Dynamical analysis of a class of sign-changeable interacting dark energy scenarios

Antonella Cid M. [1*], Fabiola Arévalo R.[2†]

[1]Departamento de Física, Universidad del Bío-Bío, Casilla 5-C, Concepción, Chile.
[2]Núcleo de Matemática, Física y Estadística, Universidad Mayor, Temuco, Chile.

*acidm@ubiobio.cl, †fabiola.arevalo@umayor.cl

Abstract

We revise the dynamical properties of a class of cosmological models where the dark sector interacts through an interacting term that changes sign during evolution. These models are proportional to the deceleration parameter which change of sign once during the cosmological evolution of the late universe [1]. In particular, we obtain the critical points and investigate the existence and stability conditions for cosmological solutions, describing radiation, matter and dark energy dominated eras. We find that all the studied models admit a stable critical point corresponding to an accelerated phase. We use background data (the local determination of H_0, supernovae type Ia, baryon acoustic oscillations, cosmic chronometers and the angular scale of the sound horizon at last scattering) to find the best fit parameters for one of the studied models, resulting in an interacting parameter with a definite sign within the 1σ confidence level, consistent with the results of the dynamical system analysis. Some of our results are shown in figure 1, where the phase plot and contour plot are shown for one of the studied models, Γ_{1T}, see reference [2] for more details.
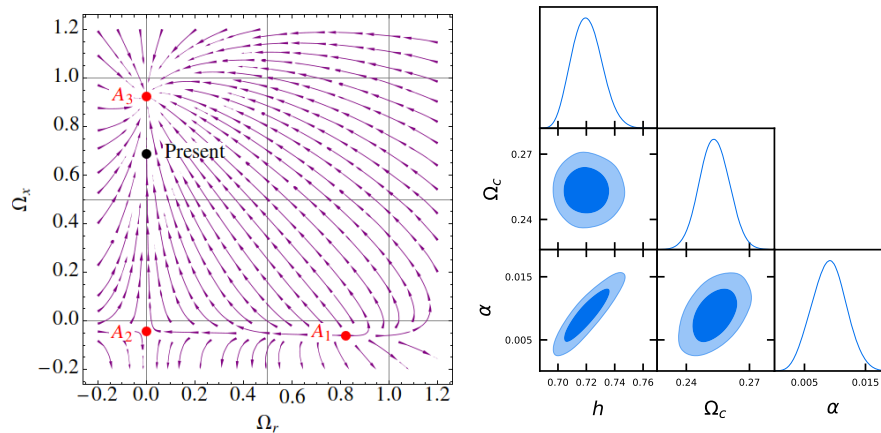
Figure 1: *For the model Γ_{1T} we show the phase plot with $\alpha = 0.08$ (left) and the contour plots (right).*

References

[1] F. Arevalo, A. Cid, L. P. Chimento and P. Mella, Eur. Phys. J. C **79**, no.4, 355 (2019).
[2] F. Arevalo and A. Cid, [arXiv:2202.05130 [astro-ph.CO]]. To be published in EPJC.