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ORIGINAL ARTICLE

Entropy-corrected new agegraphic dark energy in Hořava-Lifshitz cosmology

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Abstract We study the entropy-corrected version of the new agegraphic dark energy (NADE) model and dark matter in a spatially non-flat Universe and in the framework of Hořava-Lifshitz cosmology. For the two cases containing noninteracting and interacting entropy-corrected NADE (ECNADE) models, we derive the exact differential equation that determines the evolution of the ECNADE density parameter. Also the deceleration parameter is obtained. Furthermore, using a parametrization of the equation of state parameter of the ECNADE model as $\omega_\Lambda(z) = \omega_0 + \omega_1 z$, we obtain both ω_0 and ω_1. We find that in the presence of interaction, the equation of state parameter ω_0 of this model can cross the phantom divide line which is compatible with the observation.

Keywords Dark energy theory · Quantum cosmology

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1 Introduction

Astronomical observations indicate that our Universe is in a phase of accelerated expansion (Perlmutter et al. 1999; Bennett et al. 2003; Tegmark et al. 2004; Allen et al. 2004). One explanation for the cosmic acceleration is the dark energy (DE), an exotic energy with negative pressure. The dynamical nature of DE, at least in an effective level, can originate from various fields, although a complete description requires a deeper understanding of the underlying theory of quantum gravity. Nevertheless, physicists can still make some attempts to probe the nature of DE according to some basic quantum gravitational principles. Two examples of such a paradigm are the holographic DE (HDE) and the agegraphic DE (ADE) models which have originated from quantum gravity and possess some of its significant features. The former, that arose a lot of enthusiasm recently (Cohen et al. 1999; Hsu 2004; Li 2004; Huang and Li 2004; Jamil et al. 2009a, 2009b; Jamil and Farooq 2010; Setare and Jamil 2010; Wang et al. 2005a, 2005b, 2008; Sheykhi 2010a; Karami 2010a, 2010b; Karami and Abdolmaleki 2010a, 2010b; Karami and Fehri 2010a, 2010b), is motivated from the holographic hypothesis ('t Hooft 1993; Susskind 1995) and has been tested and constrained by various astronomical observations (Feng et al. 2005; Zhang and Wu 2005, 2007). The latter originated from the uncertainty relation of quantum mechanics together with the gravitational effect of general relativity (GR). The ADE model assumes that the observed DE effect comes from spacetime and matter field fluctuations in the Universe (Sasakura 1999; Cai 2007; Wei and Cai 2008a, 2009). Following the line of quantum fluctuations of spacetime, Karolyhazy (1966), Karolyhazy et al. (1982, 1986) proposed that the distance t in Minkowski spacetime cannot be known to a better accuracy than $\delta t = \varepsilon t_P^{2/3} t^{1/3}$, where ε is a dimensionless constant