

Dissecting the Bird: an off-nuclear LIRG starburst and gas flows in a triple merger

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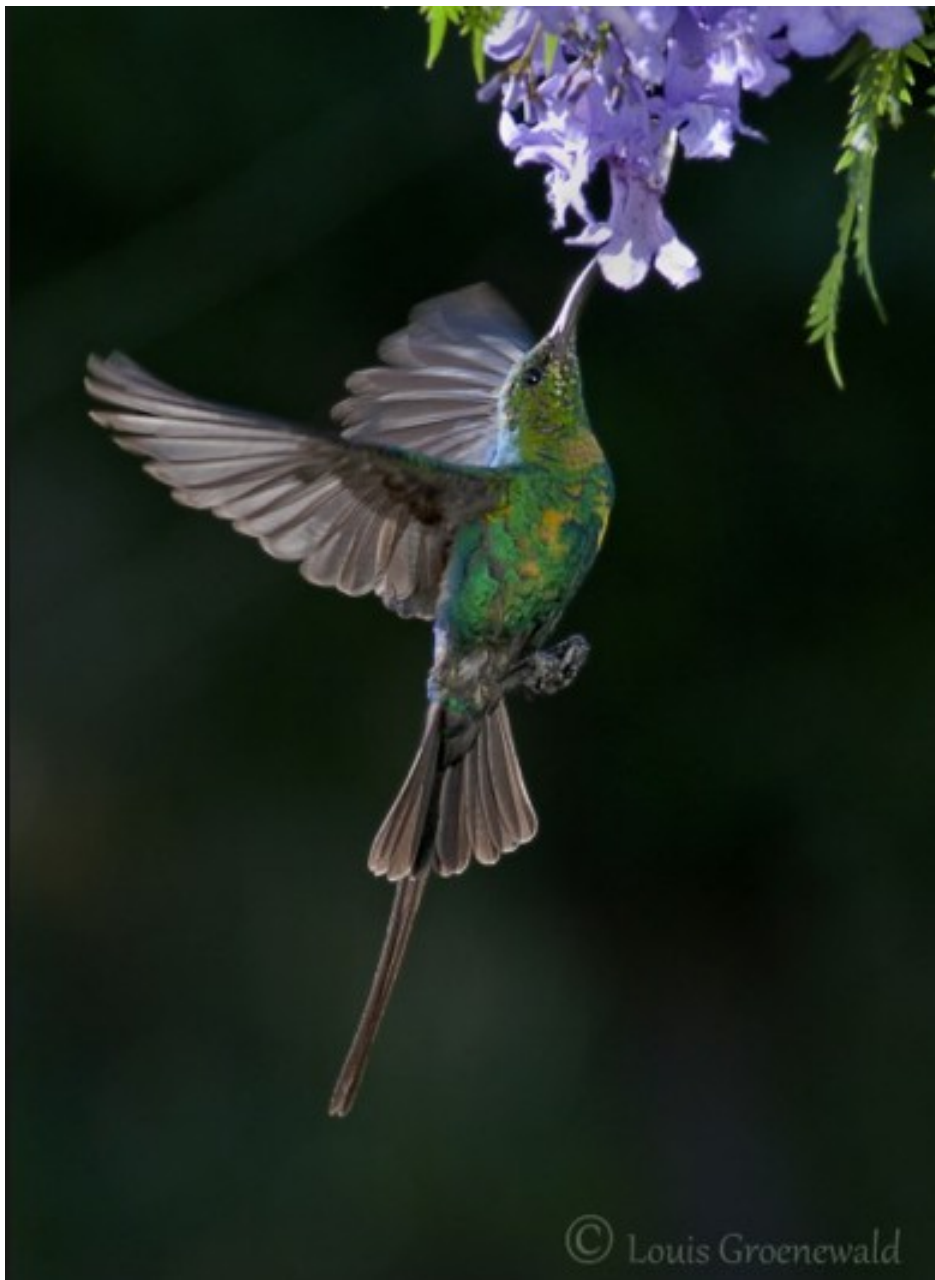


