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Consistent large-scale response of hourly extreme precipitation to temperature variability

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Hourly precipitation extremes can intensify with higher temperatures at higher rates than theoretically expected from thermodynamic increases explained by the Clausius-Clapeyron (CC) relationship ($\sim 6.5\%/K$), but local scaling with surface air temperature is highly variable. Here, we use daily dewpoint temperature, a direct proxy of absolute humidity, as the scaling variable instead of surface air temperature. Using a global dataset of over 7000 hourly precipitation gauges, we estimate the at-gauge local scaling across six macro-regions; this ranges from CC to 2xCC for more than 60% of gauges. We find positive scaling in subtropical and tropical regions in contrast to previous work. Moreover, regional scaling rates show surprisingly universal behaviour at around CC, with higher scaling rates in Europe. Our results show a much greater consistency of scaling across the globe than previous work, usually at or above the CC rate, suggesting the relevance of dewpoint temperature scaling to understand future changes.