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# Effect of correlations in the structures of the Universe

Pascal Wang\*<sup>1</sup>

<sup>1</sup>Centre de Recherche Astrophysique de Lyon – École Normale Supérieure - Lyon, Université Claude Bernard Lyon 1, Institut national des sciences de l'Univers, Centre National de la Recherche Scientifique : UMR5574, Institut national des sciences de l'Univers, Institut National des Sciences de l'Univers – France

## Résumé

The current LambdaCDM paradigm of cosmology has been successful in explaining a wide range of cosmological observations, among which are the anisotropies of the Cosmic Microwave Background and the dimming of type Ia supernovae. It invokes dark energy in the form of a cosmological constant Lambda, and dark matter, which represent the majority of the energy content of the Universe and whose physical origins are at present unknown. The LambdaCDM model also relies on the assumption of a homogeneous and isotropic background expansion of the Universe. However, the Universe exhibits substructures, for example in the form of filaments, galaxy clusters, voids, etc., which can be described as inhomogeneities or correlations. Similarly, in a galaxy, substructures exist in the form of spiral arms and condensations. The thesis aims to employ formalisms inspired by statistical mechanics to study analytically and numerically the effect of such substructures on the dynamics at the cosmological and at the galactic scales and determine whether or not they can have effects reproducing those of dark matter and/or dark energy.

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\*Intervenant