pyHIIExplorerV2: a tool for detecting and extracting physical properties from HII regions.

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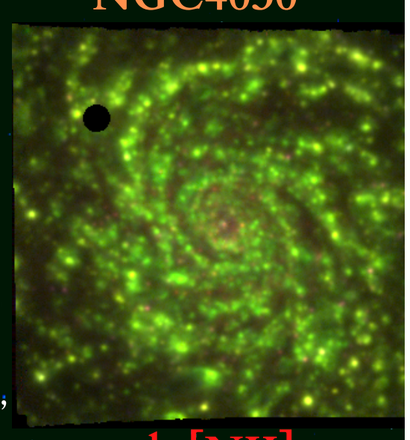
Detecting and extracting

We present pyHIIExplorer V2, a new tool that detects clumpy emission fluxes of H**α**, either from maps or images. The code was intended for high-resolution spectral and spatial data such as MUSE, separates candidates for HII regions and diffuse ionized gas (DIG) with minimal assumptions, decontaminates the fluxes of candidates to HII regions and extracts the information from the underlying stellar populations and emission lines.



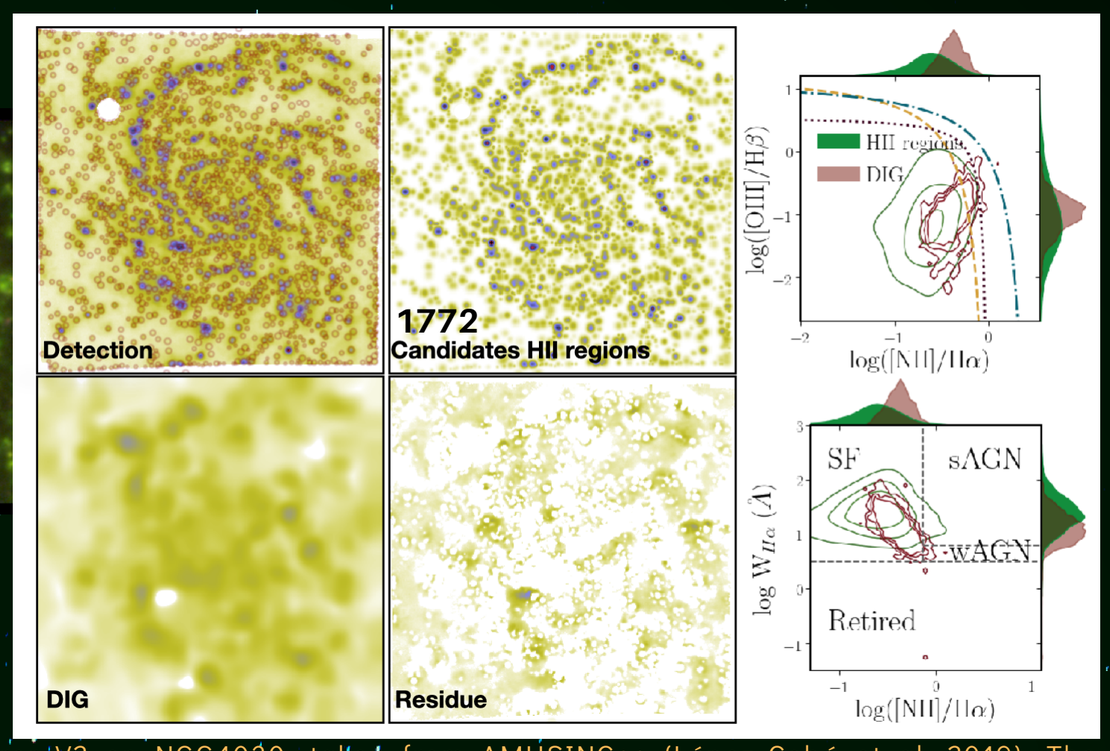


Figure 1. Using pyHIIexplorer V2 on NGC4030, taken from AMUSING++ (López-Cobá et al. 2019). The contour levels are at 15%, 50%, and 99%. The demarcation lines are from Kauffman 2003, Kewley 2001, and Espinosa-Ponce 2020 (yellow dashed, blue dot-dashed, and black dotted lines, respectively).

Simulations

To characterize the code, we performed spiral-type galaxy simulations. Below an example.

