

Galaxy & AGN evolution SWG

WP2

Physical Parameter Estimates from Spectra

Anna Feltre & Margherita Talia

Wiki page: https://euclid.roe.ac.uk/projects/geswg/wiki/Physical_parameter_estimate_from_spectra

Mailing list: swg-galaxy-agn-wp2-spec-group@euclid-projects.org

Project portal: <https://euclid-projects.org/groups/314/overview/>

(77 members, ~48% from Italy)

- tools and support for spectral analysis
- strong synergy with other WPs
- participations to Q1/DR1 projects papers (KP-GEV-2/3/4/7)
- monthly telecons + regular team meetings

TIGER TEAMS

SpectraPyle



- TT01 - Stacking tool (🇮🇹 Talia)
- TT02 - Off-pipeline spectral measurements (🇮🇹 Vergani)
- TT03 - Full spectral(+photo) fitting (🇮🇹 Feltre)
- TT04 - Models-to-data comparison (🇮🇹 De Lucia - see WP6)
- TT05 - 2D spectroscopic emission line mapping (🇮🇹 Granett)

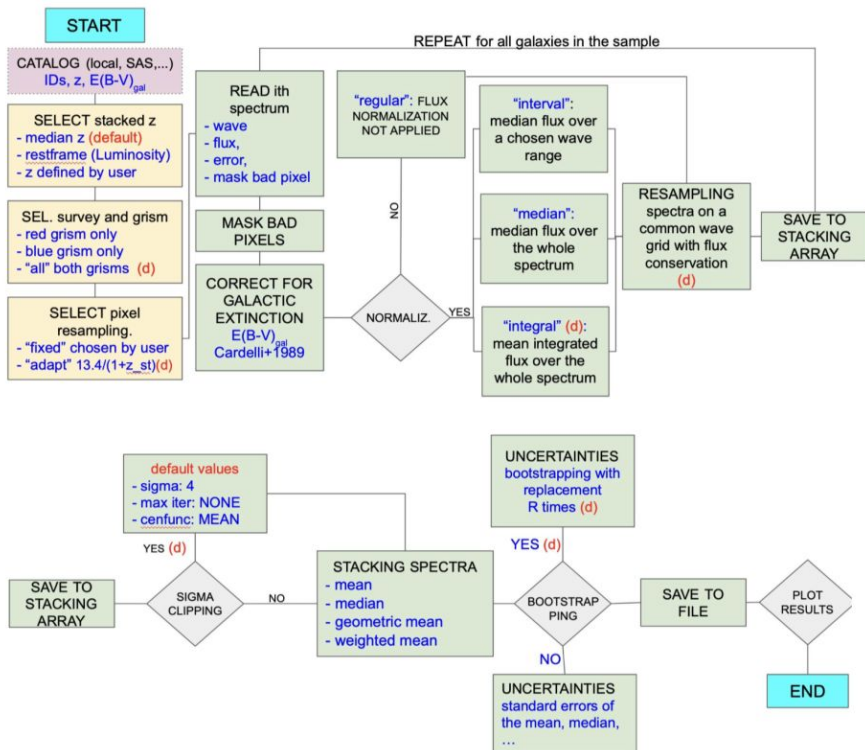
GELSA



SpectraPyle and **GELSA** were developed inside the **ELSA** program <https://elsa-euclid.github.io/> - PI 🇮🇹 Talia

"ELSA: Euclid Legacy Science Advanced analysis tools" (Grant Agreement no. 101135203) is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or Innovate UK. Neither the European Union nor the granting authority can be held responsible for them.

