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Recent changes in hot and humid extreme over China

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Extreme heat events are well identified as a climate threat for human health. Less studied but at least as important as heat waves, extreme hot and humid conditions can lead to conditions where human survivability is not possible because in such environments bodies cannot cool down (evaporation becomes impossible). Wet-bulb temperature (TW) is a combined measurement of dry-bulb temperature and relative humidity (RH) and can be used to study hot and humid conditions. TW summarizes the complex interaction between humidity and temperature and allows more easy analysis. Here we investigate how TW has changed in the recent decades over Eastern China, a region already identified as vulnerable to such conditions.

For any observational analysis, reliable datasets are needed. Temperature data have traditionally received a lot of attention from the community while humidity observation remains poorly evaluated. We used a dense network of Chinese observation and compared it with the new ERA5 reanalysis during the 1979-2017 period. A first analysis indicate a weak increase in TW in both dataset due to a sharp drop in RH around 2000s. However, a new homogenised RH data have revealed that this decrease was an artifact due to a change in Chinese observation network. Newly homogenised data show no drop in RH and consequently a much larger increase in TW. ERA5 has assimilated biased data over China and is not reliable to study TW without performing RH correction. We did so by using an independent model approach, and recalculated RH and TW in ERA5. After correction, increase in TW becomes much larger and we could identified several location with already dangerous TW levels.