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Supplementary information

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Daytime urban heat stress in North America reduced by irrigation

In the format provided by the authors and unedited

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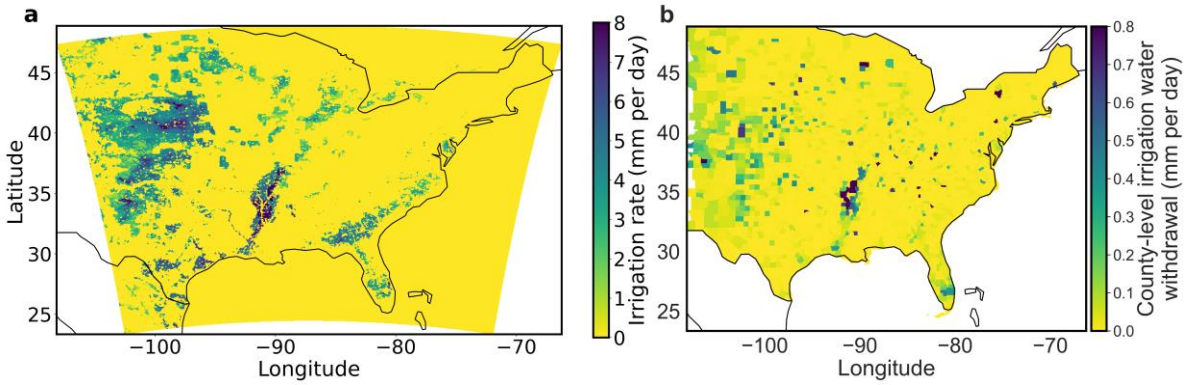

Fig. S1 | Modeled and reference irrigation rates | a Grid-wise irrigation rate over the model domain during the study period from the 'irrigation' simulations. **b** Reference county-level irrigation rate for the year 2015 based on estimates by the United States Geological Survey (USGS).