WP2 - The SpectraPyle code



Python code

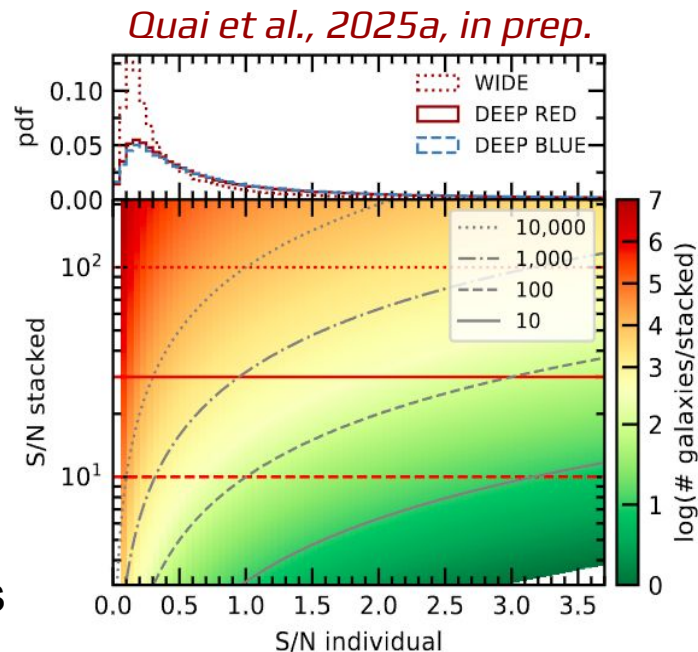
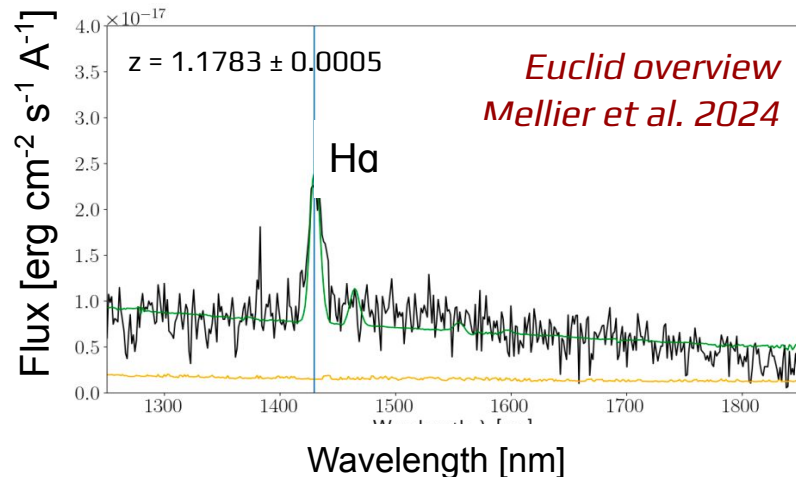
- very flexible;
- many possibilities for stacking normalization and errors derivation;
- use spectra directly from Euclid database.

Available to EC on ESA DATAlabs:

<https://datalabs.esa.int/datalab-manager>

(salvatore.quai@unibo.it,
margherita.talia2@unibo.it)

