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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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We would like to thank the referee for his comments

* More details about climatology of Hong and The Netherlands. We added two paragraph's about the climatology in Hong Kong and the Netherlands in section 2.1.

* The use of dew point temperature and climate change. We added a longer motivation why we used the dew point temperature in the analysis in section 2.2. " Relations between temperature and precipitation are difficult to asses because of an ambiguity of causes and effects, in particular over moisture-limited regions and the summer

season \citep{Trenberth2005,Lenderink08}. Most important is the dependency of both temperature and precipitation on the atmospheric circulation conditions. In summer, this causes a negative correlation between mean precipitation and temperature since high pressure systems cause warm weather with at the same time low relative humidity and low precipitation amounts. A prolonged period with dry weather could results in soil moisture depletion, with further reduced surface evaporation and temperature increases. This again implies a negative correlation between temperature and precipitation, which could be further enhanced by feedbacks from clouds. Yet, on a climatic time scale warmer temperatures are associated with increasing moisture (as discussed in the introduction) and on a global average precipitation increases. It is this causal relation – temperature increases causing moisture increases, causing increases in precipitation extremes – we are interested in and which we want to derive from present-day observations. We (partly) circumvented this ambiguity by taking, instead of the temperature, the dew point temperature as a direct measure of moisture in most of the analyses."

We also added a definition of dewpoint temperature, and added in the conclusions: "We relate hourly precipitation extremes to the dew point temperature instead of temperature. This implies that, beside temperature changes, relative humidity changes become important as well. Consider climate change, the simplifying nature of relating changes in precipitation. extremes to temperature changes through the Clausius-Clapeyron relation is therefore apparently lost. Only if the relative humidity does not change, temperature and dew point temperature changes are equal. However, climate models commonly project considerable decreases in relative humidity over large continental areas in summer. Yet, there could be a twist here. In an ensemble of regional climate simulations over Europe we typically find 50% smaller spatial variations in the change in dew point temperature compared to the change in temperature (see Supplement, Sect. f). Therefore, changes in dew point temperature may well be more robust and better predictable than changes in temperature. Concluding, we think that the change in dew point temperature provides a physically more justifiable and a more

HESSD

8, C3833–C3835, 2011

robust indicator of the changes in precipitation extremes than the change in absolute temperature."

Small changes in the text have been applied according to the referee's suggestion

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