

Établissement **université Paris-Sud**

École doctorale **Astronomie et Astrophysique d'Île-de-France**

Spécialité **Astronomie et Astrophysique**

Unité de recherche **IAS - Institut d'Astrophysique Spatiale**

Directeur de la thèse **Nabila AGHANIM**

Début de la thèse le **1 octobre 2018**

Date limite de candidature **1 juin 2018**

Mots clés - Keywords

cosmology, statistical methods, computer science, models

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Profil et compétences recherchées - Profile and skills required

Statistical methods

Computer science

Basics in cosmology

Some English skills (spoken & written)

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Computer science

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Description de la problématique de recherche Project description

ByoPiC (The Baryon Picture of the Cosmos) is a project that aims at answering the key question: Where and how are half of the baryons hidden at late times?

Addressing this issue will be made possible thanks to the detection, mapping, and assessment of the physical properties of hot ionised baryons at large cosmic scales. This gas and in particular the gas in unbound cosmic structures such as filaments should indeed represent most of the hidden baryons.

The project will be based on a statistically consistent, joint analysis of complementary multiwavelength data: notably Planck observations tracing hot, ionised baryons via the Sunyaev-Zeldovich effect, that will be combined with optical and near infrared data from galaxy surveys.

The goal of the PhD will be the development of optimised tools to recover the cosmic web elements such as filaments and then assess their baryon content. This will be performed in the context of a collaboration with Rien van de Weygaert (Univ. Groningen). The work will consist in optimising a cosmic web reconstruction technique based on the galaxy cluster distribution to recover the filaments. This tool will be tested against numerical simulations and actual data.

The work will be conducted within the ByoPiC team. The PhD will thus benefit from the expertise of the staff members and postdocs (in particular on the statistical methods) who constitute the team.

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Thématiques

Précision sur l'encadrement

The work will be conducted within the ByoPiC team. The PhD will thus benefit from the expertise of the staff members and postdocs (in particular on the statistical methods) who constitute the team. Weekly meetings to monitor the work and specific working sessions will take place. Informal meetings every 3 months will allow to follow the progress and potentially modify the objectives.

Conditions scientifiques matérielles (conditions de sécurité spécifiques) et financières du projet de recherches

The PhD will benefit from all IAS facilities. In addition, the ByoPiC project provides dedicated computing facilities and funds to attend conferences and schools. The PhD will spend visiting periods at Univ. Groningen (Netherlands)

Objectifs de valorisation des travaux de recherche du doctorant : diffusion, publication et confidentialité, droit à la propriété intellectuelle,...

Standard for a PhD: publications, public codes, presentations and posters, outreach

Collaborations envisagées

The research will be performed in the context of a collaboration with Rien van de Weygaert (Univ. Groningen)

Ouverture Internationale

Collaborations are foreseen with Univ. Groningen (Netherlands) and Institute of Astronomy of the Canary Islands (Spain). The work can prepare for the data analysis of the Euclid mission.

Références bibliographiques

Bos, E. G. Patrick; van de Weygaert, Rien; Kitaura, Francisco; Cautun, Marius (arXiv:1611.01220)

Bos, E. G. Patrick PhD Thesis

Planck collaboration 2013 results, 2014 A&A, 571, 29

Complément sur le sujet

<https://byopic.eu/> (<https://byopic.eu/>)