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A 2D near-infrared study of a sample of local LIRGs and ULIRGs

We are carrying out a large program involving integral field spectroscopy observations of local LIRGs and ULIRGs, with the aim of studying their kinematics, ionization mechanisms, etc. In particular, this study is based on VLT-SINFONI observations covering both H (1.45-1.85 micron) and K (1.90 - 2.50 micron) bands, with an intermediate spectral resolution ($R \sim 3000 - 4000$), a FOV of $\sim 8'' \times 8''$, and spatial resolution of ~ 0.25 arcsec/pixel.

Here I present SINFONI reconstructed maps of the Hydrogen recombination lines (Pa_alpha and the Brackett series), molecular Hydrogen excitation lines and metal lines (HeI, [FeII], [SiVI]...) of a sample of 9 LIRGs and 7 ULIRGs. Since the reddening is less important at infrared wavelengths, we can investigate in detail the different ionizing mechanisms and how they relate with the star formation activity.

A further study of the kinematics and the spatial distribution of the dust will prove the full potential of our dataset.

A 2D NEAR-INFRARED STUDY OF A SAMPLE OF LOCAL LIRGS AND ULIRGS

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The Project

⊙ SINFONI Sample

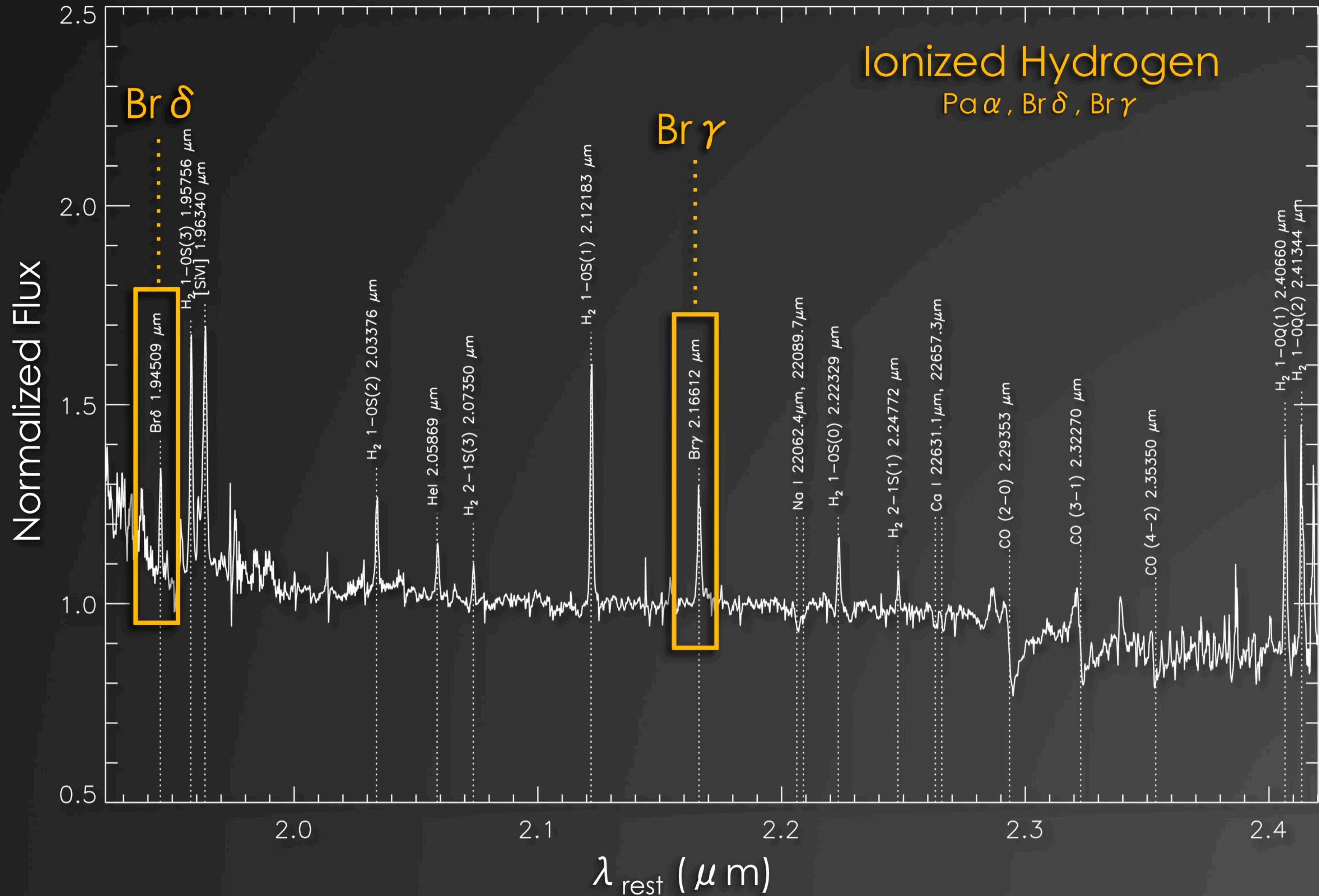
- ⊙ Representative sample of 9 LIRGs and 7 ULIRGs @ $z < 0.1$
- ⊙ H and K bands, $R \sim 3000 - 4000$
- ⊙ FOV $\sim 8'' \times 8''$, spatial resolution ~ 0.25 arcsec/pixel

