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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characteristics and evolution of diurnal foehn events in the Dead Sea valley" *by* Jutta Vüllers et al.

Anonymous Referee #1

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Review of: Characteristics and evolution of diurnal foehn events in the Dead Sea valley I found this paper very important and interesting particularly the unique observations done in the DS area and described hear. I recommend to accept the paper after making a revision in light of the comments below. P1l6 (page 1 line 6) "the mean maximum velocities of around 5m/s". Mean of the maximum is an exact number please give the exact value. Section 3.1 It will be helpful if you will add some sentences describing the main differences between density and radiative driven flow, and their relation to potential temperature difference between the crest and bottom. What are the problems that the automatic mixture model deal with. p.6 line 5. The distinction between foehn and radiative flow are determined mainly by the potential temperature difference between the crest, Jerusalem 810 m and Masada, -7m p6l9 or Ein Gedi -427m p6l10. In Fig. 3

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Discussion paper

the temperature differences are shown. Please show the potential temperature differences instead. Also it looks like a mistake the positive temperature difference between Jerusalem and Ein Gedi, p6l13, Jerusalem is always cooler than Ein Gedi.

P7l16-l19 The west wind observed at least 2 hours earlier at 14:00. The height of the maximum west wind at 14:00 is at 1750m, and so at 16:00. p8l19-26 The mixed events. At least in August 28 it is not clear to me why you call it mixed event and August 16 strong event. Comparing Fig. 5f after 20:00 and Fig. 6 after 21:00 the wind behavior is similar and so both cases can considered as mixed events. P9l10 Please note that from the ground up to 900m the stratification is unstable or neutral i.e. The strong vertical mixing from the ground to 900m discussed in, P9l18-20, is mainly due to the unstable layer close to ground, and not due to mechanical mixing. P9l16 It is not clear that the western wind is the return flow. I think it is the residual wind from the night. P9l23-34 What was the resolution in COSMO-EU model, may be the not observed front is a consequence of the resolution. The flow field is not shown and could be very helpful in interpret the model results since the wind field play a major role in understanding the foehn. I recommend to add a figure o the flow field. Please also show the mixing ratio (q) instead RH fields in Fig. 11, since q is more relevant. p10-11 Stage III. You combine observations, model results and interpretation, I suggest to note what based on observations what based on model and what is interpretation. I also suggest to add a model wind cross section at 21:00. The description of the hydraulic jump you refer looks like a sea breeze front/ gravity current head. You did not address one of the main questions: is this sea breeze front developed over the plains much earlier and propagates into the DS, or it developed in the valley. The formation of the foehn is not clear, since the authors claim that the source of the air is the Mediterranean and we would expect high q of this sea air relative to the inland air. Please explain the formation of the dry air. It is not clear if the hydraulic jump observed in the DS is formed there or maybe it is the sea breeze front formed over the plains and mountains and propagates downslope into DS. If the hydraulic jump is the sea breeze front, this might explains the elevated foehn found in some cases since under certain conditions the front leave

the mountain and propagates on isopycnicals. P12l7-12 The mixing is mainly due to convection from the unstable layer near the ground see my comment P9l10 above.

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