ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DIPARTIMENTO DI FISICA E ASTRONOMIA
DEPARTMENT OF PHYSICS AND ASTRONOMY - DIFA

Title of the Project: Maximising the scientific return of the Euclid survey of galaxy clusters

Supervisors: Lauro Moscardini

Duration: 1 year

Scientific Case:

The aim of the activities of this project is the maximization of the scientific return of the cluster samples identified in the galaxy survey obtained by Euclid, an approved ESA Medium class mission, whose launch is planned in 2022. Galaxy clusters are an important cosmological tool, complementary but independent with respect to the two main Euclid probes (galaxy clustering and weak lensing). Their abundance (as a function of redshift and mass proxy) and clustering (including high-order statistics, baryon acoustic oscillations and redshift-space distortions) are extremely useful to improve the Euclid constraints on the dark energy equation of state, on the dark matter properties and on deviations from General Relativity, main objectives of the Euclid mission. For these reasons, the goal of this project is the optimization of the tools for cluster detection, for the measurements of cluster counts and clustering, for the extraction of the cosmological constraints from them, for the definition of a robust mass-observable relation.

Outline of the Project:

The project will be developed following one (or more) of these lines of research:

- Validation of the entire **Cosmological pipeline** for Clusters developed inside the Euclid Consortium through its application to existing dataset, like e.g. HSC.
- **Collaboration with the Euclid IST-Nonlinear team:** Implementation of the specific tools related to galaxy clusters; Calibration of the halo mass function and halo bias covariances in comoving boxes and in past-light-cones; Development of tools for cross-covariances, with Galaxy Clustering and Weak Lensing.

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- Characterisation of the halo mass function and halo bias in **non-standard cosmological models** and modelisation of the systematic effects related to the **baryonic component.**
- Implementation of wide **past-light-cone** simulations of Galaxy Clusters to create realistic **Galaxy Clusters image simulations** to be used to optimise the systematics for Cluster Mass Calibration as a function of richness and redshifts and to validate strong lensing algorithms.
- Optimisation of the tools to extract cosmological information from **cluster clustering,** including BAO and RSD.
- Development of tools to constrain the **dark matter properties** from cluster density profiles.

Contact:

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