⊙ We will focus on:

- ⊙ HI recombination lines (Pa α , Br γ and Br δ)
- ⊙ H₂ excitation lines
- ⊙ High excitation and metal lines (HeI, [FeII] and [SiVI])
- ⊙ Stellar component of the spectra (CO bands, NaI...)

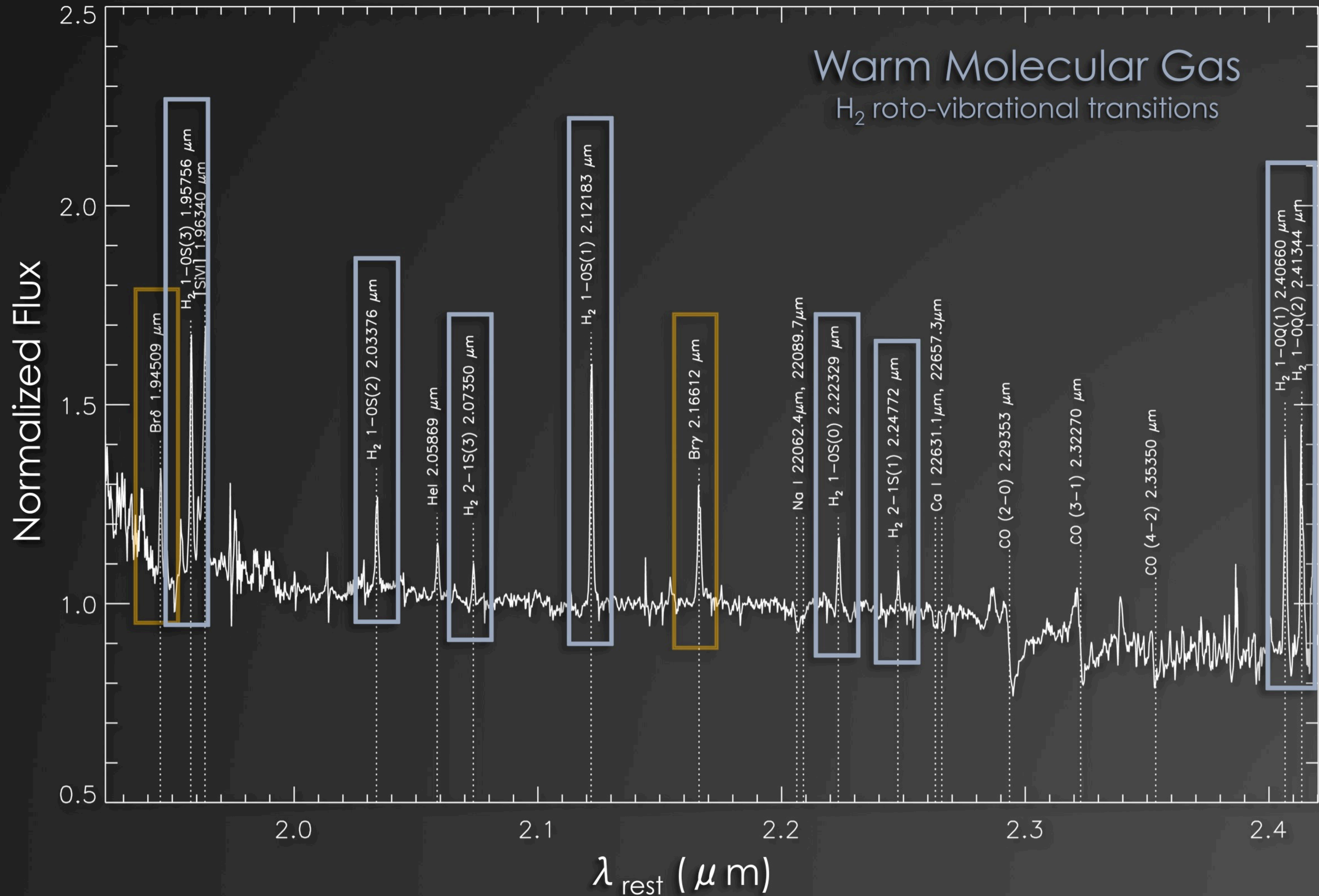
