

Título/Title:

Cosmological tests of theories beyond General Relativity

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Descrição/Description:

Given current observations we now know that the Universe has recently entered a phase of accelerated expansion. The simplest model to understand this behavior invokes the existence of a cosmological constant (LCDM), however, this model suffers from some outstanding problems. These problems lead researchers to propose and investigate alternative ideas, which are based on deviations from General Relativity at cosmological scales. In most cases they resort to the use of scalar fields, which introduce a modification of gravity on the large scales. A particular model, the Generalized Galileon, has been extensively studied in the context of inflation and late-time acceleration. It is very promising given its theoretical properties. Moreover, on the observational side, it has been shown that Galileons can be a strong alternative to the cosmological constant. Furthermore, such theories are safe from constraints on extra-forces on the solar system scale, where no modifications have been found.

In this context it is of relevance the implementation of a Galileon model in an Einstein Boltzmann solver to explore the impact of the modifications on cosmological observables. Finally, testing the model against data will show the viability of the model as a valid alternative to LCDM model.

During the project, the student will study the construction of a quite general theory of modified gravity and he/she will analyse and explore the cosmological implications of such modifications. The student will also have the opportunity to learn how to use an Einstein Boltzmann code in order to perform cosmological tests of gravity.