Turun yliopisto
University of Turku

Sharp Eyes on European Skies
Cambridge, U.K., Sep 2015



Finnish Centre for Astronomy with ESO



SUNBIRD -
~~**SU**per**NO**vae **B**ared by
In**FR**a**RE**D **D**etection~~

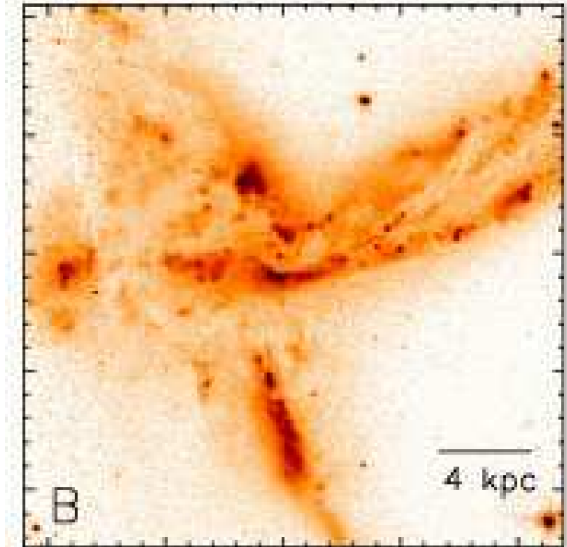
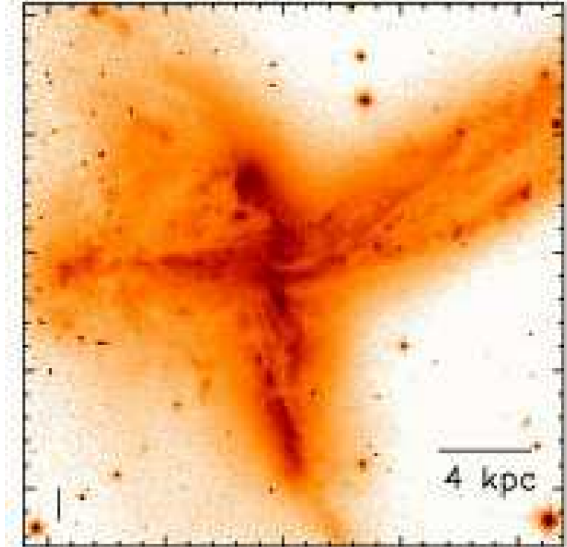
SUper**NO**vae & star**B**ursts
in **I**n**FR**a**RE**D

Spatially resolved history
of SFR in LIRGs:

- triggering of SF
- galactic winds
- metallicity gradients
- stellar populations
- super star clusters

The Bird: Introduction

- Nearby (U)LIRGs allow to study in detail the key mechanisms at play in galaxy evolution
- Strong SF is coupled with AGN growth and morphological transformation of galaxies
- Gas outflows powered by nuclear starbursts and/or AGN suppress further SF
- Large amounts of molecular gas and dust, probe the SF and AGN activity
- **IRAS 19115–2124** (aka **Bird**): gas-rich LIRG (L(IR) $\sim 8 \times 10^{11}$ Lsun; SFR ~ 190 Msun/yr) starburst merger
- Two Mdyn $\sim 5 \times 10^{10}$ Msun nuclei in an advanced interaction (**Body** and **Heart**), with large tidal tails and nuclear bars
- No evidence for AGN



HST/ACS BI-bands

The Bird: Introduction

- But: NIR adaptive optics and Spitzer 24 μm imaging showed that SF is dominated by third component, **Head**
- Here: VLT/SINFONI integral field spectroscopy of this rare triple merger to study its evolutionary state

