

Contents

| | |
|---|-----------|
| 1. Introduction | 1 |
| 1.1. Background | 1 |
| 1.2. Physics of a merger | 3 |
| 1.2.1. Criteria for merging | 4 |
| 1.2.2. Structure of ongoing mergers and merger remnants | 4 |
| 1.3. Measuring the incidence of galaxy mergers on mass growth | 6 |
| 1.3.1. Pair and merger fractions | 7 |
| 1.3.2. Post-merger galaxies | 7 |
| 1.4. Merging in clusters or “pre-processed”? | 8 |
| 1.5. This work | 8 |
| 1.5.1. Aims | 9 |
| 1.5.2. Outline | 9 |
| 2. Previous work and a description of the Coma cluster | 10 |
| 2.1. The Coma cluster: A description | 12 |
| 2.1.1. Dynamical properties and evolutionary state | 13 |
| 3. Data description and the sample of Coma red sequence galaxies | 14 |
| 3.1. The Coma Treasury Survey: Carter et al. (2008) | 15 |
| 3.1.1. Spatial coverage | 16 |
| 3.1.2. Pixel scale, resolution and limiting magnitudes | 17 |
| 3.1.3. SExtractor photometric and structural parameter catalogues | 18 |
| 3.2. Radial velocities | 18 |
| 3.3. Red sequence galaxies | 19 |
| 3.4. Stellar masses | 20 |
| 4. Pairs and post-mergers in the red sequence: Selection methods and results | 25 |
| 4.1. Pair selection | 25 |
| 4.2. Pair likelihood | 27 |
| 4.3. Morphological inspection of Galaxies | 29 |
| 4.3.1. <i>ellipse</i> models | 30 |
| 4.3.2. GALFIT models | 33 |
| 4.4. Morphological inspection of galaxies in the pair sample | 36 |
| 4.4.1. 125930.824p275303.05 & 125931.893p275140.76 | 36 |
| 4.4.2. 125944.407p275444.84 & 125942.301p275529.15 | 37 |
| 4.4.3. 130028.370p275820.64 & 130027.966p275721.56 | 38 |

| | | |
|-----------|---|-----------|
| 4.4.4. | 125943.721p275940.82 & 125938.321p275913.89 | 39 |
| 4.4.5. | 130018.873p280033.38 & 130017.641p275915.27 | 40 |
| 4.4.6. | 130012.868p280431.74, 130008.003p280442.81, & 130011.143p280354.91 | 40 |
| 4.5. | Morphological inspection of galaxies in the Red Sequence | 42 |
| 4.5.1. | Single component models | 42 |
| 4.5.2. | Double component models | 43 |
| 4.5.3. | Triple component models | 45 |
| 4.6. | Asymmetry of galaxies in the pair sample | 47 |
| 5. | Dry merger rate and post-merger fraction | 51 |
| 5.1. | Pair fraction and merger rate | 51 |
| 5.2. | Post-merger fraction | 53 |
| | Conclusions | 56 |
| | Bibliography | 72 |

List of Tables

| | |
|---|----|
| 2.1. Fraction of Post-mergers, Interacting, Pair, and Faint Companion Galaxies among cluster's red sequence galaxies. | 12 |
| 3.1. Main properties of the spectroscopic-complete sample of Coma red sequence galaxies | 23 |
| 3.1. Main properties of the spectroscopic-complete sample of Coma red sequence galaxies | 24 |
| 4.1. Galaxies belonging to selected pairs/triplets by projection and velocity proximity | 28 |
| 4.2. Structural decomposition parameters for galaxies fitted with a single Sersic component | 43 |
| 4.3. Structural decomposition parameters for galaxies fitted with two Sersic components. | 44 |
| 4.4. Structural decomposition parameters for galaxies fitted with three Sersic components. | 46 |
| 4.5. Asymmetries for the training set galaxies extracted from the Frei catalog. . . | 49 |
| 4.6. Asymmetries 13 galaxies in the projected pair sample. | 50 |
| 5.1. Sub-clusters in the central region of the Shapley supercluster | 62 |

List of Figures

| | |
|---|----|
| 1.1. Merger criteria for the $\hat{E} - \hat{L}$ plane | 3 |
| 1.2. Examples of features observed in perturbed galaxies | 5 |
| 2.1. Post-merger fraction found in Sheen et al. (2012) | 11 |
| 3.1. Angular resolution comparison for IC3973 | 15 |
| 3.2. Limiting surface brightness comparison | 16 |
| 3.3. Complete and observed footprint of the Coma Treasury survey | 17 |
| 3.4. Found red sequence of galaxies on Coma | 19 |
| 3.5. Radial velocity distribution and positions of red sequence galaxies | 22 |
| 4.1. NGC 4898: A case of extreme overlapping | 26 |
| 4.2. Distribution of the 13 'possible pair' galaxies | 27 |
| 4.3. Isophotal radial profiles using <i>ellipse</i> | 32 |
| 4.4. Sample mask image used in GALFIT modeling | 34 |
| 4.5. 1-component versus 2-component GALFIT models | 36 |
| 4.6. IC3973 and 125931.893p275140.76 | 37 |
| 4.7. NCG 4876 and PGC 44649 | 38 |
| 4.8. IC 4030 and IC 4033 | 39 |
| 4.9. PGC 44656 and PGC 44636 | 40 |
| 4.10. 130018.873p280033.38 and 130017.641p275915.27 | 41 |
| 4.11. IC 4012, PGC 44723 and 130011.143p280354.91 | 41 |
| 4.12. Training sample galaxies for asymmetry calculations | 49 |
| 5.1. F814W image and residuals of IC 3973 | 54 |
| 5.2. Caustic diagram for galaxies in Sheen et al. (2012) and Coma | 60 |
| 5.3. Density map of the Shapley supercluster | 61 |
| 5.4. Post merger galaxy residuals in the Shapley supercluster | 62 |
| 5.5. Fraction of perturbed galaxies in Shapley as a function of R/R_{200} | 63 |