

# Scientists reveal close connections between the Northern Hemisphere mid-high latitudes and East Asia

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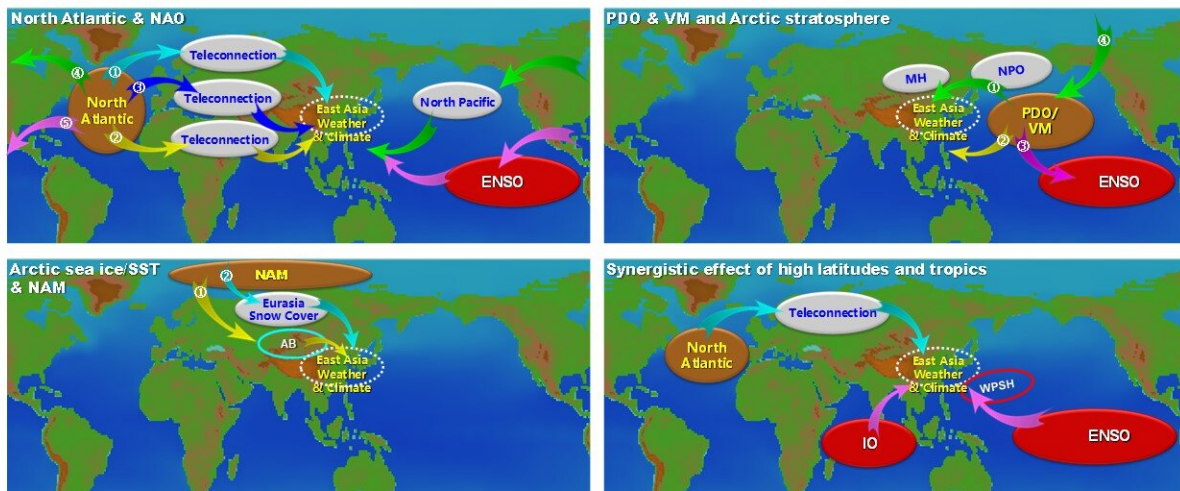
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Chinese scientists have made significant progress on the influence of the Northern Hemisphere mid-high latitudes on East Asian climate,

according to Prof. Jianping Li, from the Key Laboratory of Physical Oceanography-Institute for Advanced Ocean Studies, Ocean University of China and Qingdao National Laboratory for Marine Science and Technology, and the lead/corresponding author of a study recently published in *Advances in Atmospheric Sciences*. The article is included in a special issue on the national report (2011-2018) to the International Union on Geophysics and Geodesy (IUGG) Centennial by the China National Committee for IAMAS.

China is located in the East Asian monsoon region, and its weather and climate are greatly affected by the East Asian monsoon. Drought and flood disasters caused by monsoons often cause significant economic losses and casualties. Understanding the formation and variation of the East Asian monsoon has important implications for understanding [climate change](#) and variability in China, revealing the predictability sources of flood and drought, proposing new theories and methods for climate prediction, and producing drought and flood prediction products. Therefore, the related research is also a scientific issue of great significance for the development of the national economy, especially industrial and agricultural production, and people's property.

In recent years, increasingly more observational and simulation evidence shows that mid-high latitude climate variability has an important impact on the East Asian monsoon climate, and its impact is as significant as the tropical climate variability, which has been of more concern in previous studies. Among the evidence, Chinese scientists have produced systematic research results and played a crucial role in promoting the development of climate research in East Asia. Therefore, it is necessary to periodically review these aspects of this progress and provide reference for young scholars and researchers who are new to the field of East Asian climate research.



Four pathways of influence of the Northern Hemisphere mid-high latitudes on the East Asian monsoon. Credit: Jianping Li

Focusing on the above issues, Professor Li and colleagues conducted a systematic review of research findings on the connections between the Northern Hemisphere mid-high latitudes and East Asian climate. In the paper, a theoretical framework for multi-sphere coupled bridges (ocean-atmosphere coupled bridge, land-atmosphere coupled bridge, ice-atmosphere coupled bridge, etc.) and chain coupled bridges (e.g. tropical-extratropical, Southern-Northern Hemisphere, troposphere-stratosphere, different ocean basins, and ocean-land interactions) is first proposed, which is a useful concept for studying and understanding multi-scale interactions in climate systems.

Then, under this [theoretical framework](#), existing research findings are summarized and categorized. The pathways of influence of the Northern

Hemisphere mid-high latitudes on the East Asian monsoon are divided into four categories (North Atlantic, North Pacific, Arctic, and synergistic mid-[high latitudes](#)-tropics), and for each type of pathway, detailed discussion on the impacts and dynamical mechanisms involved is provided. These classifications greatly promote the attribution and understanding of East Asian monsoon climate and potential predictability sources. Finally, new concepts referred to as the "synergistic effect" and "antagonistic effect" are proposed, which objectively explain the combined effect of the impacts of multiple regional climate variabilities on East Asian climate.

Professor Li points out that, although much work has been carried out on East Asian climate, in practice current prediction skill remains insufficient to meet the needs of society. The climate variability over the different regions mentioned in the review paper has a very significant "[synergistic effect](#)" on the East Asian [monsoon](#) climate, including tropical-mid-to-high latitude climate variability, the Southern-Northern Hemisphere, the five oceans, and the synergistic effects between the oceans and land. These synergistic effects may provide more predictability sources for East Asian climate, and how to consider contributions from these climate variabilities in East Asian [climate](#) predictions will be the focus of future research.

**More information:** Jianping Li et al, Pathways of Influence of the Northern Hemisphere Mid-high Latitudes on East Asian Climate: A Review, *Advances in Atmospheric Sciences* (2019). [DOI: 10.1007/s00376-019-8236-5](#)

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