The data: a representative example

NGC5135 - K Band



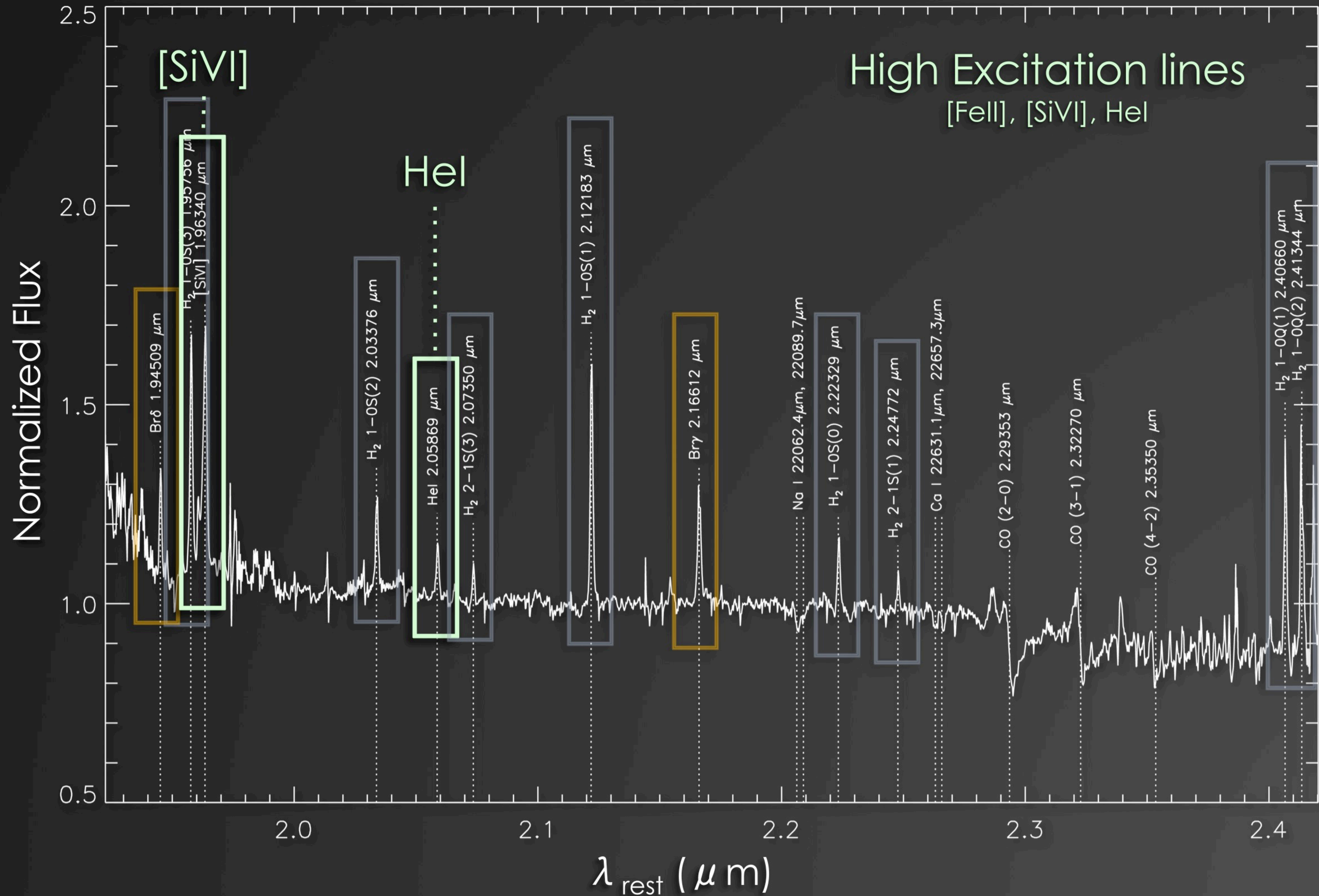
The data: a representative example

NGC5135 - K Band



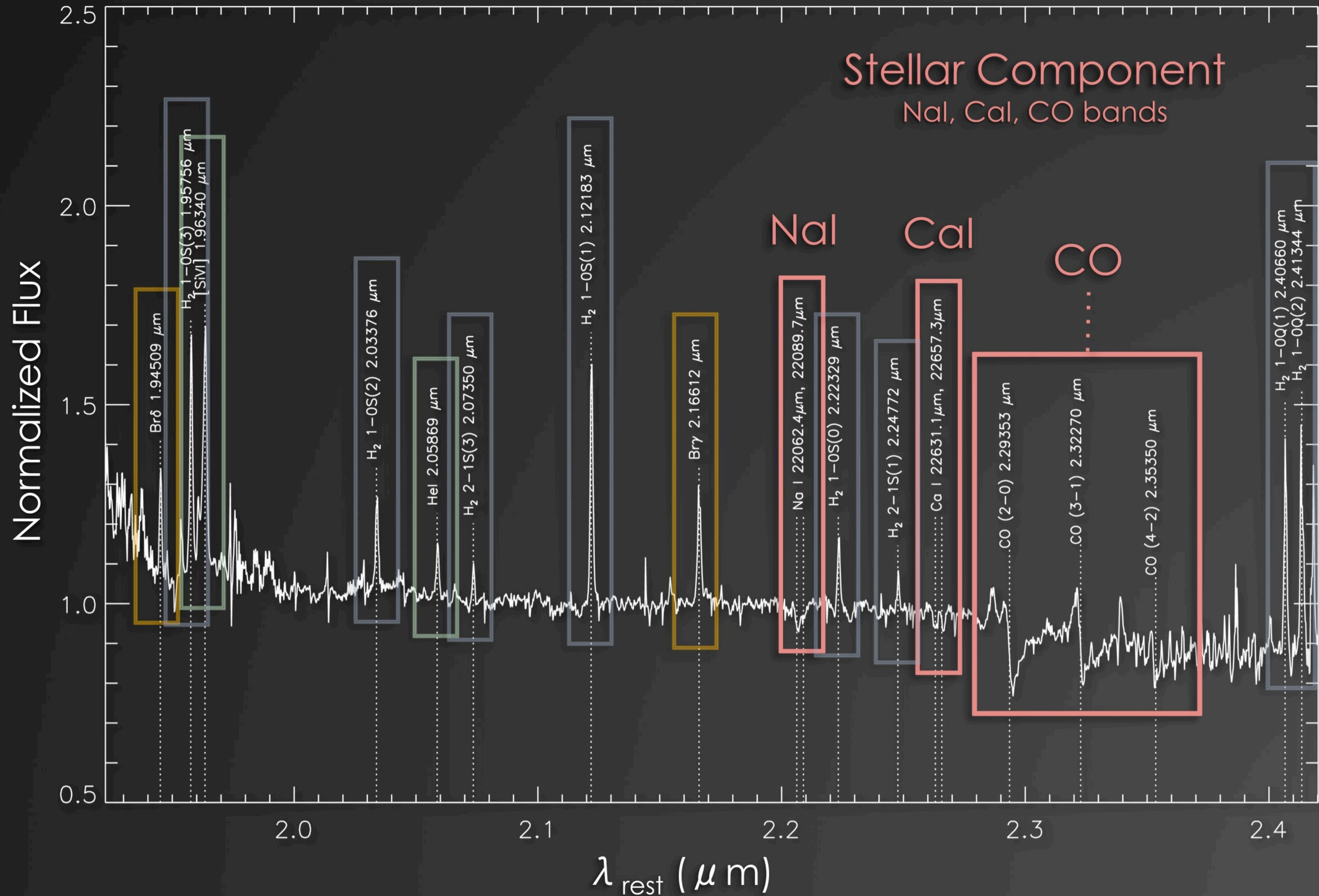
The data: a representative example

NGC5135 - K Band



