

Atmos. Meas. Tech. Discuss., referee comment RC1  
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## Comment on amt-2021-206

Anonymous Referee #1

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Referee comment on "Thermodynamic model for a pilot balloon" by Vicent Favà et al.,  
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This paper presents a model of the ascent of a sounding balloon. The motivation is the retrieval of horizontal wind information from azimuth and elevation of pilot balloons reported at a time when position information was not directly measured. The topic is of interest to AMT and the paper is clearly written. However, in my opinion, it falls short of new results and more analyses are required before it can be accepted for publication. I detail below a few suggestions to the authors.

### Main comments

- 1) Earlier studies, including those cited by the authors, have already examined the behavior of sounding balloons and it is not clear what is new in the analysis presented in this paper. This should be explicit. The development of the model equations is standard and could be shortened and partly moved to the appendix.
- 2) The lack of consideration of radiative fluxes is a severe shortcoming in my opinion. This point was also neglected in many previous studies and could be a novel interesting aspect of this paper if treated. Note that even during nighttime the infrared fluxes from the Earth surface might not be negligible compared to heat diffusion.
- 3) A validation of the numerical model is missing. Even though they do not have access to that information for Ebro launches, the authors could validate their model with ascent rates from present day radiosoundings. The sensitivity of the retrieved horizontal wind to the assumed lapse rate and model parameters should also be presented (currently only this sentence on line 859 'correlations obtained between the ERA5 wind profile and the model hardly vary even when using the lapse rate for a standard atmosphere (6.5 K km<sup>-1</sup>)' hints that the authors have carried out such a sensitivity study but the results are not

presented).

Other comment :

p5 line 164 : 'ERA5 pressure levels': why not use model levels instead ? They have a higher resolution.