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Off-nuclear starburst in a triple merger

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Abstract. We present SINFONI observations of IRAS 19115-2124, dubbed the Bird, an intriguing triple galaxy encounter. NIR line strengths and line ratios are used to study the sequence of events in this complex system. The most massive and obscured component shows LINER-like activity, while the least massive irregular component is the source of 3/4 of the current total SF. This most recent compact starburst lies 3 kpc away from the dynamically dominant components. Cool and warm gas inflows and outflows are detected at the locations of the progenitor nuclei.

1. Introduction

Nearby LIRGs and ULIRGs allow us to study in detail key processes affecting galaxy evolution over all cosmic times. Strong star-formation (SF) is coupled with the beginnings of the active stage of super-massive black hole growth and morphological transformation of galaxies. Galaxy wide winds, gas outflows powered by nuclear starbursts and/or AGN, affect the evolution of galaxies by suppressing further SF. (U)LIRGs harbour large amounts of molecular gas and dust, and the inferred rich molecular chemistry can be used to probe the different phenomena related to the SF and AGN activity.

2. IFU observation of the Bird

IRAS 19115-2124, The Bird, is a LIRG just below the ULIRG classification limit. It has all the ingredients of a prototypical central-starburst dominated gas-rich merger on its way to becoming an obscured AGN and later a massive elliptical. There are two $M_{dyn} \sim 5 \times 10^{10}$ $M_{\odot}$ nuclei in an advanced interaction (Väisänen *et al.* 2008), with large 20 kpc tidal tails and evidence of bars in the nuclear regions facilitating the flow of gas into the central merging nuclei. Our NIR adaptive optics imaging revealed a previously undetected third minor component, and low spatial resolution Spitzer imaging surprisingly suggested that the LIRG-level SF activity in the system is related to this smallest component.

We have now obtained VLT/SINFONI IFU spectroscopy of the target to further study its evolutionary state. Paα maps confirm that the majority of SF originates in the smallest off-nuclear component. The H2/Paα ratio is highest, LINER-like, at the most evolved massive component, while the ratio is pure starburst-like at the minor position. [FeII]/Paβ ratios place the youngest SF in the core of this latter component. In addition, H2 maps show evidence for system-wide shocks, while gas inflows and outflows are detected in the complex velocity fields over all the three nuclei. The third component has an unusually high velocity offset of ∼300 km/s compared to the major nuclei. Observations suggest the main components to be evolved past their first starburst-phase, while the third component is now shocking the system to a new LIRG-phase.

Reference

Vaisanen, P., *et al.* 2008, *MNRAS*, 384, 886