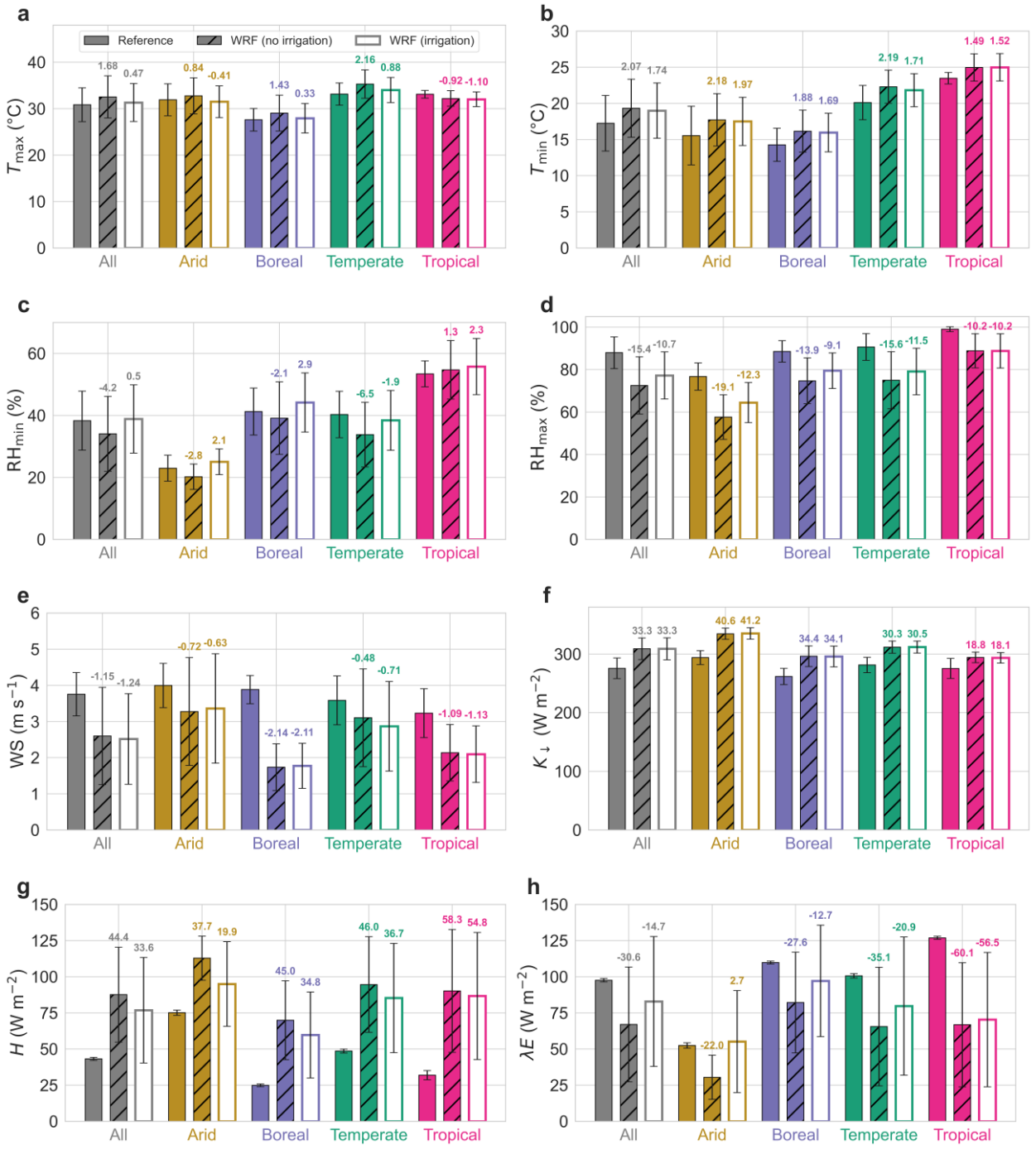

Fig. S2 | Summaries by domain and climate zone | a Maximum and **b** minimum air temperature (T_{max} and T_{min}, respectively), **c** minimum and **d** maximum relative humidity (RH_{min} and RH_{max}, respectively), **e** mean wind speed (WS), **f** mean incoming solar radiation ($K_{\downarrow}$) **g** mean sensible heat flux (H) and **f** mean latent heat flux (λE) for the WRF simulations with and without irrigation for the 2008-2012 summer (June, July, August) period overall and by climate zone.

The reference data are from GRIDMET for **a**, **b**, **c**, **d**, **e**, and **f**, and ERA5-Land for **g** and **h**. The error bars are the standard deviations for those regions. The mean bias error (MBE) values against the reference are noted above the bars for both simulations.

