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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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This is a novel and valuable analysis of responses in heavy rainfall for two contrasting locations that offer long-term hourly rainfall observations and in my opinion deserves to be published in HESSD. I have a few short comments:

1) Over moisture-limited regions, less cloud and rainfall may be associated with greater surface heating leading to a negative relationship between precipitation and temperature. It would be useful to briefly discuss the potential ambiguity of cause and effect, for example with reference to Trenberth and Shea (2005) GRL.

2) The novel use of dewpoint temperature (Td) by the authors circumvents this issue somewhat by linking intense rainfall to one of the primary controlling variables, water vapour concentration (an equation linking Td to specific humidity may help the general reader). My only concern is that the same Td could be associated with high temperature and low relative humidity or cooler temperatures and higher humidity, with contrasting lifting condensation levels. Could a systematic transition between these situations with temperature impact the relationship between Td and precipitation?

3) How robust are the measurements to intense rainfall? If gauges are less accurate for the heaviest rainfall, could this impact the relationship with temperature?

4) Willett et al. (2010) ERL also find changes in surface specific humidity over land in models and observations since the 1970s that are close to the Clausius Clapeyron rate at the larger scales although deviations indeed occur in some moisture limited regions [e.g. p.4703, line 10]

5) The paper by Haerter et al. (2010) JGR should be referenced I think since this suggests sub Clausius Clapeyron responses over Germany and a strong dependence upon time-averaging period. However, these authors do not consider Td, nor the influence of local changes in the large-scale circulation.

6) Averaging over the tropics helps to minimize the influence of local dynamical responses on precipitation. I have found, using tropical ocean interannual variability of precipitation, that satellite data appears to show a larger response of the heaviest tropical precipitation to warming than models and greater than expected from Clausius Clapeyron (Allan et al. 2010 ERL) although there is a large range of responses by the models due to contrasting dynamical responses (O'Gorman and Schneider, 2009; Allan et al. 2010 ERL; Gastineaux and Soden, 2009 GRL). [e.g. p.4704, line 25]

7) The dependence of rainfall intensity of the type of rainfall event may, as is mentioned, affect the relationship between heavy precipitation and temperature or Td. Are the highest Td associated with particular weather types or seasons or even times of day?

[e.g. p.4708, lines 20-25]

8) Although there is no relationship between Td and Pr_h for decadal fluctuations in Fig. 4b, there are upward trends for both variables over the centennial time-scale.

9) The final statement [p.4712, line 5] suggesting increases in intense rain will affect the dry season seem to contradict results for monthly mean data (e.g. Chou et al. 2007 GRL; Allan et al. 2010 ERL).

Corrections: p.4706, line 14 "equal to 0.1 mm hr-1" p.4709, line 17: "than" –> "then" p.4710, line 6: "reasonable good" –> "reasonably good" p.4711, line 12 "summer halve year" –> "summer half of the season"

References

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Willett et al 2010 Environ. Res. Lett. 5 025210

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