VLT/NACO Ks-band

head
heart
body

Väisänen et al. 2008

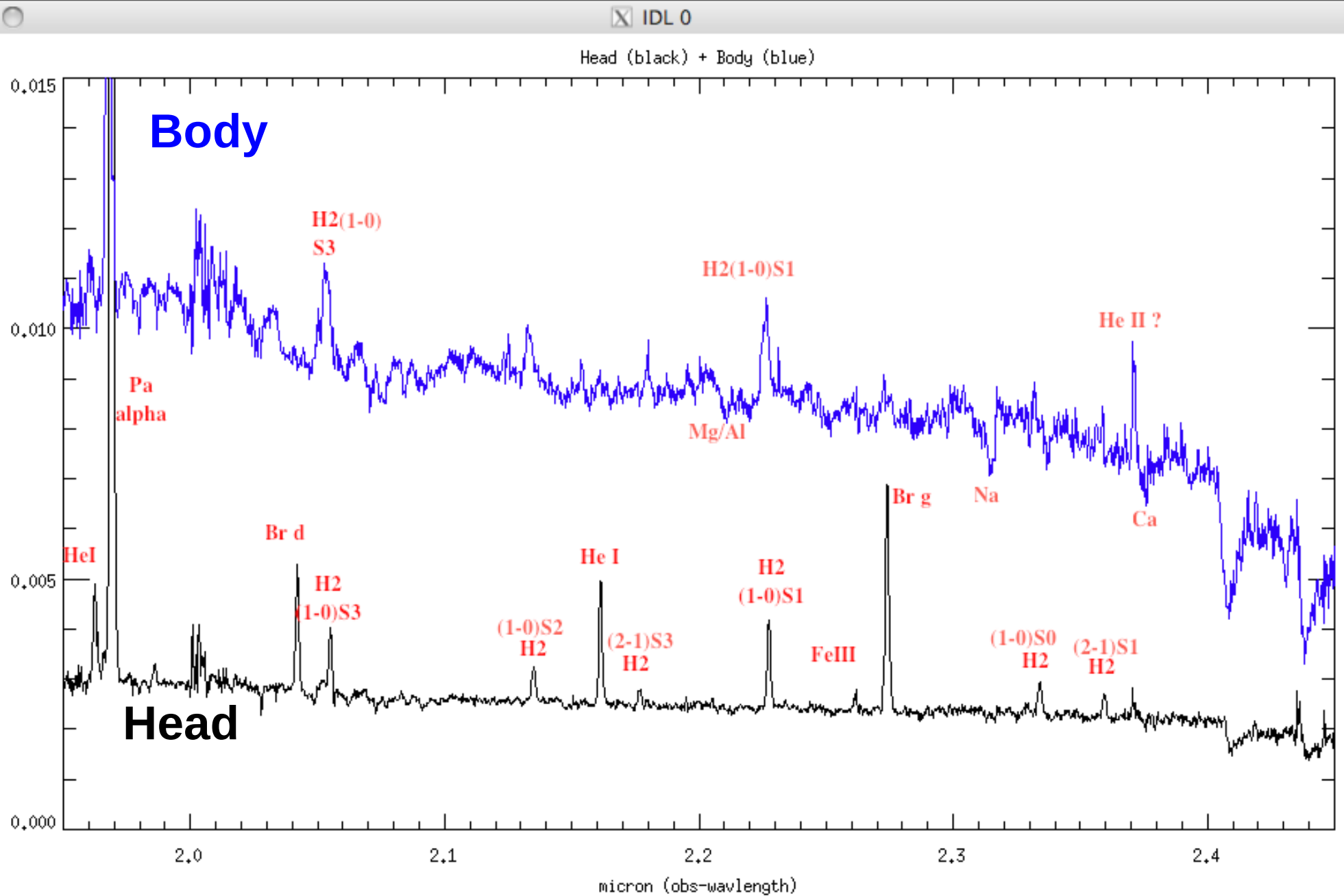
BIKs three-colour image

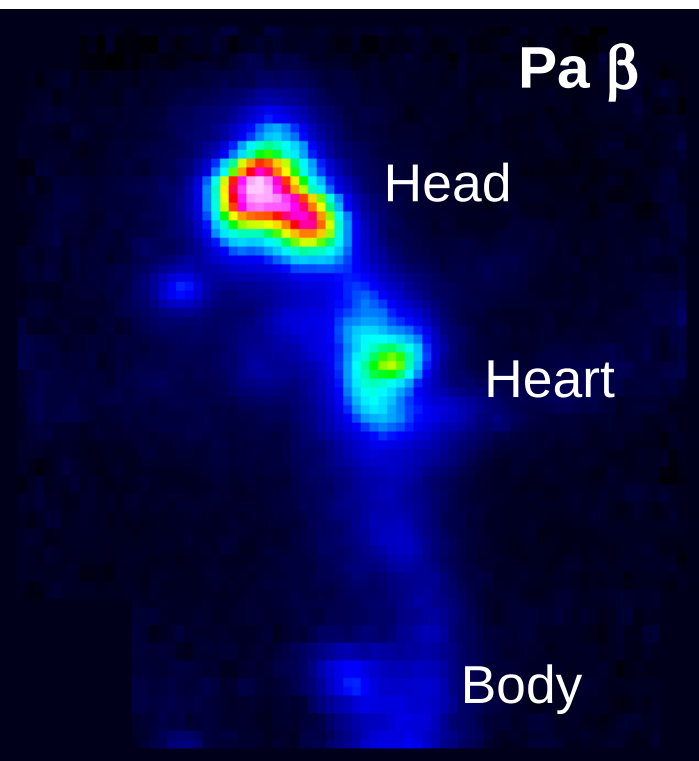
Bird