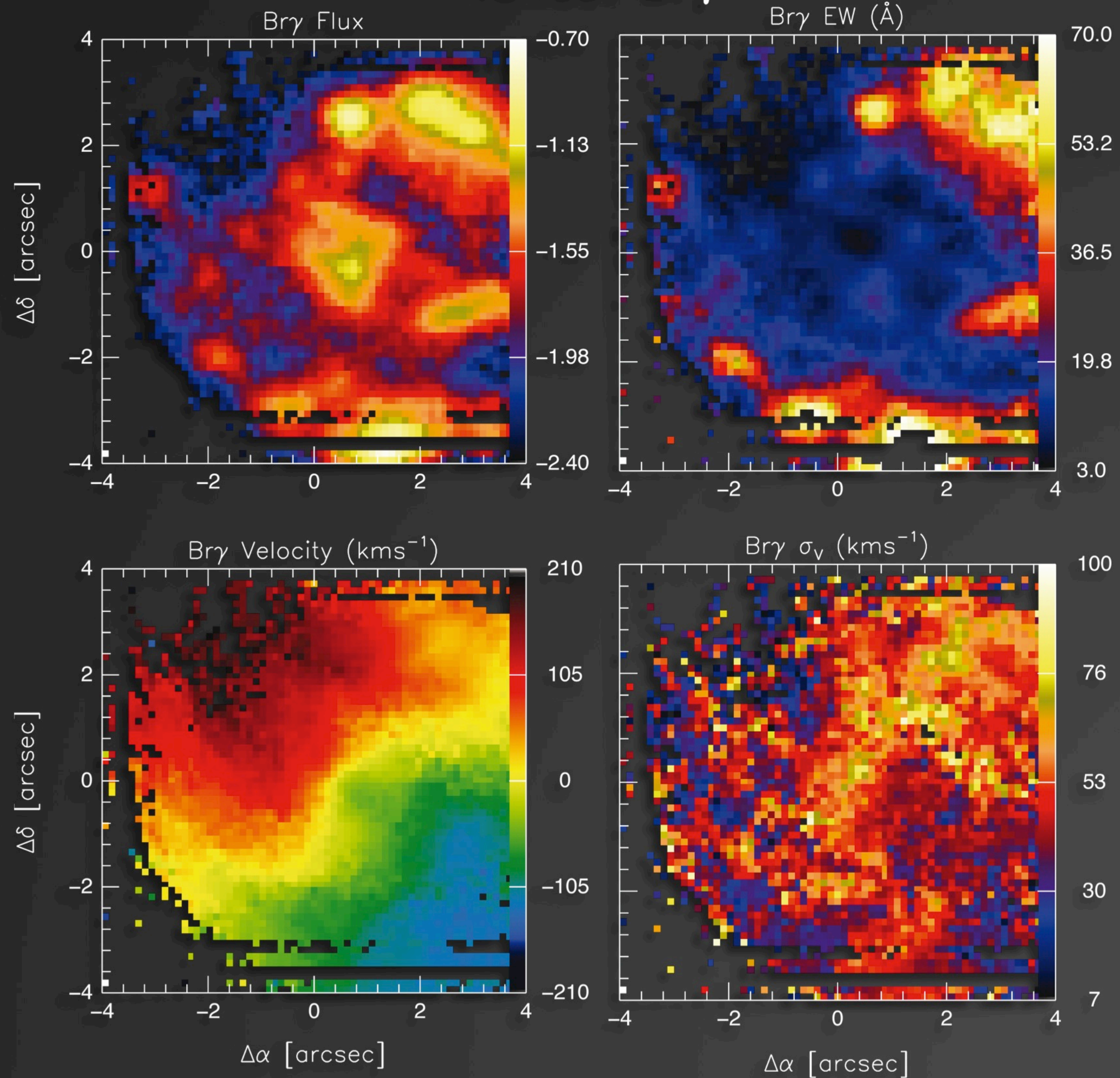
The data: a representative example

NGC5135 - K Band

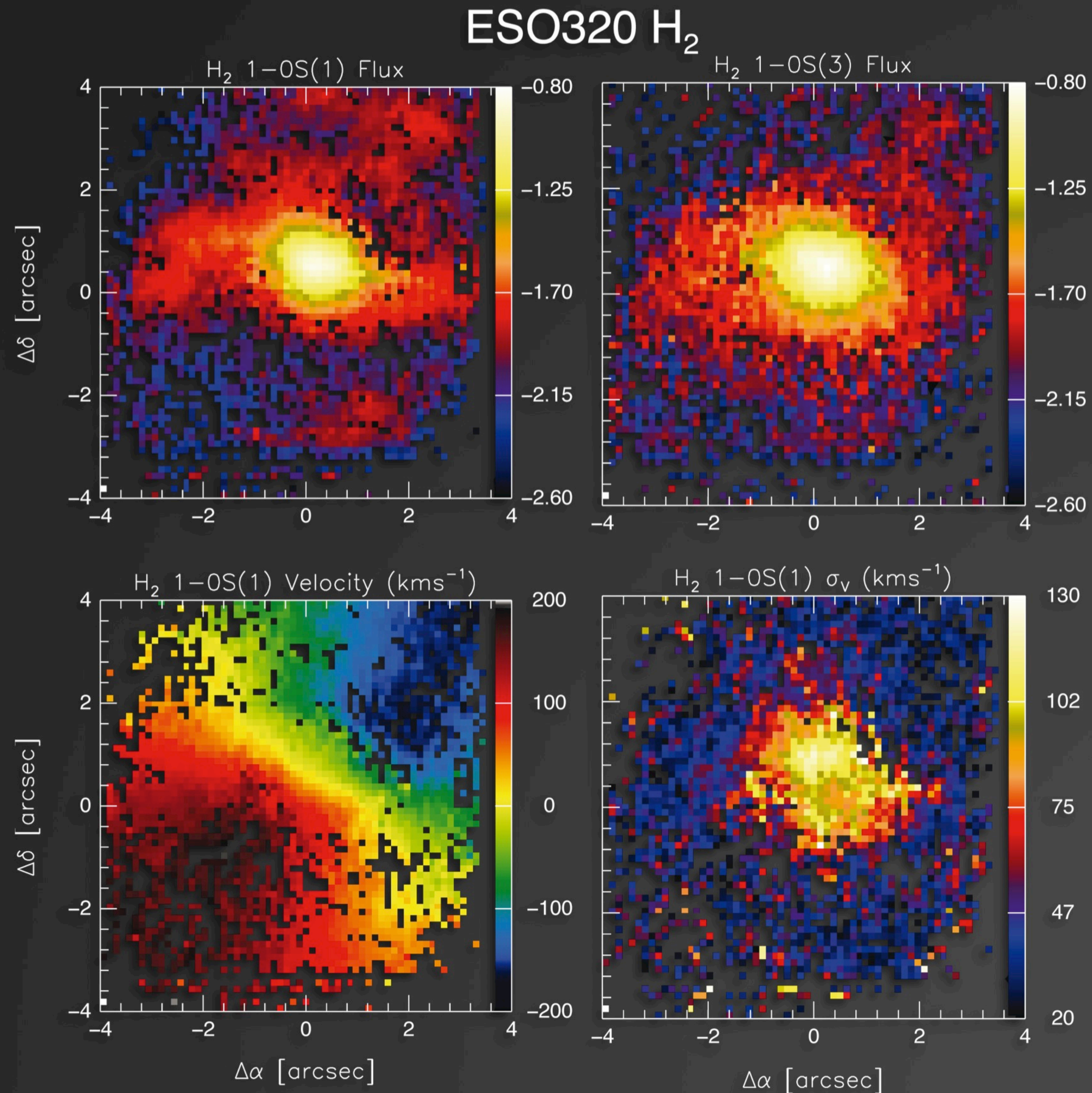


The data: representative examples

IC4687 Br γ

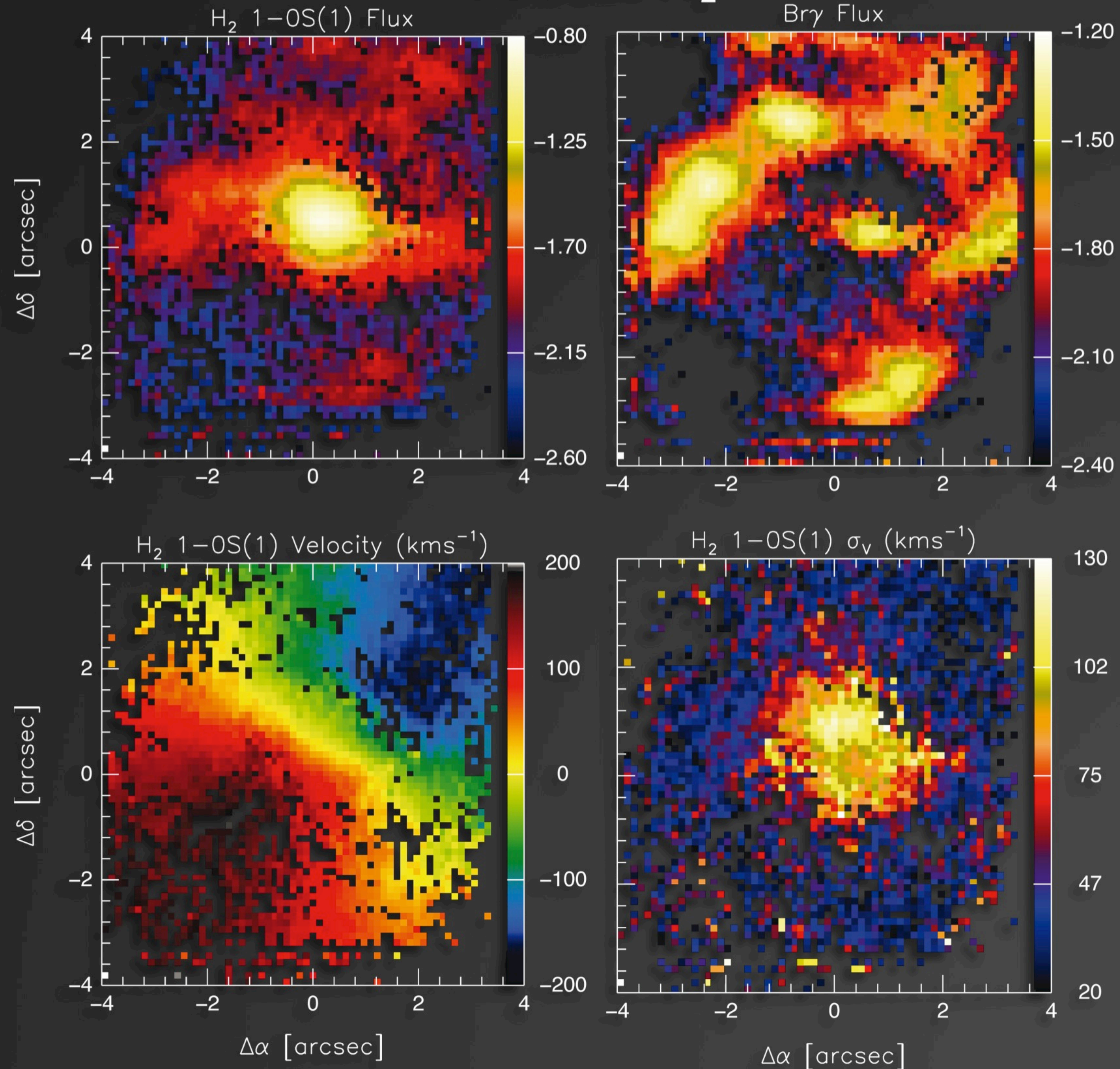


The data: representative examples