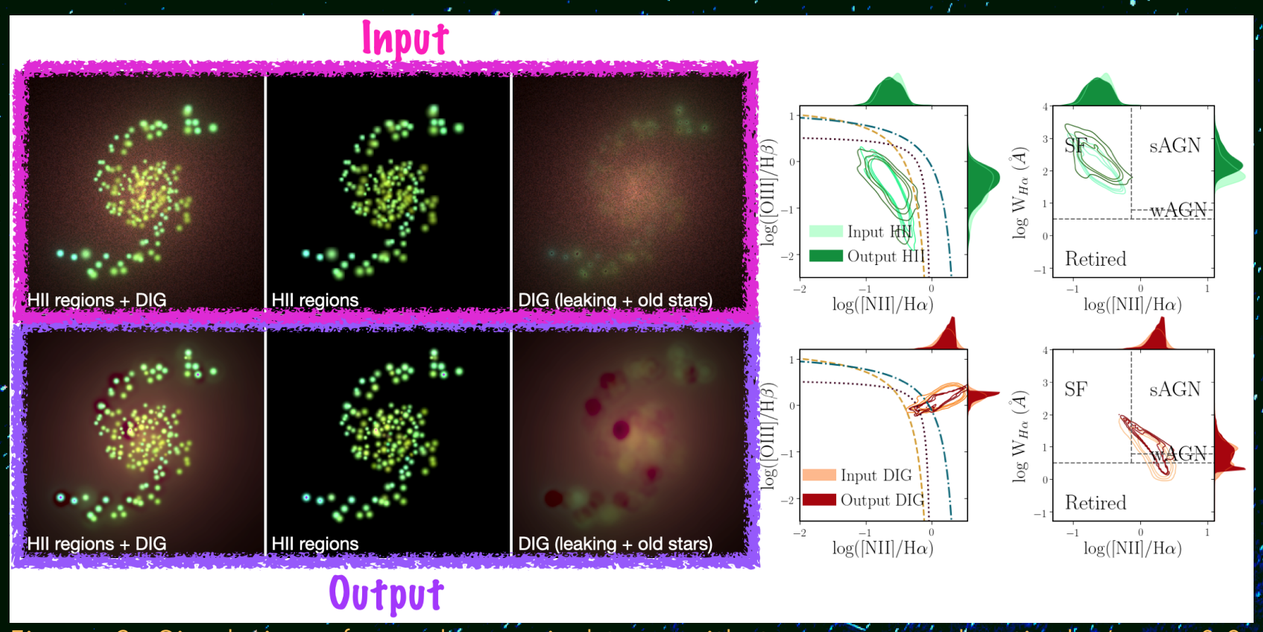


Figure 2. Simulation of a galaxy spiral-type with two arms and ratio b / a = 0.9. Component colors are based on the RGB code. The demarcation lines of BPT diagrams and separation lines of the WHAN diagrams are as described in figure 2.

Quantitative results

In the simulations we have varied the arms number, ratio b/a, and photons fraction that can escape from the HII regions, to obtain the recovery percentage and other parameters such as the flux recovery per HII region and the size of the HII regions.