— 0.1m*

— 0.4m*

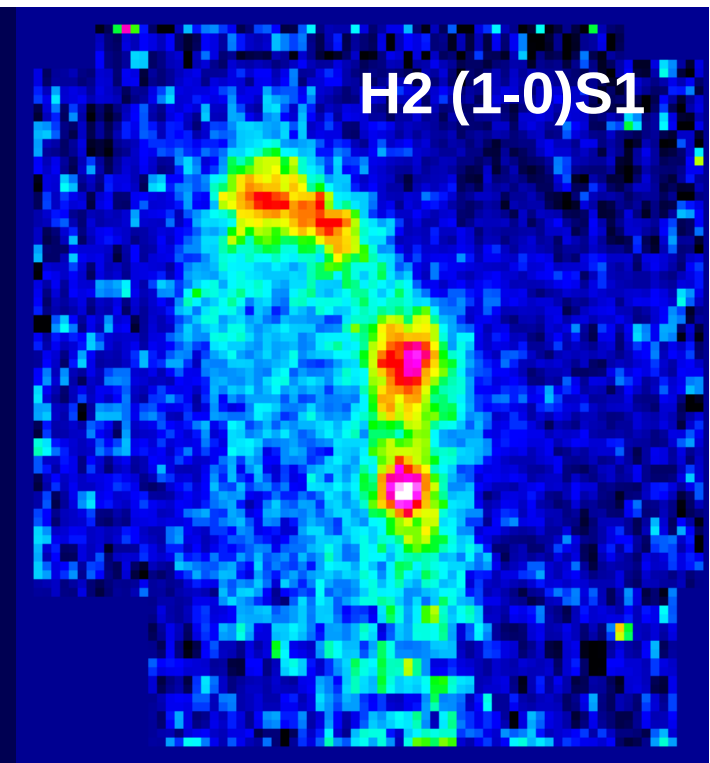
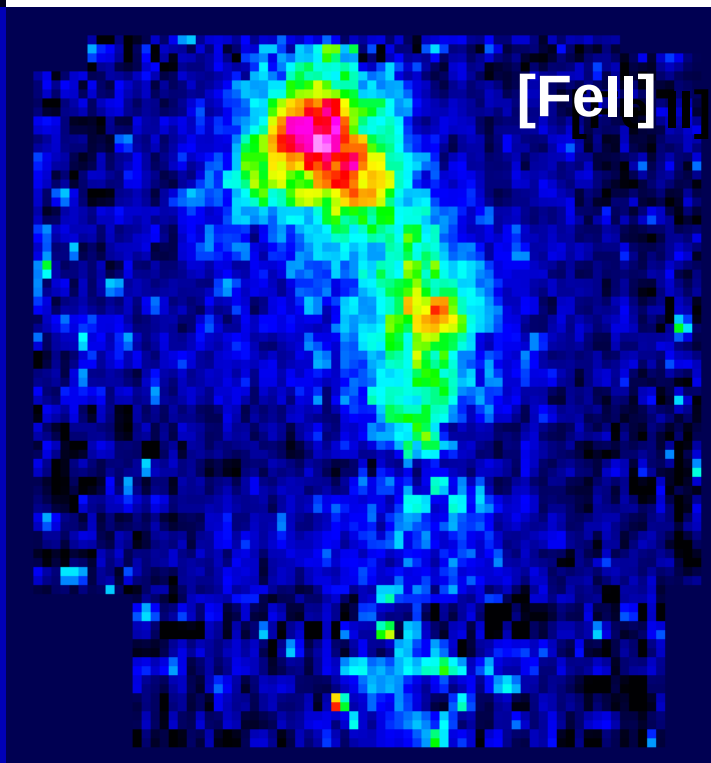
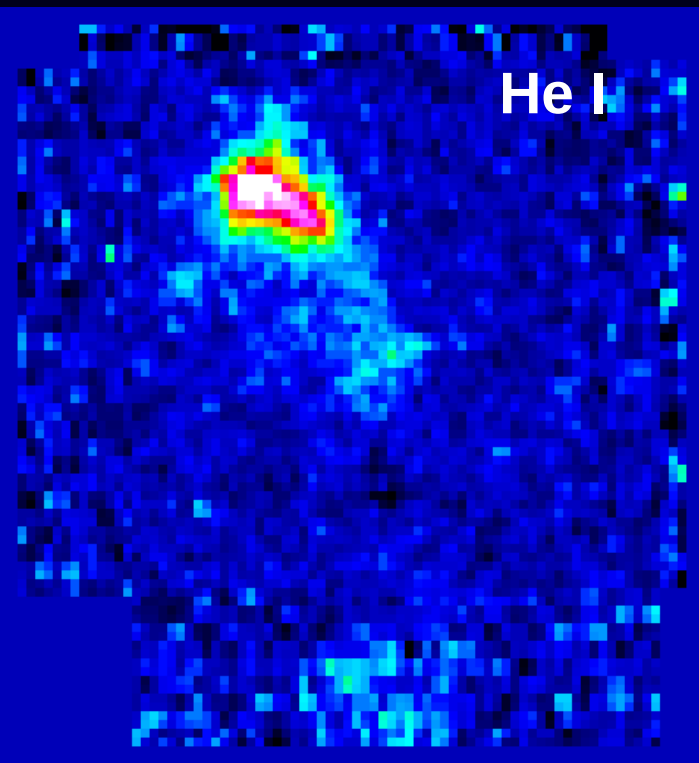
VLT/SINFONI NIR spectra