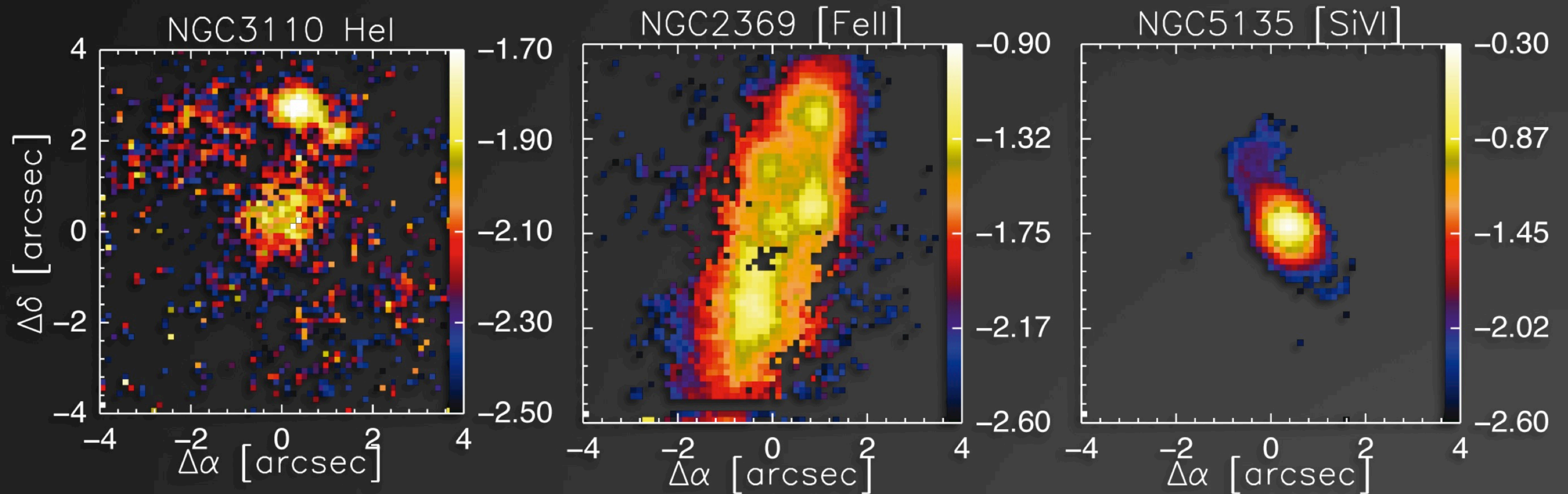


The data: representative examples

ESO320 H₂



The data: representative examples



The Physics behind the scenes

⊙ Ionized Hydrogen

- ⊙ Age estimation of the young stellar population
- ⊙ Dynamical masses
- ⊙ SFR
