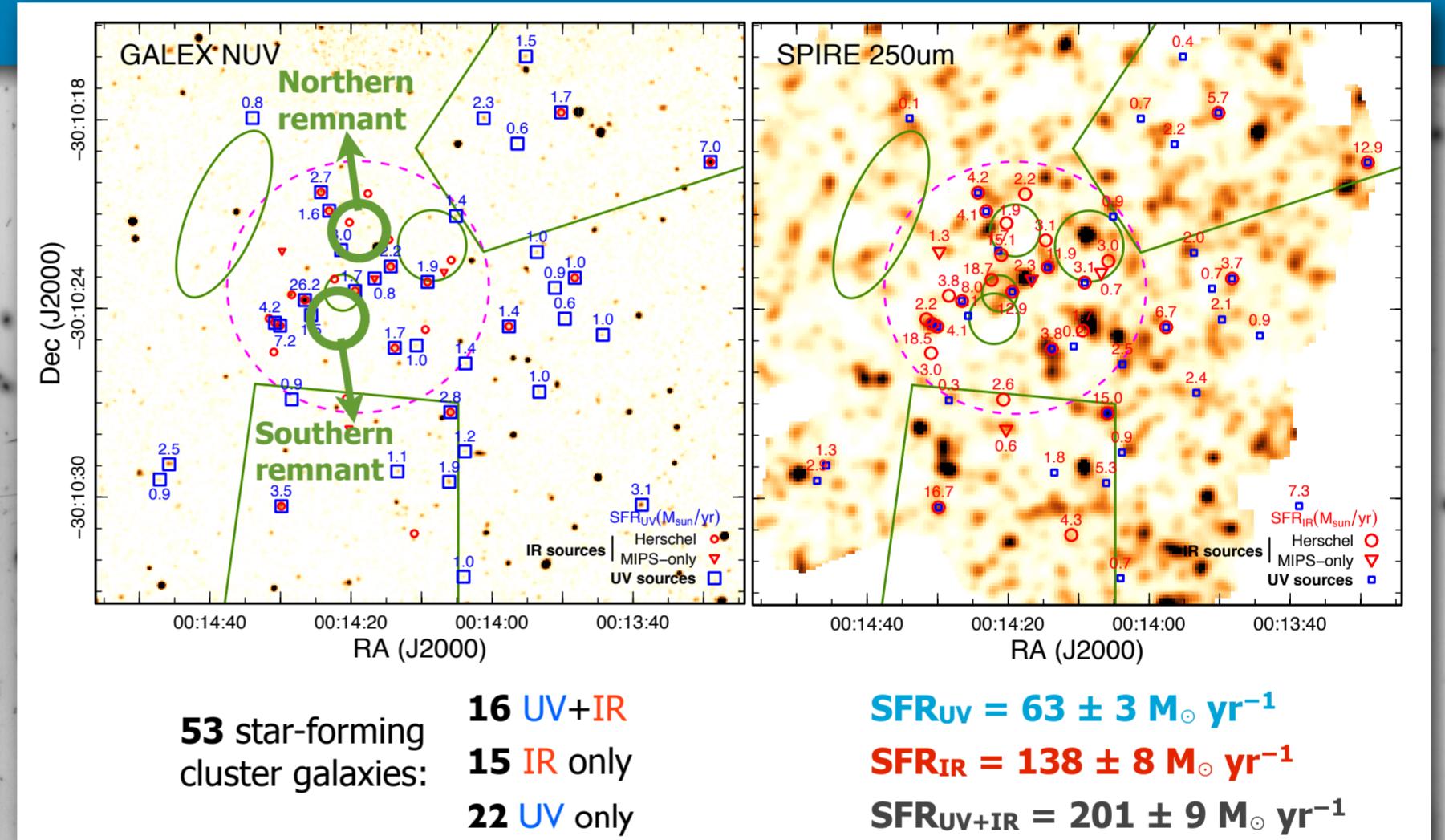
Optical / Lensing / X-ray [NASA/ESA/ESO/Merten+11]

- Chandra X-ray (120ks)
- GALEX UV
- ESO2.2m WFI U-band **SFR_{UV}**
- HST optical (including HFF ultra-deep)
- CTIO NEWFIRM J and K_s
- Spitzer IRAC (3.6, 4.5, 5.8, 8μm)
- WISE (3.6, 4.6, 12, 22μm)
- Spitzer MIPS 24μm **SFR_{IR}**
- Herschel PACS 100, 160μm
- Herschel SPIRE 250, 350, 500μm
- 447 cluster spec-zs

We explore multi-band imaging of the HST Frontier Field **Pandora's cluster** (Abell 2744), assessing the influence of a massive cluster merger on the evolution of constituent galaxies (**Rawle+14**).

