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Interactive comment on “Countergradient heat flux observations during the evening transition period” by E. Blay-Carreras et al.

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general comments:

The transition periods of the atmospheric boundary layer (ABL) are poorly understood. Most of our current analytical models and understanding rely on linear behaviour and quite simple assumptions. That these do not reflect reality can be easily seen regarding the correlation of the vertical temperature profile and the buoyancy flux in time, which is often observed to be shifted in phase. In the morning this phenomenon can be described by the Rayleigh-Bernard (R.-B.) hypothesis. The manuscript describes experimental data from the BLLAST campaign, which is focussed on the afternoon and evening transition. Thus a reversed R.-B. hypothesis is tested.

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The manuscript is easy to read and understand and well structured. Language could be improved, but this is not necessary in my opinion.

My only criticism is that the data base is rather thin and that the results discussed on page 7724 are based on only a few data points gathered on a handful of days (only two really convective days) at a certain location. However, the (thus statistically spoken not very significant) results are a motivation to study the ABL transitions in more detail and check the presented hypothesis with more data also from other experiments.

specific comments:

* Did you check whether the fine-wire thermocouple and / or their cold junctions including the connected electronics were influenced by direct or indirect solar radiation? I saw similar experiments in the past where insolation disturbed thermocouple measurements significantly.

* Please explain: how was the height z_i of the ABL detected and quantified using a ceilometer? Note, the cloud base is not a measure for z_i (page 7722, lines 11 ff), cumulus clouds may form at any height within the ABL. The convective time scale strongly relies on a correct measurement of z_i and thus the following interpretation. Was z_i correctly determined on weakly convective days? Could this be the reason why the presented hypothesis agreed best on convective days (24 and 30 June)?

This can be a minor issue if it turns out that it is just based on a misunderstanding. But if not it may have impact on the data interpretation. This is the only reason why I recommend a major revision of the manuscript.

technical corrections:

* eq 1 and in text: dimensionless number Ra not italic!

* Fig. 4: I cannot see asterisks but bullets

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