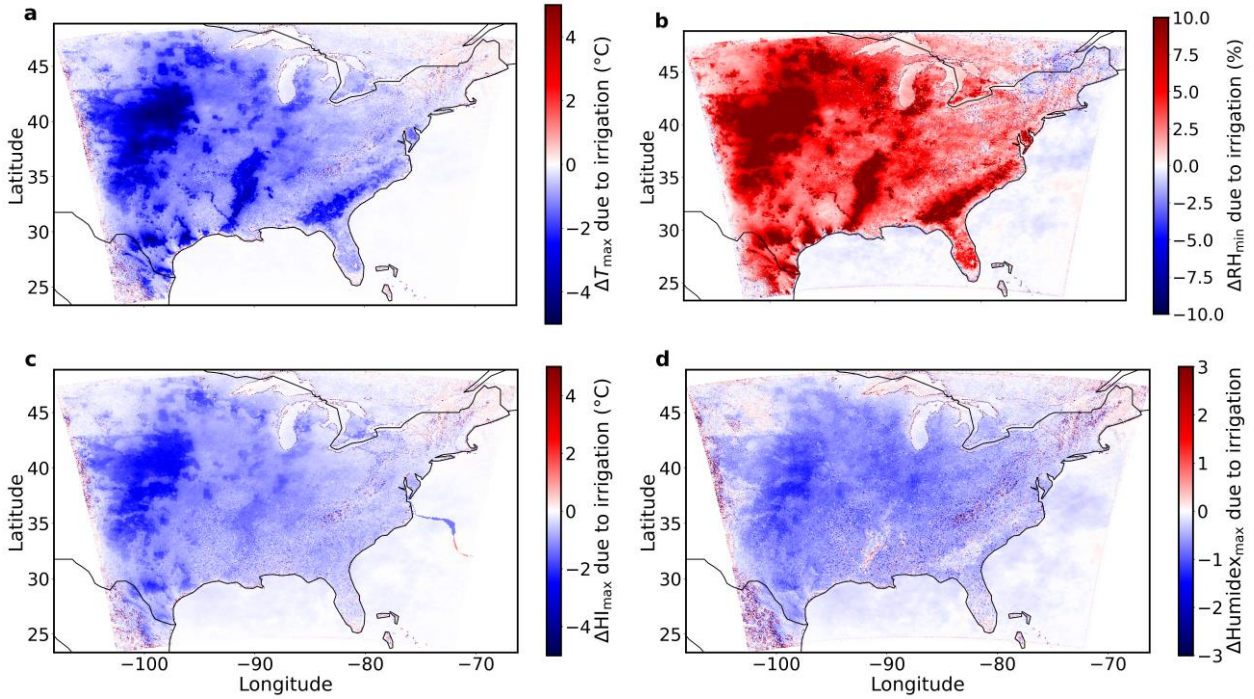

Fig. S3 | Domain-wide daytime changes in surface climate and heat stress due to irrigation | Irrigation-induced grid-wise changes in **a** maximum air temperature (ΔT_{max}), **b** minimum relative humidity (ΔRH_{min}), **c** maximum heat index (ΔHI_{max}), and **d** maximum Humidex ($\Delta Humidex_{max}$) over the model domain.

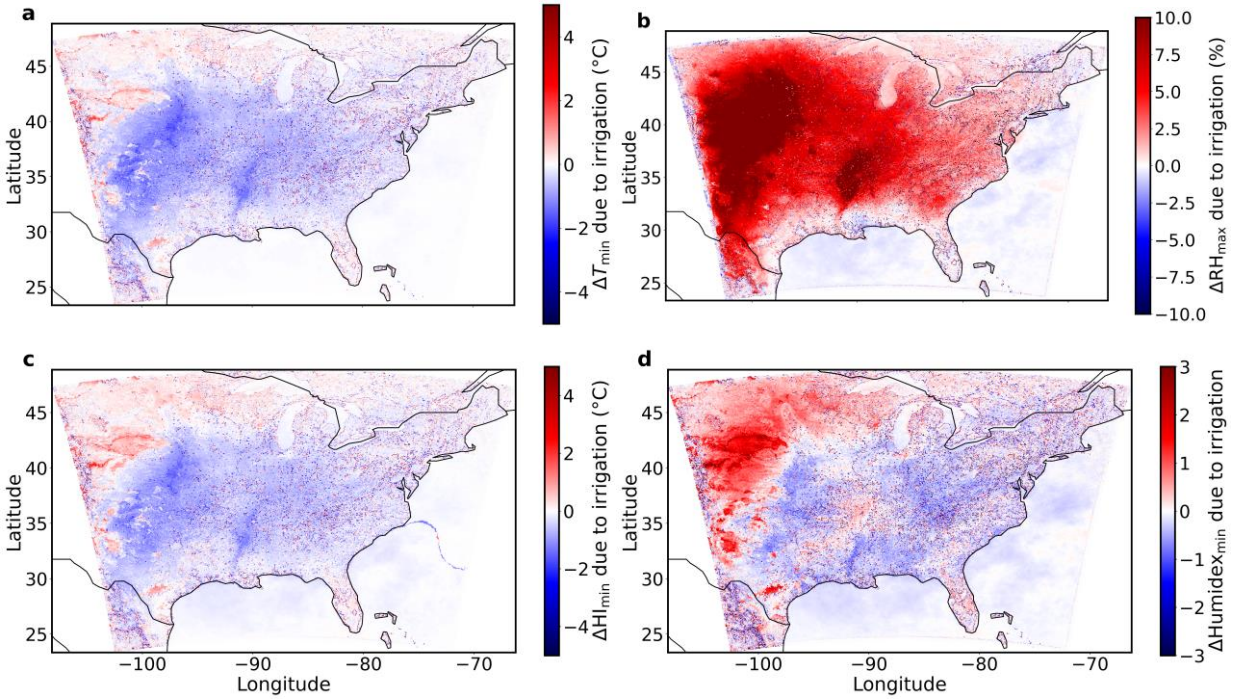

Fig. S4 | Domain-wide nighttime changes in surface climate and heat stress due to irrigation | Irrigation-induced grid-wise changes in **a** minimum air temperature (ΔT_{min}), **b** maximum relative humidity (ΔRH_{max}), **c** minimum heat index (ΔHI_{min}), and **d** minimum Humidex ($\Delta Humidex_{min}$) over the model domain.

