

Study shows summer climate change, mostly warming

November 13 2012

Analysis of 90 years of observational data has revealed that summer climates in regions across the globe are changing—mostly, but not always, warming —according to a new study led by a scientist from the Cooperative Institute for Research in Environmental Sciences headquartered at the University of Colorado Boulder.

"It is the first time that we show on a local scale that there are significant changes in summer temperatures," said lead author CIRES scientist Irina Mahlstein. "This result shows us that we are experiencing a new summer climate regime in some regions."

The technique, which reveals location-by-location temperature changes rather than global averages, could yield valuable insights into changes in ecosystems on a regional scale. Because the methodology relies on detecting temperatures outside the expected norm, it is more relevant to understand changes to the animal and plant life of a particular region, which scientists would expect to show sensitivity to changes that lie outside of normal variability.

"If the summers are actually significantly different from the way that they used to be, it could affect ecosystems," said Mahlstein, who works in the Chemical Sciences Division of the [National Oceanic and Atmospheric Administration](#)'s [Earth System](#) Research Laboratory.

To identify potential temperature changes, the team used [climate observations](#) recorded from 1920 to 2010 from around the globe. The

scientists termed the 30-year interval from 1920 to 1949 the "base period," and then compared the base period to other 30-year test intervals starting every 10 years since 1930.

The comparison used statistics to assess whether the test interval differed from the base period beyond what would be expected due to yearly [temperature variability](#) for that [geographical area](#).

Their analysis found that some changes began to appear as early as the 1960s, and the observed changes were more prevalent in [tropical areas](#). In these regions, temperatures varied little throughout the years, so the scientists could more easily detect any changes that did occur, Mahlstein said.

The scientists found significant summer [temperature changes](#) in 40 percent of tropical areas and 20 percent of higher-latitude areas. In the majority of cases, the researchers observed warming summer temperatures, but in some cases they observed cooling [summer temperatures](#).

"This study has applied a new approach to the question, 'Has the temperature changed in local areas?' " Mahlstein said. The study is in press in the journal *Geophysical Research Letters*, a publication of the American Geophysical Union.

The study's findings are consistent with other approaches used to answer the same question, such as modeling and analysis of trends, Mahlstein said. But this technique uses only observed data to come to the same result. "Looking at the graphs of our results, you can visibly see how things are changing," she said.

In particular the scientists were able to look at the earlier time periods, note the temperature extremes, and observe that those values became

more frequent in the later time periods. "You see how the extreme events of the past have become a normal event," Mahlstein said.

The scientists used 90 years of data for their study, a little more than the average lifespan of a human being. So if inhabitants of those areas believe that summers have changed since they were younger, they can be confident it is not a figment of their imagination.

"We can actually say that these changes have happened in the lifetime of a person," Mahlstein said.

Provided by University of Colorado at Boulder

Citation: Study shows summer climate change, mostly warming (2012, November 13) retrieved 11 May 2024 from <https://phys.org/news/2012-11-summer-climate.html>

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