Galaxy & AGN evolution SWG

WP6

Theoretical models

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Wiki page: https://euclid.roe.ac.uk/projects/geswg/wiki/Theoretical_models/
Members & Mailing list: no formal list of members and dedicated mailing list - relevant for all SWG (and beyond).

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- **Goal**: discuss specific needs in term of theoretical models that cannot be satisfied by the official Euclid galaxy mocks based on the Flagship, and take actions towards specific requests.

- **Organization**:
  - no formal member list (but list of people *willing to do work*). Communications are sent to the entire SWG and feedback expected/welcome from all SWG members, but WP leaders are asked to collect desiderata/give specific feedback.
  - strong connection with other SWGs (Simulations and Clusters of Galaxies)
  - monthly telecons open to all SWG members (attendance is ~ok but participation low)

- **Participation to projects**: WP6 virtually involved in all relevant KPs involving data interpretation. Significant involvement in a number of PLKPs. No massive use of theoretical models in Q1 papers. Likely very different situation of DR1 papers.

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What is available:

- light-cones (different area and resolution) from 5 independent theoretical models (3 based on hydro-simulations, 1 empirical, 1 semi-analytic model)
- for 4 of these light-cones, Euclid-like properties (perturbed magnitudes, photo-z computed using Phosphorus, Halpha fluxes)
- 2 provide virtually all information requested (at the time) and have been the most used ones: MAMBO (, Bologna) and GAEA (,Trieste)
  - physical properties, consistent redshift and spatial information
  - several magnitudes (including Euclid bands)
  - emission lines fluxes (for both) and incident spectra (only MAMBO)
  - FASTSPEC spectra (only MAMBO)
  - merger tree information plus BH accretion rates info (only GAEA)

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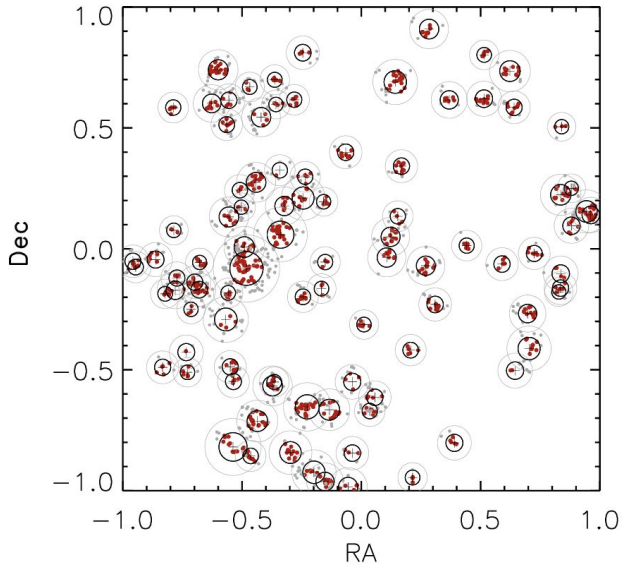
What will become available:

- Incident and FASTSPEC spectra for latest GAEA mock (ECLM)
- AGN s.e.d and spectra for MAMBO (possibly also for GAEA)
- GAEA incident spectra/emission lines based on different SSPs
- AGN broad line emission lines
- Larger and deeper GAEA lightcones based on P-Millennium Simulation (ideal @high-z too)

What can be made available (upon request):

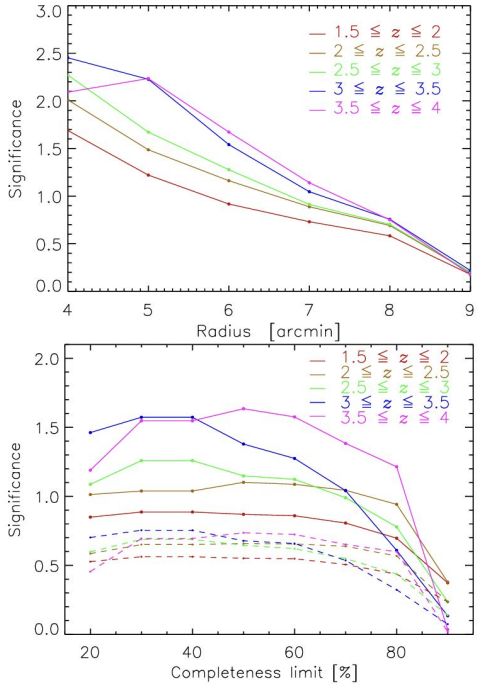
- Both MAMBO and GAEA mocks based on Flagship DEEP ***if/when merger trees will be made available***
- Emission line maps based on hydro-dynamical simulations (Magneticum, TNG, ….) ***if there is enough specific interest*** (get in touch with me and Michaela)

Böhringer et al 2024. **- Euclid preparation. LV. Exploring the properties of proto-clusters in the Simulated Euclid Wide Survey**



Explore the expected observational properties of proto-clusters in the EWS using both MAMBO and GAEA lightcones. Study ability to identify protoclusters against the background in galaxy distribution using photometric redshifts.

Focusing on the redshift range z = 1.5 to 4.



