What Eurasia's winter will be like under a third-year La Niña

November 21 2022, by Li Yuan

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In the summer of 2022, scientists predicted that a "third-year" La Niña is

very likely to occur during the winter of 2022.

Now, a team of researchers set out to study what the Eurasian climate will be like in the upcoming 2022 winter. Their findings were published in *Advances in Atmospheric Sciences* on Nov. 19.

La Niña is a climate pattern in the Pacific Ocean that can impact weather worldwide. During La Niña winters, the northern hemisphere often experiences frequent cold air outbreaks and heavy snowfalls.

To better understand the current La Niña, the team studied a variety of climate models. "Almost all the climate models we examined predict an overall warm condition over most of Eurasia. It somewhat contradicts the knowledge that La Niña facilitates cold Eurasian winters, especially when the Arctic sea ice is still at its low level compared with the historical average," said Wang Lin from the Institute of Atmospheric Physics (IAP) of the Chinese Academy of Sciences (CAS).

The team suggested that these results may arise partly from global warming or the models' biases. "Nevertheless, some post-processes to the model outputs indicate a possibility of below-normal temperature over mid-latitude Eurasia. Hence, there is still a chance of severe winter or some cold spells over Eurasia in the upcoming winter," said Wang.

"How the 2022–2023 winter weather and climate over the Eurasian continent respond to such a significant global climate signal and whether the Eurasian continent will experience a cold winter or not is an urgent question for seasonal climate prediction," said Zheng Fei from IAP.

The team used an ensemble approach, based on four different state-of-the-art coupled general circulation models developed by IAP to study the weather in the coming winter. They conducted seasonal predictions for surface air temperature and precipitation anomalies using this ensemble

approach. To increase the accuracy, they calculated the prediction anomalies relative to the average of hindcasts for the years from 2002 to 2021.

How the future Eurasian climate will evolve in winter is still subject to some uncertainties, mostly according to the unpredictable internal atmospheric variability. "Persistently improving the seasonal forecast skills of climate models and further understanding the influencing factors and physical processes on controlling the winter Eurasian surface air temperature, especially under a global warming background, should be our ultimate goal," said Zheng.

Looking ahead to future research, the team sees opportunities for improved predictions. Winter climate in Eurasian continent is closely associated with the North Atlantic Oscillation, but the predictive skill for the North Atlantic Oscillation needs to be improved. "We need to solve this problem by improving our models in North Atlantic Oscillation simulations and developing a more advanced coupled assimilation scheme," said Wu Bo from IAP.

The team wants to continue to improve the capabilities of short-term climate prediction. "In particular, in the context of global warming, the multi-system synergistic effect on climate has become increasingly significant. How to transform the synergistic effect into an effective predictor in the model is an important scientific problem to be solved, and also a great challenge," said Yao Yao from IAP.

More information: Fei Zheng et al, Can Eurasia Experience a Cold Winter under a Third-Year La Niña in 2022/23?, *Advances in Atmospheric Sciences* (2022). DOI: 10.1007/s00376-022-2331-8

Provided by Chinese Academy of Sciences