VLT/SINFONI NIR spectra

- **Pa β : Head** produces 80% of current SF (up to 10 Myr) => LIRG
- **He I**: the youngest SF in the **Head**.
- **[FeII]**: ~ 30 Myr population around **Head** and **Heart**.
- **H2 1-0 S(1)**: molecular gas more diffuse
- Has SF at **Body** been quenched?

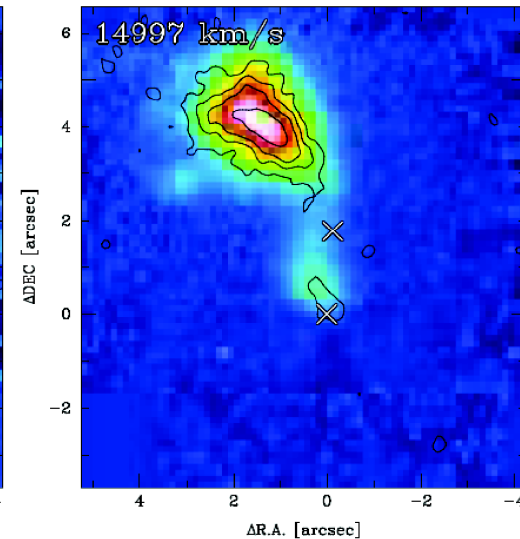
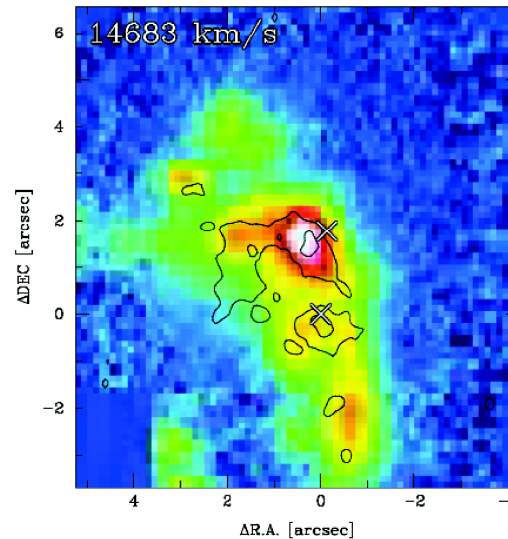