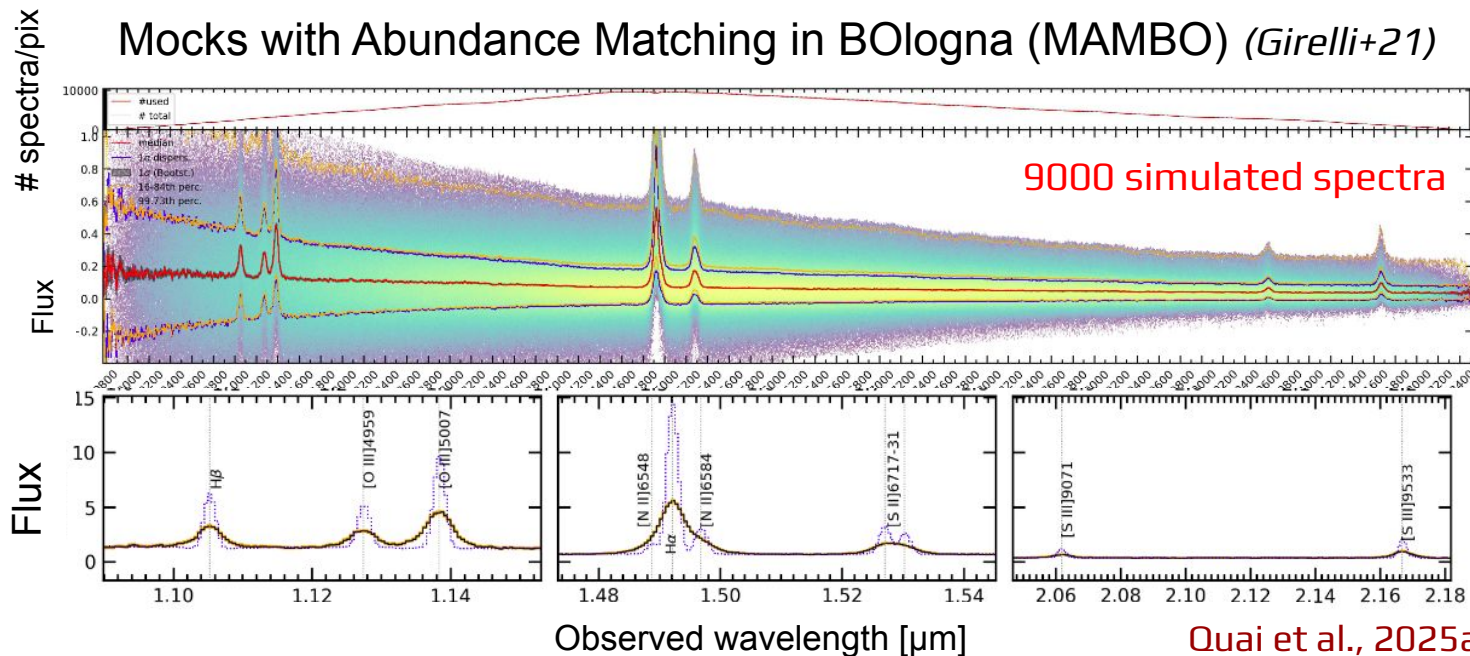
Stacking spectra in the Euclid surveys



Euclid spectra: low S/N $\rightarrow$ stack spectra
using from few k to 100k of individual ones

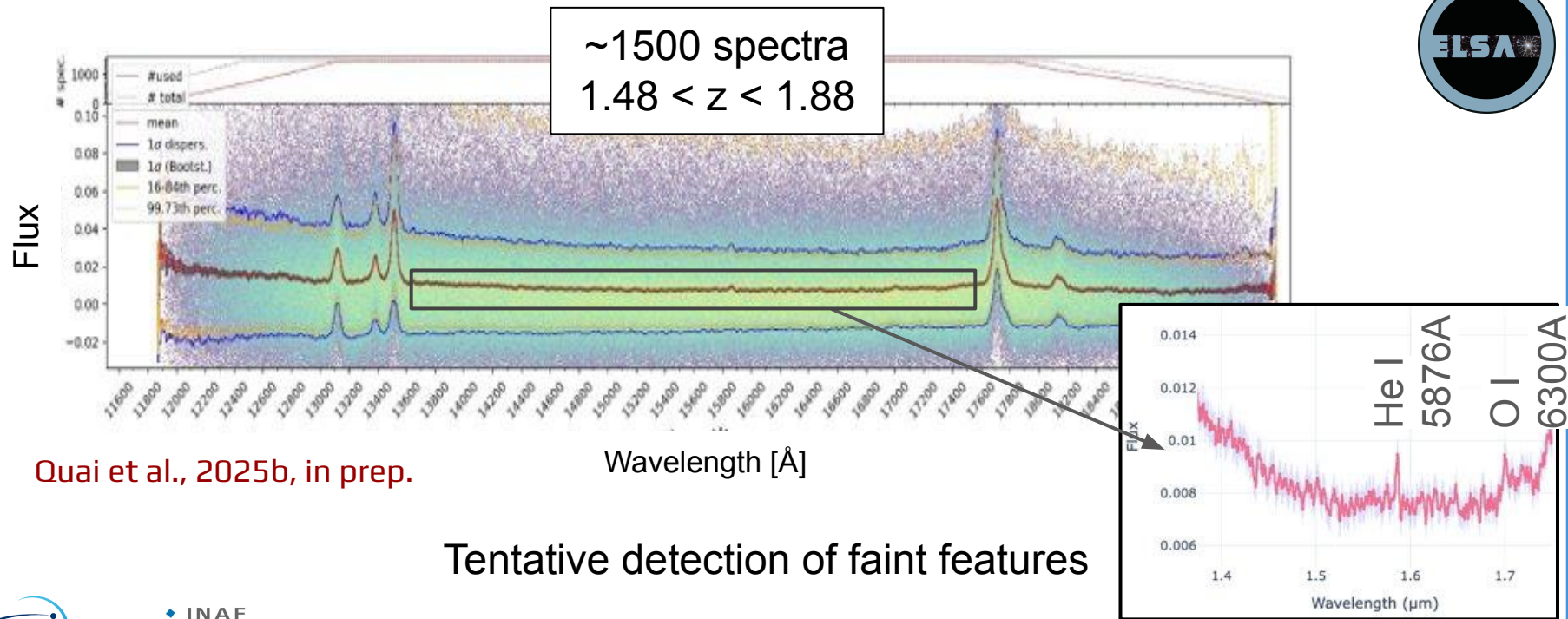
Stacking spectra in the Euclid surveys

Mocks with Abundance Matching in BOlogna (MAMBO) (*Girelli+21*)



