A drier south: Europe's drought trends match climate change projections

October 25 2017

Researchers published new findings that suggest European drought trends are lining up with climate change projections. Credit: Andrzej Boldaniuk

On the same day that global leaders wrapped up an international water and climate summit in Rome, researchers published new findings that

suggest European drought trends are lining up with climate change projections.

Their study, published Oct. 25 in *Scientific Reports*, shows that two major drought indices are deviating from one another across Europe in a manner consistent with climate change simulations.

"This is one more big drop in the bucket toward climate change attribution," said lead author James Stagge, a post-doc at Utah State University's Utah Water Research Lab. "There have been a lot of projections, but now that we're starting to see the projections and observations line up, it's not a question of 'is it happening?' It's a question of 'how much?' And 'what do we do?'"

The spatial patterns observed by Stagge and his team match climate change projections for Europe that suggest decreases in drought frequency in the north and increases in drought frequency in the south.

"Once you add in the temperature increases for all of Europe, you have all the hallmarks of climate change," Stagge said.

As temperatures increase across Europe, evapotranspiration - meaning what is leaving the ground and going back into the atmosphere - increases. Stagge explained that although one drought index captures this concept, the other does not.

Drought frequency has increased in Southern Europe and the Mediterranean in the last 30 to 40 years due to climate change. Credit: James Stagge

"When you include evapotranspiration, the border from where it's getting wetter to where it's getting drier is pushing farther and farther north," he said. "So it's not just the Mediterranean that's getting drier. It's pushing up into Germany and England. It's moving everything farther north."

This increasing deviation in European drought frequency is observed from the 1980s until today. In a stationary climate, Stagge and co-authors say they would expect this difference to be randomly distributed

and stable like it was from the 1950s through the 1970s.

"This recent and consistently increasing trend is a clear signal, not random noise," he added.

Stagge says the new findings are important to the scientific community and could influence public policy and Europe's agriculture industries. Many drought monitoring agencies use the indices to determine what constitutes drought, and insurance pilot programs have considered using them to determine whether or not farmers are entitled to compensation if drought affects their region.

"The research highlights the increasing need to carefully define drought in a changing climate," said Stagge. "Indices that were standardized in the past may drift significantly in a changing climate depending on how a data set is measured and what time period is considered."

The study was verified using two sets of data, primarily WFD/WFDEI, and E-OBS as an external check. Additionally, the team, which includes Lena Tallaksen (University of Oslo, Norway), Daniel Kingston (University of Otago, New Zealand), and David Hannah (University of Birmingham, UK), used several alternative evapotranspiration models to validate their findings.

More information: James H. Stagge et al, Observed drought indices show increasing divergence across Europe, *Scientific Reports* (2017). DOI: 10.1038/s41598-017-14283-2

Provided by Utah State University