EXPLAINING EXTREME EVENTS OF 2015 FROM A CLIMATE PERSPECTIVE

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Cover credits:
Front: ©Photo by Joe Raedle/Getty Images—A vehicle drives through flooded streets The flood was caused by a combination of the lunar orbit which caused seasonal high tides and what many believe is the rising sea levels due to climate change. (on September 30, 2015, in Fort Lauderdale, Florida) South Florida is projected to continue to feel the effects of climate change, and many of the cities have begun programs such as installing pumps or building up sea walls to combat the rising oceans.
The heat index is defined as a function of temperature \( T \) in degrees Fahrenheit and relative humidity \( R \) in percent by the following formula if \( T > 80^\circ F \) and \( R > 40\% \):

\[
HI = -42.379 + 2.04901523T + 10.14333127R - 0.22475541TR - 0.00683783T^2 - 0.05481717R^2 + 0.00122874T^2R - 0.00068378T^2 + 0.00085282R^2 + 0.00000199T^2R^2
\]  
(1)

If \( 70^\circ F < T < 80^\circ F \), or \( R < 40\% \), the following formula can be used but is only valid to \( \pm 3^\circ F \).

\[
HI = 0.363445176 + 0.988622465T + 4.777114035R - 0.114037667TR - 0.000850208T^2 - 0.020716198R^2 + 0.000687678T^2R + 0.000274954TR^2
\]  
(2)

The Jeon et al. (2016) quantile bias correction procedure consists of the following steps:

4. Calculate the return value of the counterfactual simulation associated with the observed return period to obtain an estimate of the human-induced change in magnitude of the event.

**REFERENCE**

Fig. S16.1. Time series of the annual maxima of daily maximum heat index and associated temperature and their pentadal averages over the period 1974–2014 for (a) Hyderabad and (b) Karachi. Linear regression fits are also shown. Return time (years) of the daily and pentadal maximum heat index and associated temperature based on the HadISD station data at (c) Hyderabad and (d) Karachi. Error bars represent the 90% confidence interval due to sampling uncertainty. All units are °C.
Fig. S16.2. Histograms portraying uncorrected counterfactual (blue) and actual (red) simulations. Left column: Hyderabad May 2015. Right column: Karachi June 2015. (a),(b) Daily maximum heat index (°C). (c),(d) Temperature at the time of daily maximum heat index (°C). (e),(f) pentadal average of that temperature.