Quai et al., 2025a, sub. to ECEB

Stacking spectra in the Euclid surveys

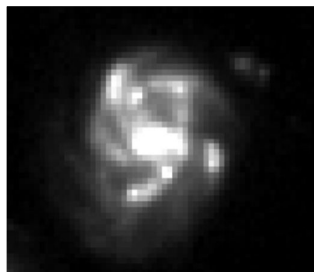


Euclid resolved spectroscopy



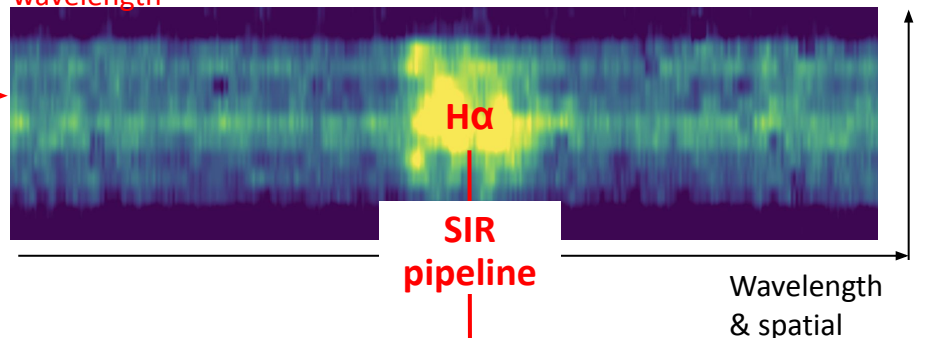
How should we interpret the Euclid spectrum of a resolved galaxy?

VIS

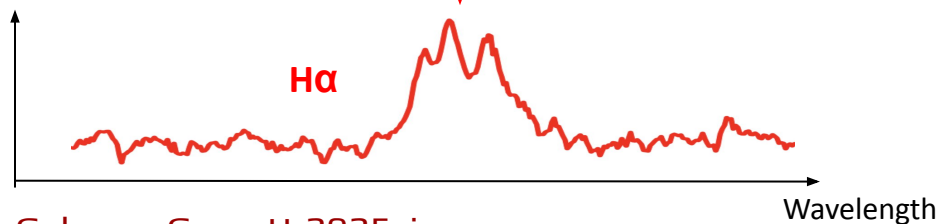


NISP Blue grism

Whole galaxy is dispersed and remapped onto wavelength

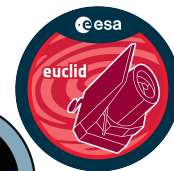


- The emission line in the 1D spectrum appears broad with peaks due to substructure.
- 2D spectra with different dispersion directions are not aligned.
- Spatial and spectral information are mixed.



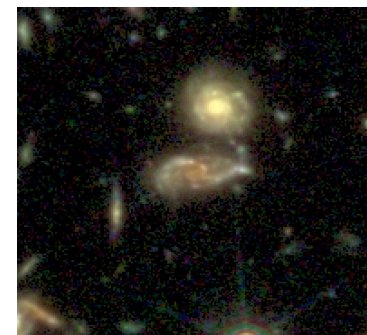
Gabarra, Granett 2025, in prep

Emission line maps in a nutshell

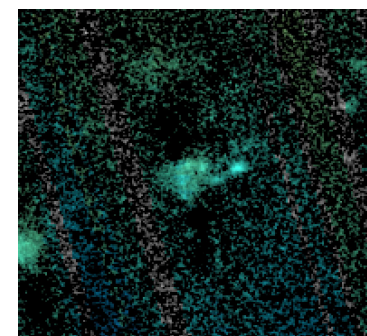


- ★ Emission line map data cubes are the fundamental dataproduct for spatially resolved spectroscopy.
- ★ The emission line map is made by **remapping** the **continuum-subtracted** image to **RA, Dec** at fixed wavelength (different grisms can be stacked).
 - *NISP is working as a narrow band imager with a tunable wavelength.*
- ★ Performed with the **GELSA** code developed in the ELSA project (B. Granett).
 - <https://gitlab.euclid-sgs.uk/bgranett/gelsa>