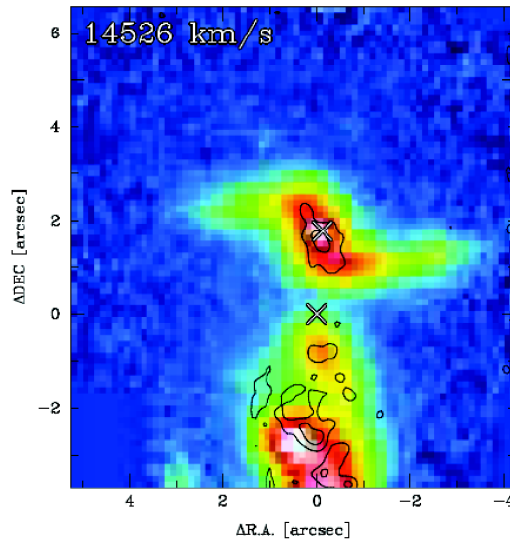
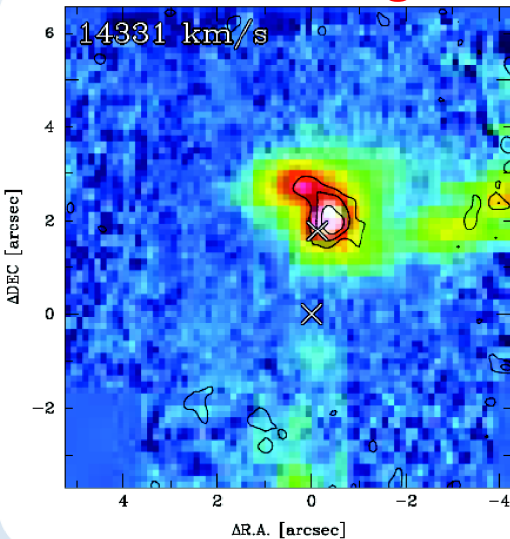
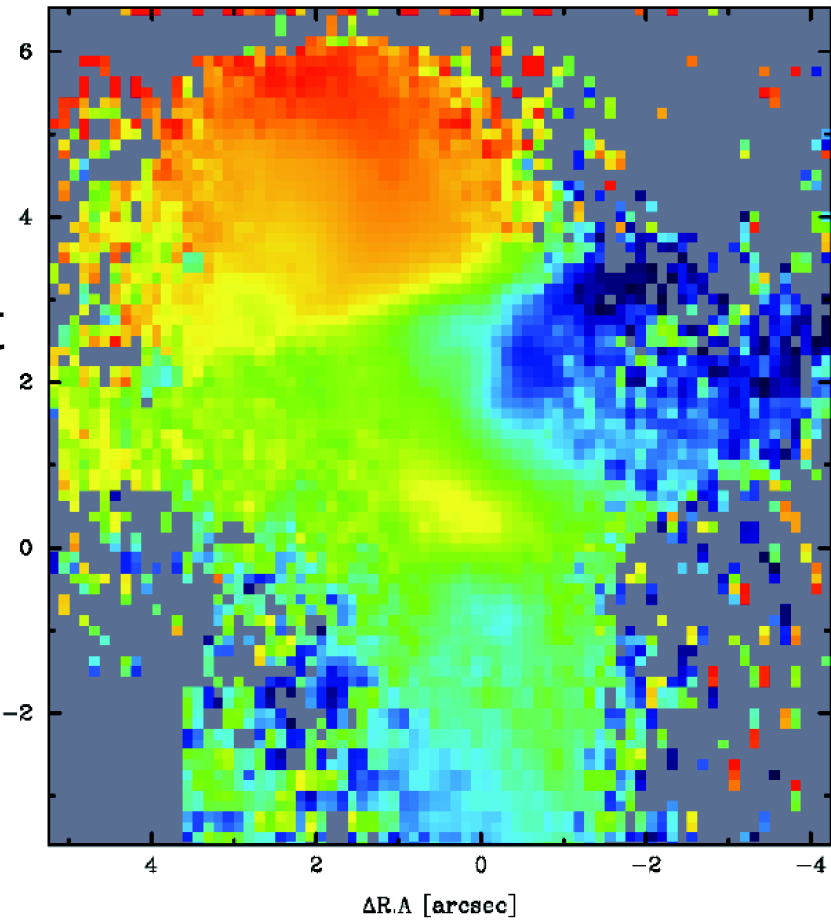


Velocities and flows

- Complex: wings and **Heart** spiral perpendicular to vertical velocity structure; **Head** is kinematically offset
- Velocity slices of Pa β show outflows and inflows of gas in all nuclei
- Warm and cool gas flows in H α + NaI⁻²

