Review of: "Dark Energy as an intrinsic property of Matter"

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Potential competing interests: No potential competing interests to declare.

The paper proposes an intrinsic link between matter and dark energy by producing space, which displays a density of ⅓ for matter and ⅔ for dark energy. Of course, the idea of relating matter and spacetime is strongly supported by the General Relativity principles, but there are recent studies very related to similar ideas. For instance, most of the results are also consistent with the extrinsic viewpoint of the hyperconical model (MC2020: Monjo and Campoamor-Sturberg 2020). I encourage the author to relate the new findings with the previous ones in order to reinforce the new paradigm of alternative cosmologies against the conventionalism of adjusting “new parameters” to solve the current tensions. Please find below some comments about that.

Major comments

The equation of state of the SPM (Eq. 6) is the same that the found in MC2020, with w = -⅓, leading to a constant expansion and hubble parameter of H = 1/t like the R_h=ct model of Melia and the Dirac-Milne model. It woul be necessary to analyse the connection between the SPM and the rest of linearly expanding models (hyperconical universe, Dirac-Milne model, R_h=ct model, …). In fact, the prediction of Ω_m = ⅓ and Ω_Λ= ⅔ is also found in RC2023. The findings show that the extrinsic geometry of the Universe leads to local values of [Ω_m = ⅓ , Ω_Λ= ⅔], while the intrinsic geometry (after an stereographic projection) displays values about [Ω_m = 0.3, Ω_Λ= 0.7], and all of these values are predicted without observations! (see for instance Monjo 2018).

- Monjo, R. (2018). Geometric interpretation of the dark energy from projected hyperconical universes.*Physical Review D* 98, 043508 (LS16206D). DOI: 10.1103/PhysRevD.98.043508. arXiv:1808.09793
- Monjo, R., Campoamor-Stursberg R. (2020). Lagrangian density and local symmetries of inhomogeneous hyperconical universes. *Classical and Quantum Gravity* **37**, 205015. DOI: 10.1088/1361-6382/abadaf
- Monjo, R., Campoamor-Stursberg R. (2023). Geometric perspective for explaining Hubble tension: theoretical and observational aspects. *Classical and Quantum Gravity* (under review). CQG-110366.

Another question is, how can SPM adjust the results to radially inhomogeneous universes like the metric produced by the hyperconical model?

Finally, the idea of Space Production Model is very interesting itself, but it arises some questions:

- What is the physical process to produce or emit space from matter? Can we observe it in the Solar System? How?
- Can the model explain the Hubble tension?

- Where is the (dark) matter of $\Omega_m = ⅓$? In galactic halos? Alternatively, could be this value an apparent (geometrical) effect like the $\Omega_\Lambda = ⅔$? In other words: why "space emission" is linked to the matter and why not both quantities are consequence of other phenomena (e.g. geometrical perspectives).
- How is it related the curvature of the universe to the curvature caused by the matter?

Minor comments:

- The word “invoke” appears too many times in the paper. Please use synonyms.
- Figure 1 needs to add x-axis and y-axis.