Cosmological models with Kantowski-Sachs metric using the running cosmological constant

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Resumo

In this work, using Einstein's equations, the Kantowski-Sachs metric (KS), a Running Cosmological Constant (RCC), and the dust perfect fluid, we consider the present model as a candidate for describing the primordial universe. That is possible because in the initial conditions of high energies after the Big Bang, during Planck's time, the universe could have been inhomogeneous and anisotropic. The KS metric we consider is the metric that describes the geometry of this spacetime, it is not the Friedmann-Lemaitre-Robertson-Walker (FLRW) metric due to anisotropies between some spatial directions. As for the material content, we are using the dust perfect fluid, along with the RCC, which can be interpreted as a quantum correction to the cosmological constant that varies with the energy of the universe. The RCC is described by a factor (ν) (phenomenological parameter) that multiples the Hubble parameter (H), which is characteristic of the model we are using. Developing the necessary calculations, we obtained Einstein's equations for that model, whose solutions describe the universe dynamic evolution through the scale factors ($a(t)$) and ($b(t)$). We show that if one lets that universe evolves for some time, the anisotropic pattern flows into one isotropic model, and tends to a FLRW type universe, that has homogeneity and isotropic proprieties. The studied model presents accelerated solutions of the scale factors for all values of the parameters used, where each parameter affects directly the evolutive behavior of the scale factors.

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