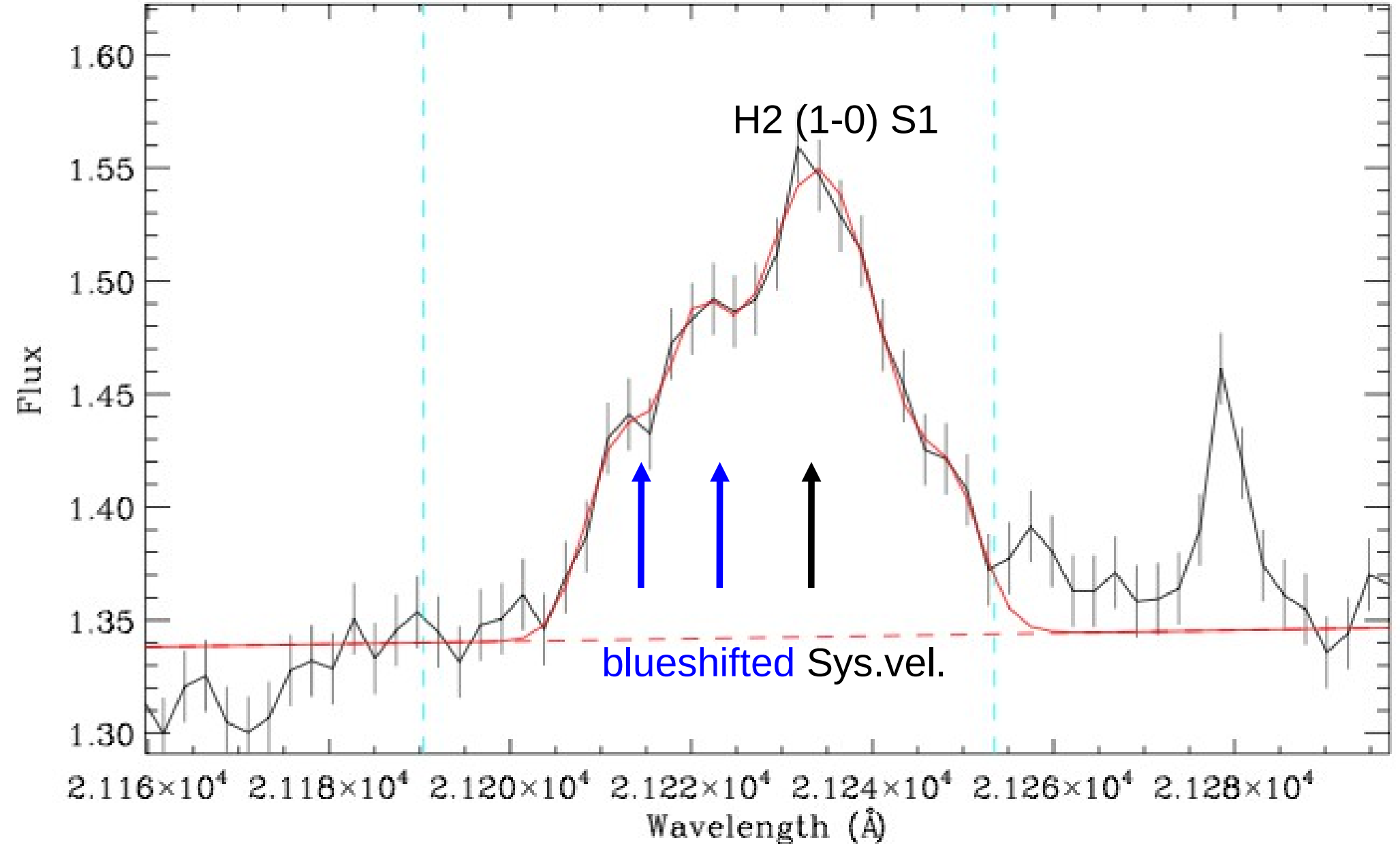
Major nuclei past ULIRG phase, minor one entering ?

PaAlpha vel - 14600 km/s



Velocities and flows

- Multiple blueshifted molecular H₂ velocity components at **Body**
- Outflowing gas causes SF quenching?



Summary

- NIR IFU spectra of the **Bird**: minor off-nuclear starburst component dominates current SF output of this triple LIRG
- Complex velocity fields with in/outflows of gas over all nuclei
- Body and Heart are evolved past their first starburst phase, while Head is shocking the system to a new LIRG phase?
- Local template of clumpy IR-luminous high-z galaxy mergers?

