Review Form 3

Journal Name:	**International Astronomy and Astrophysics Research Journal**
Manuscript Number:	**Ms_IAARJ_129279**
Title of the Manuscript:	**Resolving the Hubble tension with a Late Dark Energy Modification to the ΛCDM Model**
Type of the Article	**Original Research Article**

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PART 1: Comments

	Reviewer's comment	**Author's Feedback** *(Please correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Please write a few sentences regarding the importance of this manuscript for the scientific community. A minimum of 3-4 sentences may be required for this part.	This manuscript aims to addresses one of the most pressing challenges in modern cosmology —the Hubble tension—which highlights inconsistencies between early- and late-universe measurements of the Hubble constant The manuscript proposes a modification to the standard ΛCDM model, introducing the $\Lambda_f CDM$ model, which hypothesizes that dark energy within gravitationally bound structures does not contribute significantly to spatial expansion. More concretely, in the $\Lambda_f CDM$ mode, an effective cosmological constant Λ_f is used in replacement of the usual cosmological constant. During galaxy clusters formation, the effective cosmological constant is supposed to be much smaller than the usual cosmological constant. The authors then presented numerical simulations of the new cosmological model, in comparison with simulations based on the ΛCDM models.	
Is the title of the article suitable? (If not please suggest an alternative title)	Yes	

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Is the abstract of the article comprehensive? Do you suggest the addition (or deletion) of some points in this section? Please write your suggestions here.	I think the abstract is good as it is.	
Is the manuscript scientifically, correct? Please write here.	The manuscript is scientifically correct.	
Are the references sufficient and recent? If you have suggestions of additional references, please mention them in the review form.	The references are sufficient and recent.	
Is the language/English quality of the article suitable for scholarly communications?	Yes	
Optional/General comments	**) In the manuscript, it was claimed that numerical simulations suggest the proposed model can "resolve the Hubble tension", which is an overstatement. To really "resolve the** **Hubble tension", one needs to propose a cosmological model which, when combined with the CMB observations, can produce constraints on the Hubble constant that is consistent with late-universe measurements. As presented in section 4 of the manuscript, the proposed new model either interpolates between two other numerical simulations (used as proxy for early universe and late universe observations) based onΛCDM (with different choice of parameters), or agrees with one of the simulations in certain regimes. It is not clear to me how this suffice to demonstrate a resolution of the Hubble tension.** **(2) In the paragraph after figure 1, it was claimed that the Λf CDM model has the same early time scale factor evolution as ΛCDM67. However, according to the figure itself, the scale factor evolution predicted by the new model seems to coincide with ΛCDM73 at early time and agree with ΛCDM67 at late time. Is there a mistake in the figure?** **(3) Both figure 2 and figure 3 demonstrates that the proposed new model converges to ΛCDM 73 at late times. But what about ΛCDM 67? Shouldn't one also demonstrate some agreement with ΛCDM67 at early time ?** **(4) In figure 3: what's the definition of "Early Clusters", "No Clusters" and "Late Clusters" ?** **And more concretely, how do simulation parameters differ for these three curve? Similar clarification is also needed for figure 4.** **(5) It was emphasized several times that the simulation based on the new model agrees with ΛCDM 73 at late times. However, this seems to be a consequence of fine-tuning. For example, it was mentioned (after figure 3) that "the cluster radius is changed to 4.005 Mpc to optimize the fit to H0=73 km s−1 Mpc−1 in the late universe". More discussions of parameter variations and their effect on the results should be included. The brief** **discussion in the end of section 4 seems insufficient.** **(6) The font seems inconsistent throughout the manuscript.**	

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PART 2:

	Reviewer's comment	**Author's comment** *(if agreed with reviewer, correct the manuscript and highlight that part in the manuscript. It is mandatory that authors should write his/her feedback here)*
Are there ethical issues in this manuscript?	*(If yes, Kindly please write down the ethical issues here in details)*	

Reviewer Details:

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