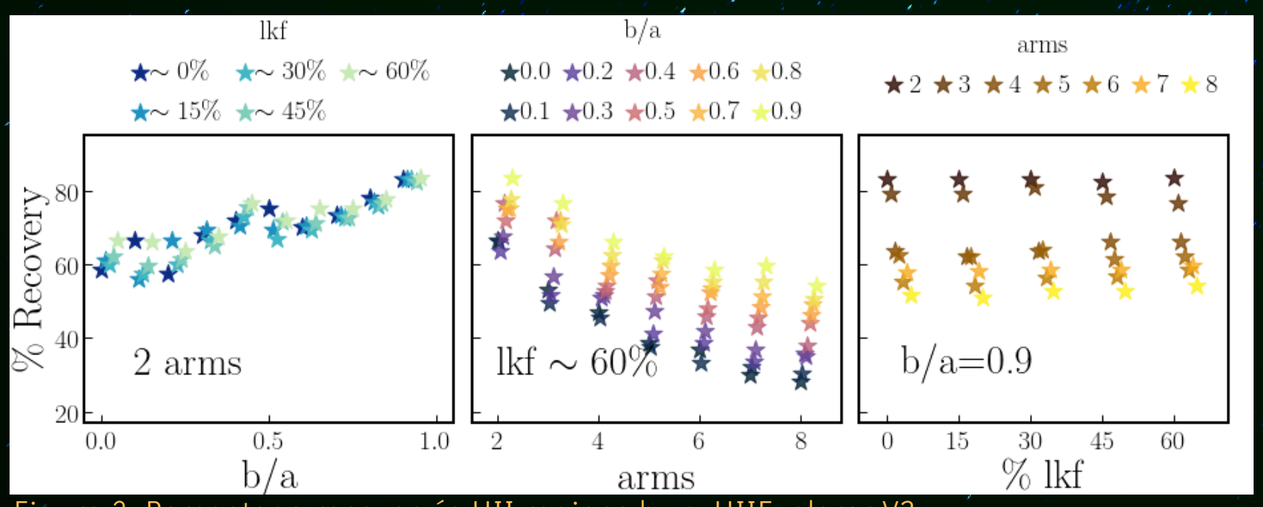


Figure 3. Percentage recovery´s HII regions by pyHIIExplorer V2.

Comparison

We are working on comparing pyHIIExplorer V2 with other detection codes like SExtractor.

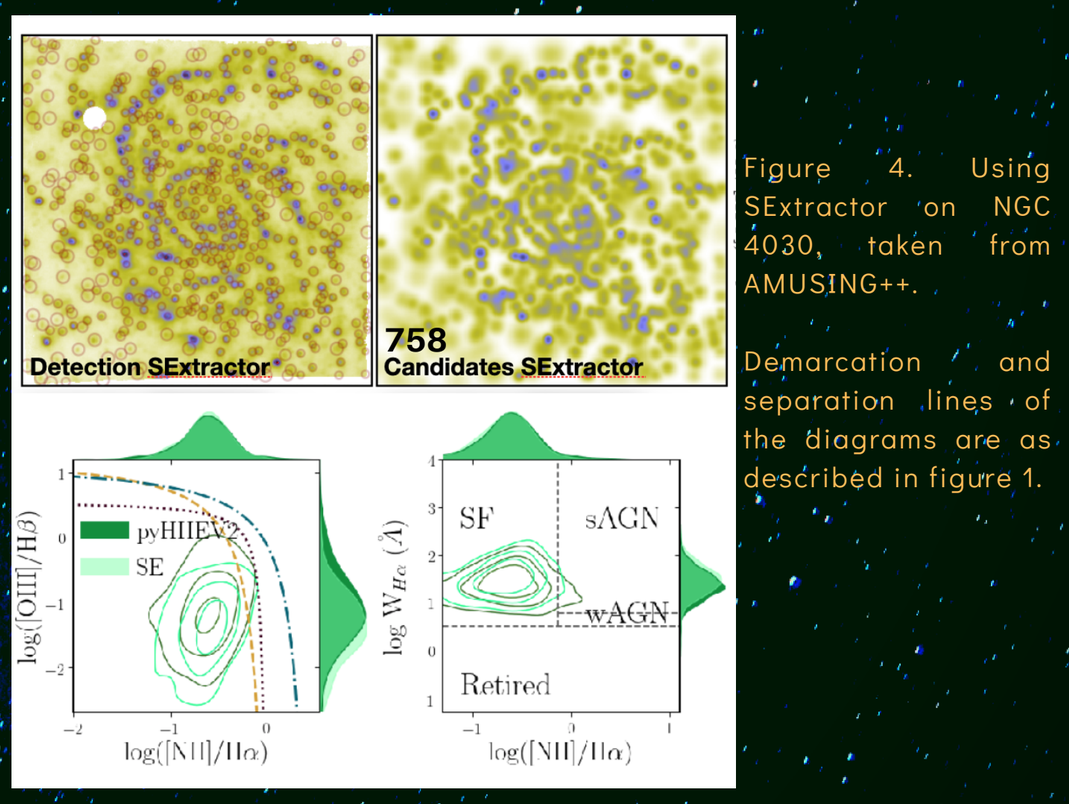


Figure 4. Using SExtractor on NGC 4030, taken from AMUSING++.

Demarcation and separation lines of the diagrams are as described in figure 1.

Conclusions

We have developed a code called pyHIIExplorer V2 to detect clumpy regions of H**α** emission maps and extract as much information as possible. The information extracted is decontaminated from DIG because the program provides a diffuse ionized gas model. This tool was thought to be used with high resolution data and spatial (100 pc), however it has great versatility.

Bibliography

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