- ⊙ Internal extinction through $\text{Pa } \alpha / \text{Br } \delta$ and $\text{Br } \delta / \text{Br } \gamma$ ratios

⊙ Molecular Hydrogen

- ⊙ Roto-vibrational transitions
- ⊙ Different mechanisms proposed: UV-fluorescence, thermal collisional excitation by SN, X-rays.

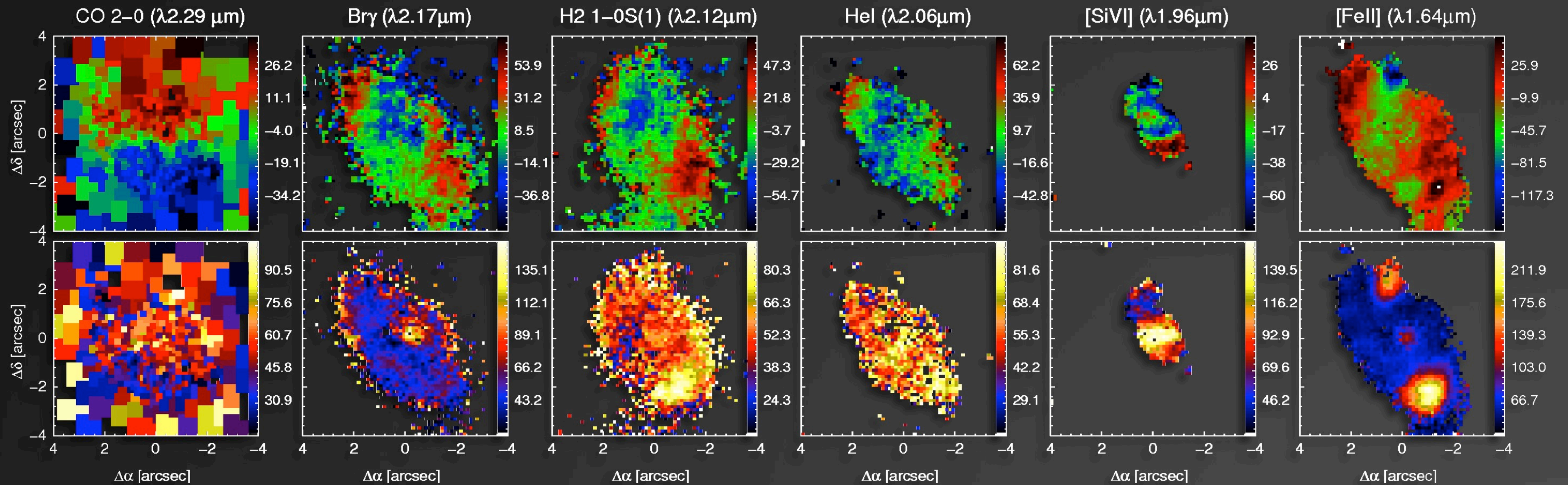
⊙ Other emission lines

- ⊙ *Ionized gas*: He I as a good tracer of the youngest population in SF regions
- ⊙ *Partially ionized gas*: [Fe II] as a SN rate estimator, ionization mechanisms through [Fe II]/Br γ
- ⊙ *Coronal gas*: [Si VI] associated with Seyfert activity

⊙ Stellar component

- ⊙ Stellar population ages using $\text{EW}(\text{CO})$ and $\text{EW}(\text{NaI})$

The data: representative examples



Bedregal, A.G. et al., 2010 (in preparation)