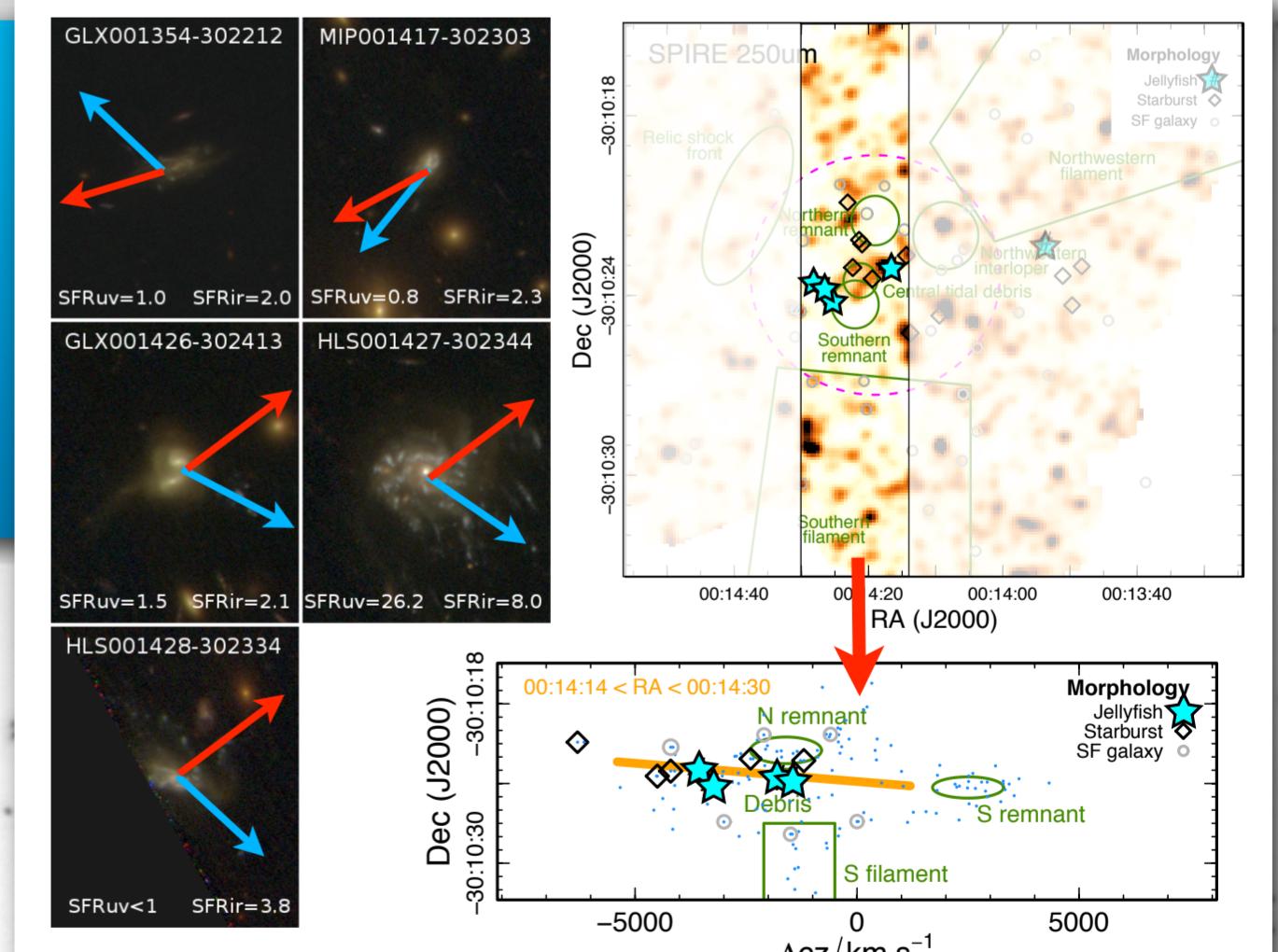
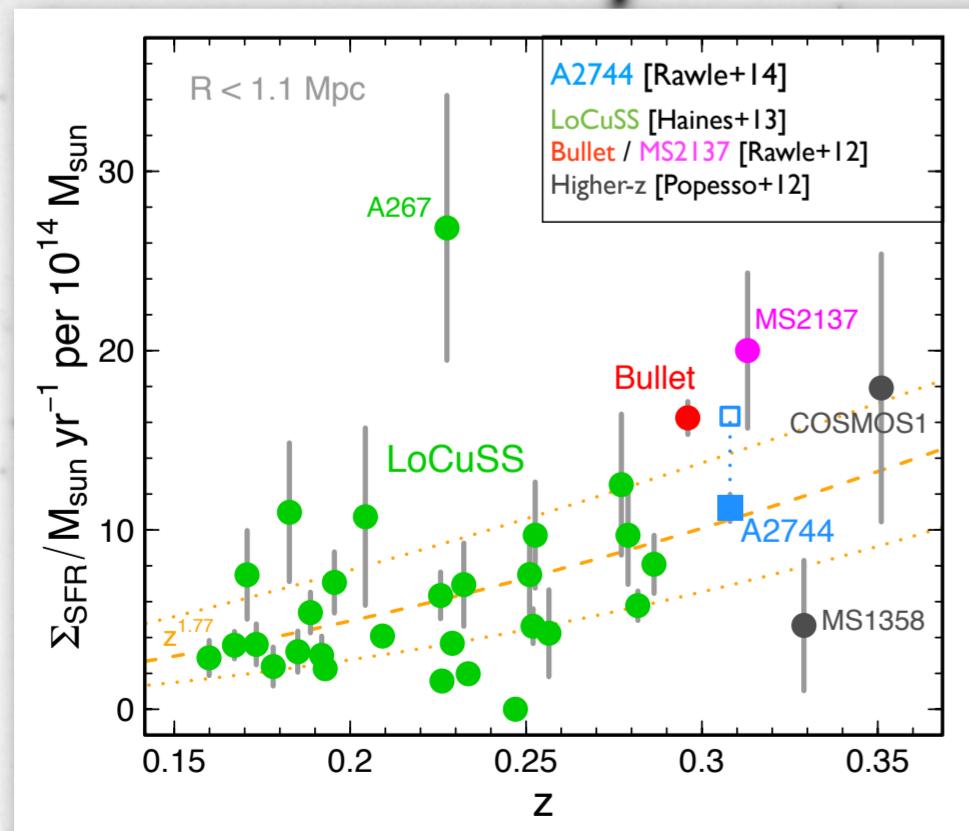
Earlier studies identified a Mach 3 central merger (Kempner&David04, Boschin+06, Owers+11), comprising a **southern “bullet-like” remnant**, moving southwards and away from us, and a (3x) more massive **northern remnant** heading north and towards the observer.

Combining deep IR coverage from **Spitzer** and **Herschel** (which traces ongoing, dusty star formation) with UV imaging from **GALEX** (which probes unobscured young stars), we are able to constrain **total star formation** within galaxies, in the context of the known cluster substructure.



We discover five galaxies with “**jellyfish**” morphologies, long tails and knots of star formation, resulting from gas stripping by ram pressure. The phenomenon is widespread in local clusters (e.g. Smith+10), where it has been demonstrated that the tail orientation indicates the dynamic axis.

In A2744, the tail (blue arrow) is generally orthogonal to the direction of the cluster centre (red arrow), ruling out simple cluster in-fall. Isolating the central merger in RA, we find that **the passage of the shock front associated with the bullet component leaves a trail of galaxy transformation**, including both star formation (starbursts) and significant stripping (jellyfish).



In A2744, the merger has a **net-zero effect on total obscured star formation** (solid symbol), but may enhance unobscured activity (open symbol), such as jellyfish.

Bulk IR properties are not systematically correlated with the existence of a recent merger (e.g. A2744, Bullet, MS1358), but a larger sample of clusters probed by UV+IR total star formation is required for confirmation.