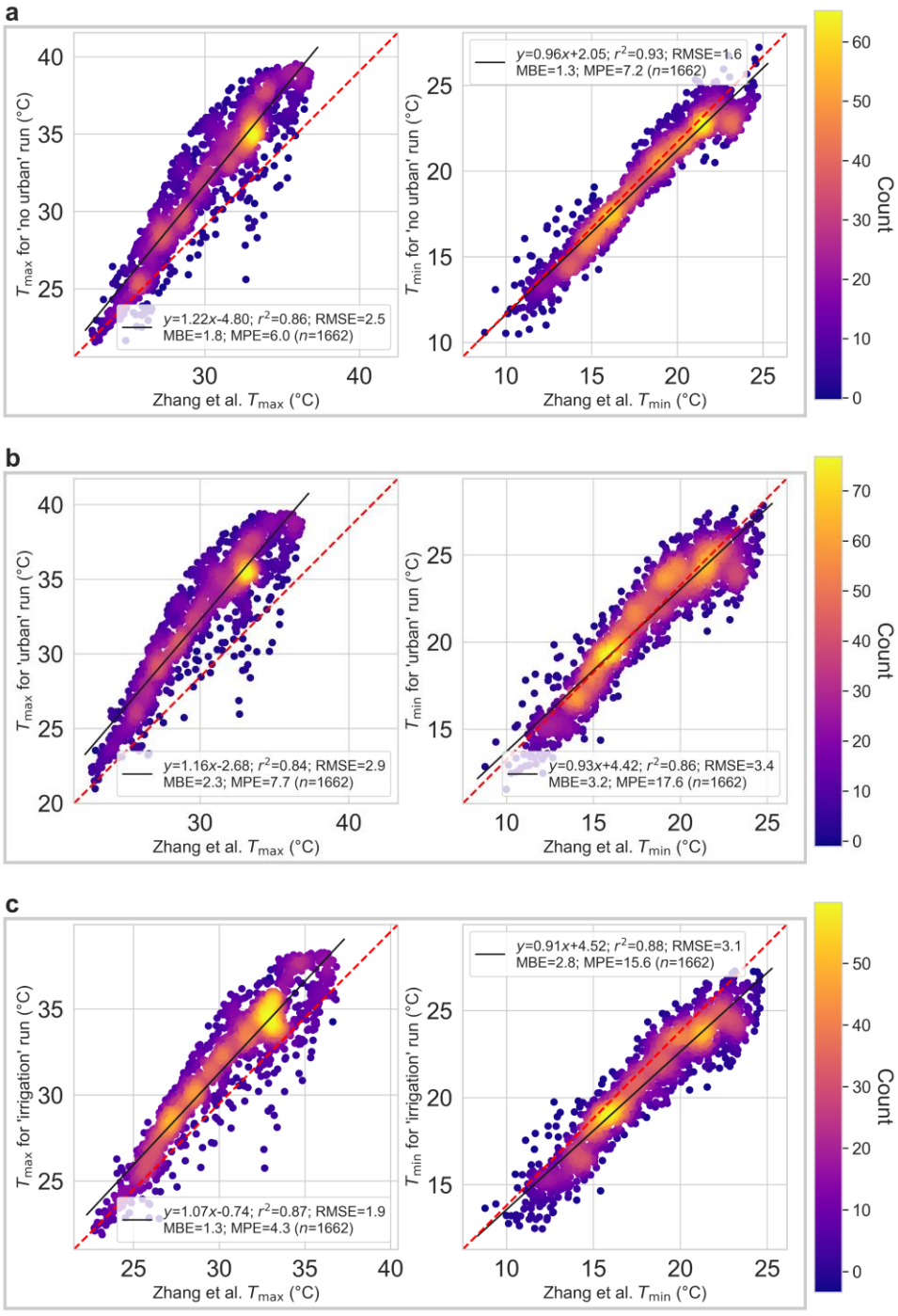

Fig. S5 | Model evaluation for urban clusters | Evaluation of maximum and minimum air temperature (T_{max} and T_{min}, respectively) in **a** 'no urban' simulation, **b** 'urban' simulation, and **c** 'irrigation' simulation against the Zhang et al. dataset for the 2008-2012 summer (June, July, August) period. Each datapoint is one urban cluster. The lines of best fit, coefficient of

43 determination (r^2), root mean square error (RMSE), mean bias error (MBE), and mean
44 percentage error (MPE) are noted for each case. The color indicates the density of data points.

