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## More perceived but not faster evolution of heat stress than temperature extremes in the future

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Global warming is projected to intensify during the 21st century. This warming will be more readily perceived by human populations if it occurs rapidly and if it induces a thermal heat stress on the human body. Yet, only few studies investigate how climate change could be felt by future populations. Here we assess this possible perceived evolution between 1959 and 2100 only combining thermodynamic and statistical indicators. We analyse extremes of temperature ( $T_{99}$ ) and simplified Wet-Bulb Globe Temperature ( $WBGT_{99}$ ), a common heat stress index assessing the combined effect of elevated temperature and humidity on the human body. For each year of the period, we define the speed of change as a difference between two successive 20-year periods (i.e. with a moving baseline), and assess how these running changes emerge from each last 20-y inter-annual variability.

According to a subset of 12 CMIP5 Earth System Models and the RCP8.5 scenario, the change of  $T_{99}$  and  $WBGT_{99}$  will be twice as fast in the future compared to the current speed of change in the mid-latitudes, and by up to four times faster tropical regions such as Amazonia. Warming accelerations are thus similar for both  $T_{99}$  and  $WBGT_{99}$ . However, in tropical regions by 2080, the speed is projected to be 2.3 times larger than the recent inter-annual variability for  $WBGT_{99}$ , and only 1.5 to 1.8 times larger for  $T_{99}$ . Currently, speeds of change are only 0.2 to 0.8 times as large as the recent year-to-year variability for both metrics. We also show that 36% of the total world population will experience an emergent  $WBGT_{99}$  intensification in 2080, but only 15% of the population for  $T_{99}$ . According to future projections, the accelerated warming of future heat extremes will be more felt by populations than current changes, and this perceived change will be more severe for  $WBGT_{99}$  than for  $T_{99}$ , particularly in the tropics.