**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Remote sensing of the tropical rain forest boundary layer using pulsed Doppler lidar" *by* G. Pearson et al.

G. Pearson et al.

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Anonymous Referee 1 comments:

Major comments:

a) Small section on Doppler lidar characteristics should be included.

More characteristics are now included in section 4, but have been limited to the characteristics that are non-technical. Technical details can be found in Pearson et al as noted in the text.

b) Discussion on climate model parameterisations

A short section has been included in the conclusions with regards to what the results

mean for modellers and comparisons with parameterisations

c) Which MLH is best?

A discussion is now included in the conclusions of how it is the mixing measurements from the lidar that can be used to inform the development of better boundary layer turbulence models and it is noted that the modelled LCL can be used to compare with lidar cloud base as a validation of how well the mixing is being modelled.

Specific Comments

a) Figure 6+7: Thresholds of -5db and -17db? The –17dB threshold was chosen since this gives a false detection probability of less than 2%. The –5dB level is somewhat empirical but was estimated from contemporaneous data taken in Europe with co-located lidars & radars and by investigating conventional lidar ceilometer algorithms.

b) Figure 8: The growth rate of the 0.3m/s threshold is shown in figure 10 and is comparable to the other growth rates. The 0.3 m/s threshold was selected based upon inspection of figure (8). Since all the contours are displayed, the reader is a liberty to select another. There is no recognised convention since this is a new metric.

c) Figure 9: Wind speeds. The average wind speed profile is the average for the whole 70 days. The maximum winds reflect the gust speeds that were infrequent and related to storm outflows. A comment referring to this has been included at the end of the results section.

Ganzeveld Comments:

Exchange of compounds?:

Comments have now been included as to what parameters are used in climate models. These comments included in the conclusion section aim to elucidate the difficulty in comparing what is actually being measured with how the models are designed. One of the difficulties as suggested in section 3 is that when backscatter lidar measures

signal backscatter it is affected by both aerosol concentration and humidity. By using the Doppler velocity as suggested in this paper we can measure the actual mixing process, which is also what is modelled in the NWP models.

What is the typical mixed layer depth one could really apply to Borneo and how to define one MLH?

Firstly the measurements imply that the aerosol concentrations are not well mixed through the depth of what we call the mixed layer, this could be due many factors including humidity. Also since most of the time over Borneo we were talking about cloudy boundary layers, we also do not know what proportion of aerosol in the upper layer air is diluted due to the cumulus driven mixing processes. In cumulus layers clean air is being mixed down as well as aerosol laden air being mixed up from the surface. We cannot, with the lidar, measure directly this cloud induced mixing and can only imply it from the aerosol concentration gradient. A discussion of this is included in the conclusions section.

Minor Comments:

Pp 5022 done

Pp 5022 done

Pp5023 I could not find the % for this number so could not put this in.

I have included a sentence to reflect the importance of tropics in chemical sources and sinks.

Pp 5024 done

Pp5025 done

Pp 5027 I have included a section on MLH from lidar data.

Pp 5028 This appears just to be a comment.

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Pp 5029 done

Pp5033 done

Pp 5034 done

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