

Framework could improve southeast rainfall forecasts

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Summer rainfall in the southeastern United States is vitally important to the region's agriculture, economy and ecology. But accurately forecasting how much rain may fall in an upcoming season can be tricky because of the complicated physical processes and environmental factors that determine its intensity.

A new study by two Duke University scientists may help improve seasonal forecasts by providing a new statistical "framework" that meteorologists can use to predict the likely [intensity](#) of rainfall for the coming summer.

"Using our new framework, we found that the characteristics of southeastern U.S. rainfall are influenced by multiple climate factors," said Laifang Li, a PhD student in climatology at Duke's Nicholas School of the Environment. "By identifying which of these climate factors or conditions is occurring, we can make more accurate rainfall intensity forecasts."

The intensity of light rainfall is associated with the combined effects of La Nina and the tri-pole sea surface temperature anomaly (SSTA) pattern over the North Atlantic, she explained. Strong, [heavy rainfall](#) is more likely to occur in years when there is a horseshoe-like SSTA pattern over the north Atlantic. In contrast, moderate rainfall is more likely caused by internal dynamics in the atmosphere and is less correlated with the SSTA.

Li developed the new statistical modeling framework with her doctoral advisor, Wenhong Li, assistant professor of climatology at the Nicholas School.

"Traditionally, probability models treat rainfall samples with a single cluster. These models cannot capture the multi-mode feature of summer rainfall and associated factors that influence precipitation over the Southeast. Our new framework, by comparison, is based on a configuration of a three-cluster finite normal mixture model and is realized using Bayesian inference. Each cluster reflects the characteristics of light, moderate or heavy rainfall," Laifang Li explained.

By using a three-cluster framework, Li and Li found they can better identify the characteristics of rainfall and its underlying physical processes. This allows them to make more accurate [seasonal forecasts](#).

While their current [framework](#) is designed specifically to forecast [rainfall](#) intensity in the Southeast during the months of June to August, they believe it can be adjusted and extended to other regions and seasons, as well.

"This could be a very useful tool to help us better understand the response of regional hydrology to climate variability and climate change in similar areas around the world," Wenhong Li said.

Li and Li published their finding in a peer-reviewed study in the online, open-access journal *Environmental Research Letters*.

More information: "Southeastern United States Summer Rainfall Framework and Its Implication for Seasonal Predictions," Laifang Li, Wenhong Li. *Environmental Research Letters*, Oct. 28, 2013. [DOI: 10.1088/1748-9326/8/4/044017](https://doi.org/10.1088/1748-9326/8/4/044017)

Provided by Duke University

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