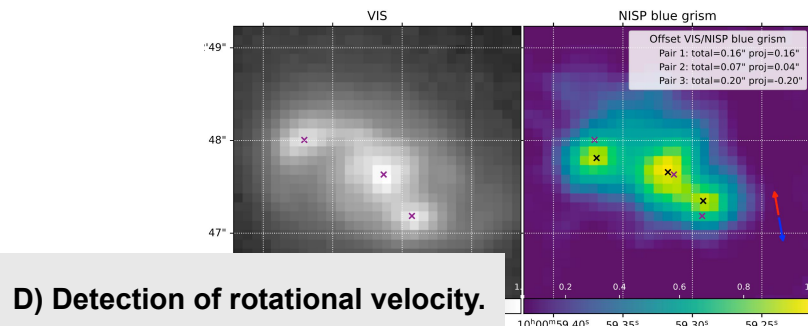
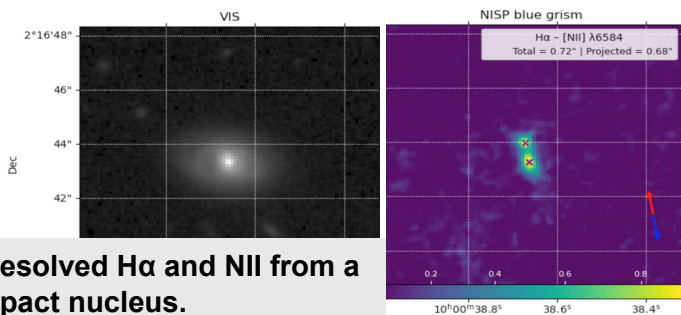
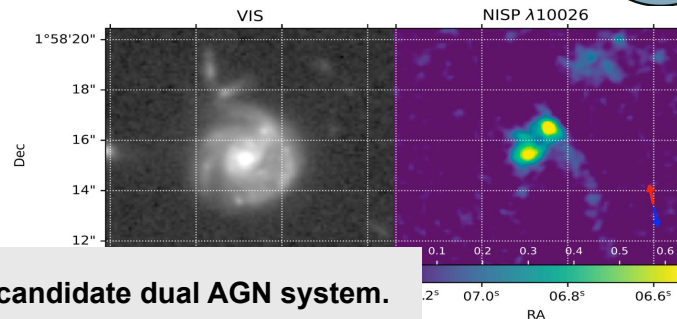
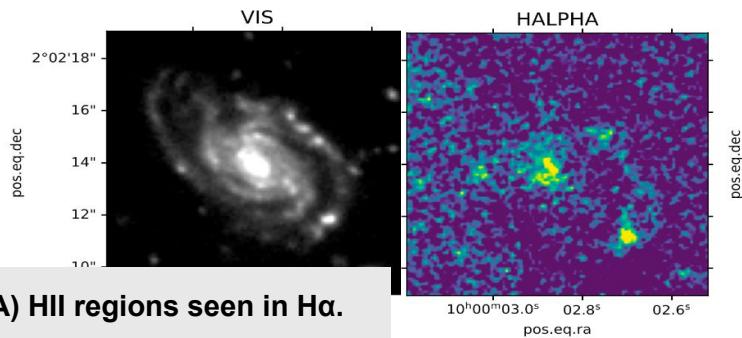
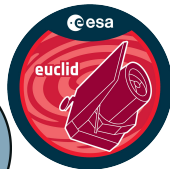
Direct image
VIS (brightness)
H,J,Y (rgb)



Emission line map
Blue grism
H α at $z=0.75$



Emission line maps showcases



Gabarra, Granett 2025, in prep

Q1 papers using Euclid spectroscopy

Quai 	WP2	KP-GEV-4	<i>A first "stacked" view on the SFR-mass-metallicity relations in the EDFs</i>
Mao 	WP1 (WP2, WP4, WP5)	KP-GEV-2	<i>Photometric and spectroscopic analysis of quenching¶</i>
Pozzetti 	WP1 (WP2, WP4, WP5)	KP-GEV-2	<i>The evolution and properties of the most massive galaxies¶</i>
Vergani 	WP5 (WP2, WP9)	KP-GEV-2	<i>Reactivation/quenching of star formation in high-ionization line AGNs</i>
Paulino-Afonso	WP11 (WP2)	KP-GEV-3	<i>H-alpha luminosity function</i>
Calhau 	WP9 (WP2)	KP-GEV-7	<i>Lines in the sky - A spectroscopic catalog of Euclid's QSOs</i>
Lopez-Lopez 	WP9 (WP2)	KP-GEV-7	<i>Synergies between spectroscopic and X-ray selection of AGN</i>
Fu	WP9 (WP2)	KP-GEV-7	<i>A Sample of Bright Quasars Identified with Euclid Q1 Spectroscopy</i>
Mezcua	WP9 (WP2)	SP	<i>Dual AGN in dwarf galaxies</i>