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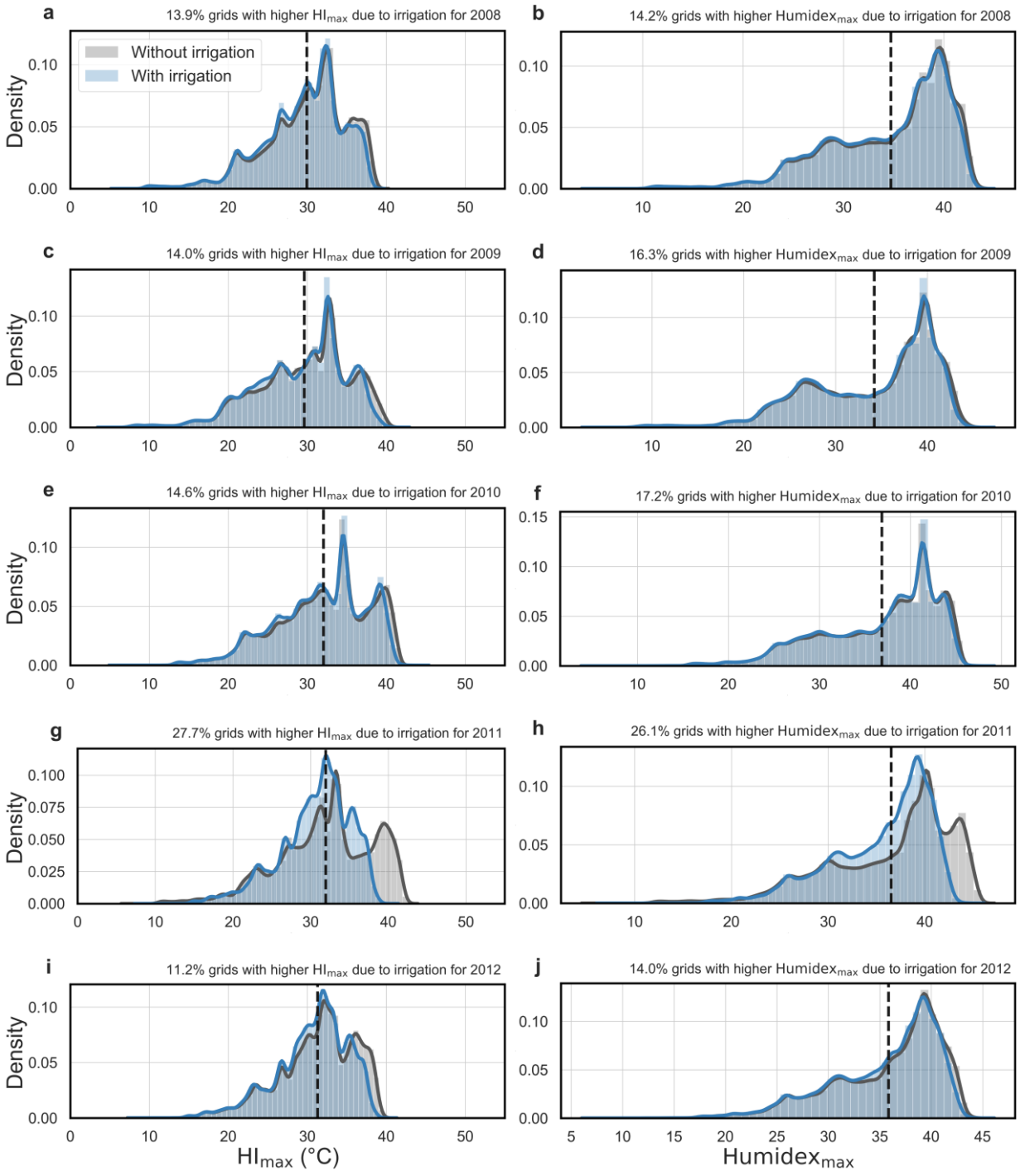

Fig. S6 | Consistency across ensemble members | Probability density distributions of grid-averaged maximum heat index (HI_{max}) for **a** 2008, **c** 2009, **e** 2010, **g** 2011, and **i** 2012. Sub-figures **b**, **d**, **f**, **h**, and **j** are similar to **a**, **c**, **e**, **g**, and **I**, but for maximum Humidex ($Humidex_{max}$). The vertical black dashed lines represent mean values and the percentage of grids where the values increase due to irrigation is noted for each case.