Some Cosmological models with variable Lambda (Λ)

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Abstract

In this thesis we study the expansion of the Universe with an accelerating epoch. The prediction of an expanding Universe from Einstein's Field Equations was confirmed by the observations of Edwin Hubble in early 20^{th} century. Recent observations of Saul Perlmutter of an expansion of the Universe with an acceleration in a certain epoch has aroused the search for new cosmological models that represent a Universe expanding with an acceleration.

In order to find such models modified Einstein's Field Equations by introducing a variable Λ (cosmological parameter) and obtained two equations with four unknowns. As there are only two equations there is no unique solution and we are at the liberty to try various solutions subjected to certain boundary conditions.

In this study we show that these two equations are satisfied by a family of solutions for R, the scalar factor of the Universe under certain assumptions. Families of solutions for the scalar factor was assumed and its unknowns were evaluated using recent observations. A better solution for the scalar factor was assumed and its unknowns were evaluated using the same boundary conditions. This second solution succeeded to illustrate a model for the Universe with inflation, acceleration and deceleration. We found that, according to the second solution the onset of acceleration took place at a redshift of 1.26, which is not in agreement with the present observations, but that the present density of the Universe is $1.22 \times 10^{-29} gcm^{-3}$, agreeing with observations.

Keywords: cosmological parameter, accelerating epoch, expanding Universe, inflation.