In SWG Clusters (WP11

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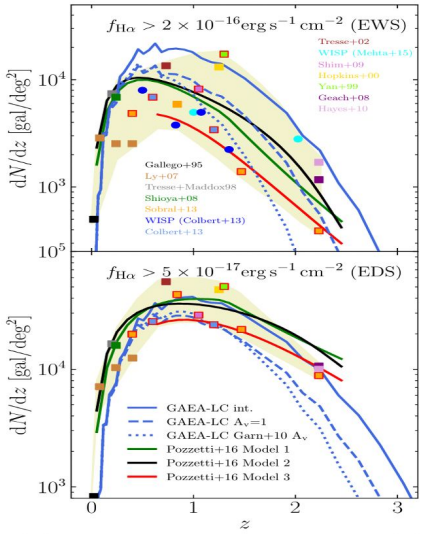
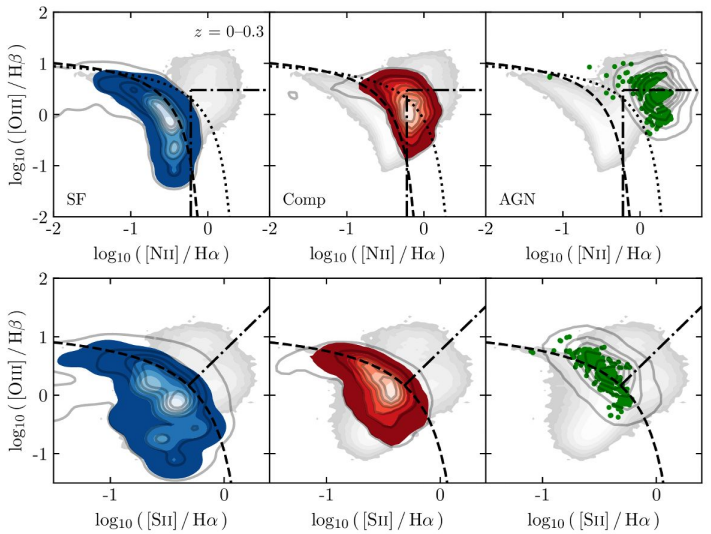
Scharré et al. **- Euclid preparation. XLV. Optical emission-line predictions of intermediate-z galaxy populations in GAEA for the Euclid Deep and Wide Surveys**



Broad good agreement with measured number counts (modulo uncertainties related to dust), and Hα LF over relevant z range.

Used to predict observability of different emission line galaxies at different redshifts with Euclid, and ability to distinguish among different types with BPT. Proposed new tracers for BH accretion rates to SF rate ratio.



In WP2

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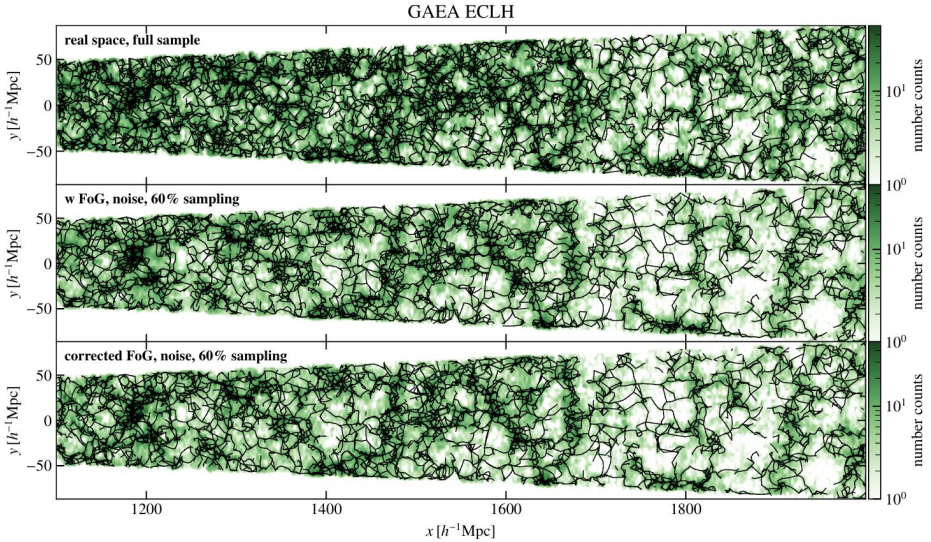
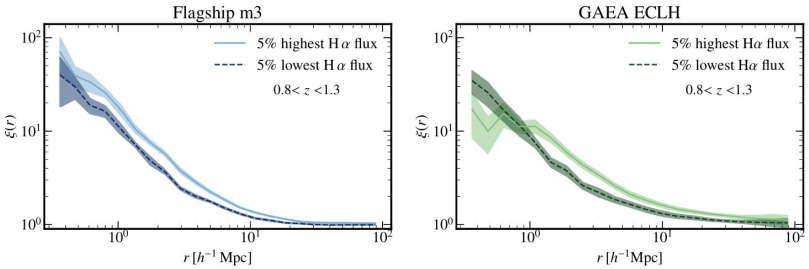
Kraljic et al. **- Euclid preparation. TBD. 3D reconstruction of the cosmic web with Euclid Deep spectroscopic samples**



Broad good agreement with the measured Hα LF and SFR-M* distributions over the relevant z range. Used to assess the quality of the reconstruction of the galaxy cosmic web environment with the expected spectroscopic dataset in Euclid Deep Fields.



In WP3

WP6 - criticalities

- **Human resources**: very limited, most work is done on best effort basis within small groups. If you're willing to help, you're welcome! Get in touch.

- **Computational resources**: no dedicated numerical resource or storage space. Becoming a problem with increasing requests and new (higher resolution/larger) simulations being used.

- **Communication**: transversal nature of the WP makes communication often difficult but information are there (wiki, emails, slack….). Get in touch if you don't find the answers to your question.