

## ***Interactive comment on “Generation of free convection due to changes of the local circulation system” by R. Eigenmann et al.***

### **Anonymous Referee #2**

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General comments.

This study is interesting and is obviously the result of a great deal of work, and contains some novel results. I think it would benefit from being abbreviated slightly (in particular with regard to quality control of the data) to make it more appealing to a general readership.

Figures: in my PDF copy some of the images are so small that they are almost impossible to read the scales and axes. Could the figures be made bigger / more legible.

It would be helpful to have a map showing the location of the measurement site in relation to the Black Forest. Figure 1, although informative, does not help to orientate the reader.

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## Scientific comments

The authors state that "...free convection to be induced in situations where high buoyancy fluxes and a simultaneously occurring wind speed collapse were present".

Are these conditions \*necessary and sufficient\* for free convection to occur? Are there any instances of FC where these conditions are not met? conversely, are there instances of low zeta (or instability) when FC did \*not\* occur? Would it be possible to show a scatterplot of zeta (the stability parameter) against some independent measure of free convective activity, for the whole of COPS (maybe split into "event" and "non-event" days)?

Too much technical information regarding quality control: could these sections be abbreviated? Also is Fig. 2 strictly necessary?

p11380 "...as buoyant forces (B)...then dominate over shear forces (S)..." This is not clear from the definition of zeta. The reader would also need to know that zeta = Richardson number for  $Ri < 0$ .

p11383-11384 regarding differing turbulent regimes for temp. and for vertical wind. Does this interesting finding have any implications for numerical modelling, parametrisations, etc?

P11387 "The mean duration of...FCE[s]...is 1h and 24 min with a standard deviation of 57min" change 1h and 24 min → 84 min. Also, this represents a quite high value for the coefficient of variation - would the authors like to comment on this?

Sect 3.2, p11385, l25 This section is quite unconvincing and needs further expansion or deleting entirely. The authors state that "now its [FC's] contribution to possible cloud formation or even precipitation events over the cops area shall be discussed." Then, mention is made of satellite imagery which is not shown, and the remainder of this section is about 15 lines long - which does not justify the assertion quoted above. Also, in the Conclusions, it is stated that FCEs "may have a strong contribution to subsequent

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possible cloud formation and precipitation over the COPS region". This should either be removed or more evidence provided for its justification.

Conclusions "Consequently, it is not possible to clarify the horizontal dimensions of the near-ground air masses destabilized in the Kinzig valley and thus the exact quantities of heat and moisture transported upwards into the ABL." Do the authors think this is a serious failing with this work, as no general conclusions or suggestions can be made regarding this aspect of the BL? I think this sentence should be re-worded, as it sells this paper short, and does not do the interesting findings the justice they deserve.

Typographical comments etc

Introduction. The first sentence is too long - split into 2 or more sentences. 11368L20 "has been carried out" -> "was undertaken" 11369L2 "modeling and forecast" -> "modeling and forecasting" 11369L15 "altering" -> "changing" 11369L23 "settings" -> "features" 11369L28 "(ii) surface heating and moisture supply overcoming convective inhibition during latent and/or potential instability" does not make sense to me. 11370L9 "compared to the surrounding air" -> "compared with the surrounding air" 11370L22 "..et al., 2004)," -> "..et al., 2004);" 11370L14 "tops of the thermal structures...and fair weather clouds" -> "tops of the structures and produce fair weather clouds" 11372L13 "a eddy covariance" -> "an eddy covariance" 11374L9 "a valuable site evaluation" in what sense valuable? 11375L27 "SOWAS (software for wavelet spectral analysis.." does this need capitalisation? 11375L23 "polynom" -> polynomial 11379L3 "free convection events (FCEs)" this acronym has already been defined. 11379L10 "previously prevailed" -> "previously prevailing" 11379L15 "ceasing of the down-valley change ceasing to cessation 11382L11 "So far parameters..." -> "So far, parameters..." 11382L16 "...it is not astonishing that the spatial as well as temporal averaged Sodar..." -> "...it is not surprising that the spatially as well as temporally averaged..." 11383L8 "Fig 8a and b" -> "Figs. 8a and 8b" 11383L14 "...in particular scales..." -> "in particular, scales" 11383L11 "within a certain range in the inertial subrange" -> "within a subset of the inertial subrange" 11385 "discussed, controversially, by..." in what sense

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controversially? 11388 "mean diurnal courses" → "mean diurnal trends" and change in the appropriate figure captions.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 11367, 2009.

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