Summary of the Doctoral Thesis

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PhD Thesis entitled: **Ricci Cosmologies**

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This dissertation deals with the new framework of Ricci Cosmology which has recently emerged from the study of out-of-equilibrium relativistic fluids in curved spacetime.
After briefly recalling the strengths and the challenges of the widely accepted Standard Cosmological Model or ΛCDM, we shortly review the theoretical construction on which the framework of Ricci Cosmology relies.
Next, we introduce different models we have derived in this framework in order to describe the late-time accelerated expansion of the Universe, under the assumption of constant transport coefficients.
The first model considered is Isotropic Ricci Cosmology, in which Ricci pressure terms affect all the matter components filling in the Universe. A departure from perfect fluid redshift scaling is found for each matter component.
Next, we consider two models in which we drop the assumption of the Cosmological Principle: in the first model, we study the consequences of the departure from equilibrium for cosmic fluids on a background described by the Bianchi I Type metric, while in the second model, we consider an inhomogeneous Universe described by the Lemaître-Tolman-Bondi metric.
Then, we study the model of Ricci Vacuum Cosmology in which non-equilibrium Ricci terms affect only the vacuum pressure. As a result of such departure from equilibrium for the vacuum, its energy density depends on the energy densities of matter and radiation. Two subcases are taken into account: in the first, the Ricci vacuum interacts with Cold Dark Matter, while in the second, it interacts with a relativistic species, which we call Dark Radiation.
The last model we consider is the Tilted Ricci Cosmology, in which the observer 4-velocity does not coincide with the fluid 4-velocity, leading to the presence of an energy flux and an anisotropic stress in the fluid as seen by the observer. We study the effects that the non-equilibrium Ricci terms have onto the cosmic fluid and on its energy conditions.
Finally, after introducing the statistical tools for Bayesian Inference and the

available cosmological data, we discuss the results of the fit of the Isotropic Ricci Cosmology model against these cosmological data.
Observational bounds on the parameters of the model are found and its capability to relief the Hubble tension at the background level and to describe better than CDM the cosmological data are discussed.

Keywords: Ricci Cosmology, relativistic out-of-equilibrium fluid, second-order transport coefficients, effective pressure

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