Astrophys Space Sci (2013) 346:545–552
DOI 10.1007/s10509-013-1475-5

ORIGINAL ARTICLE

G-corrected holographic dark energy model

M. Malekjani · M. Honari-Jafarpour

Received: 11 February 2013 / Accepted: 25 April 2013 / Published online: 25 May 2013

Abstract Here we investigate the holographic dark energy model in the framework of FRW cosmology where the Newtonian gravitational constant, G, is varying with cosmic time. Using the complementary astronomical data which support the time dependency of G, the evolutionary treatment of EoS parameter and energy density of dark energy model are calculated in the presence of time variation of G. It has been shown that in this case, the phantom regime can be achieved at the present time. We also calculate the evolution of G-corrected deceleration parameter for holographic dark energy model and show that the dependency of G on the comic time can influence on the transition epoch from decelerated expansion to the accelerated phase. Finally we perform the statefinder analysis for G-corrected holographic model and show that this model has a shorter distance from the observational point in s–r plane compare with original holographic dark energy model.

Keywords Cosmology · Dark energy · Holographic model · Gravitational constant

M. Malekjani (✉) · M. Honari-Jafarpour
Department of Physics, Faculty of Science, Bu-Ali Sina University, Hamedan 65178, Iran
e-mail: malekjani@basu.ac.ir

M. Honari-Jafarpour
e-mail: M.Honarijafarpour@basu.ac.ir

M. Malekjani
Research Institute for Astronomy & Astrophysics of Maragha (RIAAM), Maragha, P.O. Box: 55134-441, Iran

1 Introduction

Nowadays, it is widely believed that the cosmos is experiencing an accelerated expansion. This idea and belief came into existence after collection of data from "Type Ia supernova" in 1998 (Perlmutter et al. 1999; Riess et al. 1998). Also the other data from WMAP (Bennett et al. 2003; Hicken et al. 2009), SDSS (Tegmark et al. 2004) and X-ray (Allen et al. 2004) experiments support this accelerated expansion. In the framework of standard cosmology, the existence of dark energy with negative pressures is essential to interpret the cosmic acceleration. Hence, dark energy scenario has got a lot of attention in modern cosmology both from theoretical and observational point of view. Observationally, the result of SNeIa experiment shows that dark energy occupies about 72 % of the total energy of our universe, dark matter and baryons about 28 % of the total energy of the universe (Perlmutter et al. 1999; Riess et al. 1998). Although the nature of dark energy is still un-known, but the ultimate fate of the current universe is determined by this mysterious component. Till now, some theoretical models have been proposed to interpret the behavior of the dark energy. The first and the simplest one is Einstein's "cosmological constant" (Sahni and Starobinsky 2000; Peebles and Ratra 2003) which, of course, has two problems called fine-tuning and cosmic coincidence. The cosmological constant has the fixed equation of state $w_\Lambda = -1$, while the dynamics of current expansion can be explained by dynamical dark energy models with time varying equation of state. The scalar fields such as quintessence (Wetterich 1988; Ratra and Peebles 1988), phantom (Caldwell 2002; Nojiri and Odintsov 2003a, 2003b) or the combination of both which is called quintom (Elizalde et al. 2004; Nojiri et al. 2005; Anisimov et al. 2005) are examples of dynamical models. The other