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Hydrology and Earth System Sciences Discussions

Interactive comment on "Scaling and trends of hourly precipitation extremes in two different climate zones – Hong Kong and the Netherlands" *by* G. Lenderink et al.

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Dear reviewer 1,

Thank you for your comments. Here we briefly comment on your point about why we take the dewpoint temperature 4 hours below the rainfall event. Shown are the results of the scaling (Figure 2 of the main manuscript) taking the dewpoint temperature at the time of the rainfall event (h-0), two hours before (h-2), and 4 hours before (h-4) the rainfall event. Results are shown both for NL (figure 1) and HKO (figure 2).

For both NL and HKO the major differences occur for high dewpoint temperatures. For

NL (figure 1) the results for "h-0" clearly show a break in the scaling at 17 degrees. For the 99th percentile this break disappears in the results for "h-2", and for the 99.9th percentiles this is also the case for "h-4". This is the reason why we state the the best scaling is obtained with the dewpoint temperature taken four hours before the rainfall event.

For HKO (figure 2) results are similar. Again differences between "h-0", "h-2" and "h-4" occur at high dewpoint temperatures. These changes can be qualitatively understood by the change in dewpoint temperature during the showers. This change reflects two processes: i) the evaporation of the precipitation near the surface (causing an increase in dewpoint), and ii) the downward transport of dry upper air by the convective downdrafts associated with the clouds (causing a decrease in dewpoint). For the most extreme precipitation events the second effect appears to dominate (in an average sense) and often a drop in dewpoint temperature is observed during the shower. We note that a similar effect occurs in Figure 3 of the manuscript if we use the dewpoint temperature at the time of the shower. In that case, the distribution of dewpoint temperature for rainfall events larger than the 99th percentile (the pink line) is displaced by approx. 1-2 degrees to the left. Therefore, for the most extreme showers the dewpoint temperature is relatively low, and this causes a small increase (compared to the results for "h-4") in the intensity at a dewpoint temperature between 20 and 22 degrees. Less intense showers have on average a smaller drop (or even increase) in dewpoint temperature during the shower, and therefore have a stronger contribution of the population of precipitation events at the highest dewpoint temperature range. This causes the drop in the intensity of the extremes for temperatures above 24 degrees. To summarize, the change in dewpoint temperature during, and as a consequence of, the shower cause a systematic shift of lower intensity showers to relatively high values of the dewpoint temperature, and most extremes showers to relatively low values of the dewpoint temperature.

In general, we think that the differences between the results for "h-0" and "h-2" are substantial, but the differences between "h-2" and "h-4" are marginal. We take "h-4" because it gives the best scaling, and because it minimizes the possibility of the shower having affected the measured dewpoint temperature.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 4701, 2011.

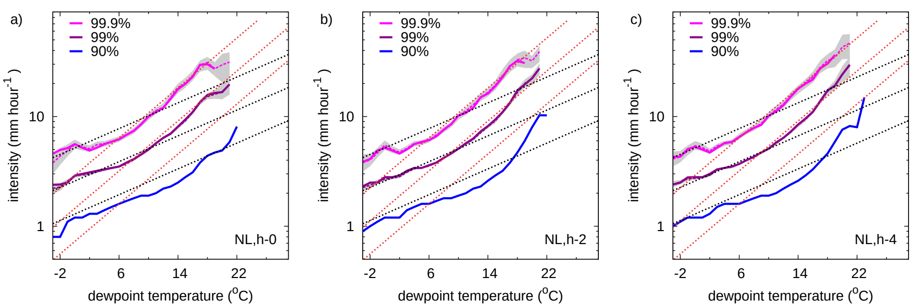

Fig. 1. Dependency of different percentiles of hourly precipitation extremes on dewpoint temperature taken 0 ("h-0"), 2 ("h-2"), and 4 ("h-4") hours before each precipitation event in results for NL

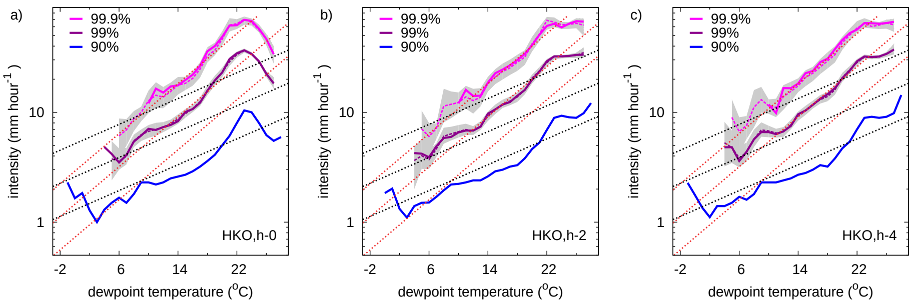

Fig. 2. Dependency of different percentiles of hourly precipitation extremes on dewpoint temperature taken 0 ("h-0"), 2 ("h-2"), and 4 ("h-4") hours before each precipitation event in results for HKO