Big data confirms climate extremes are here to stay

July 30 2014

In a paper published online today in the journal *Scientific Reports*, published by *Nature*, Northeastern researchers Evan Kodra and Auroop Ganguly found that while global temperature is indeed increasing, so too is the variability in temperature extremes. For instance, while each year's average hottest and coldest temperatures will likely rise, those averages will also tend to fall within a wider range of potential high and low temperate extremes than are currently being observed. This means that even as overall temperatures rise, we may still continue to experience extreme cold snaps, said Kodra.

"Just because you have a year that's colder than the usual over the last decade isn't a rejection of the global warming hypothesis," Kodra explained.

With funding from a $10-million multi-university Expeditions in Computing grant, the duo used computational tools from big data science for the first time in order to extract nuanced insights about climate extremes.

The research also opens new areas of interest for future work, both in climate and data science. It suggests that the natural processes that drive weather anomalies today could continue to do so in a warming future. For instance, the team speculates that ice melt in hotter years may cause colder subsequent winters, but these hypotheses can only be confirmed in physics-based studies.

The study used simulations from the most recent climate models developed by groups around the world for the Intergovernmental Panel on Climate Change and "reanalysis data sets," which are generated by blending the best available weather observations with numerical weather models. The team combined a suite of methods in a relatively new way to characterize extremes and explain how their variability is influenced by things like the seasons, geographical region, and the land-sea interface. The analysis of multiple climate model runs and reanalysis data sets was necessary to account for uncertainties in the physics and model imperfections.

The new results provide important scientific as well as societal implications, Ganguly noted. For one thing, knowing that models project a wider range of extreme temperature behavior will allow sectors like agriculture, public health, and insurance planning to better prepare for the future. For example, Kodra said, "an agriculture insurance company wants to know next year what is the coldest snap we could see and hedge against that. So, if the range gets wider they have a broader array of policies to consider."

More information: *Scientific Reports* 4, Article number: 5884 DOI: 10.1038/srep05884

Provided by Northeastern University