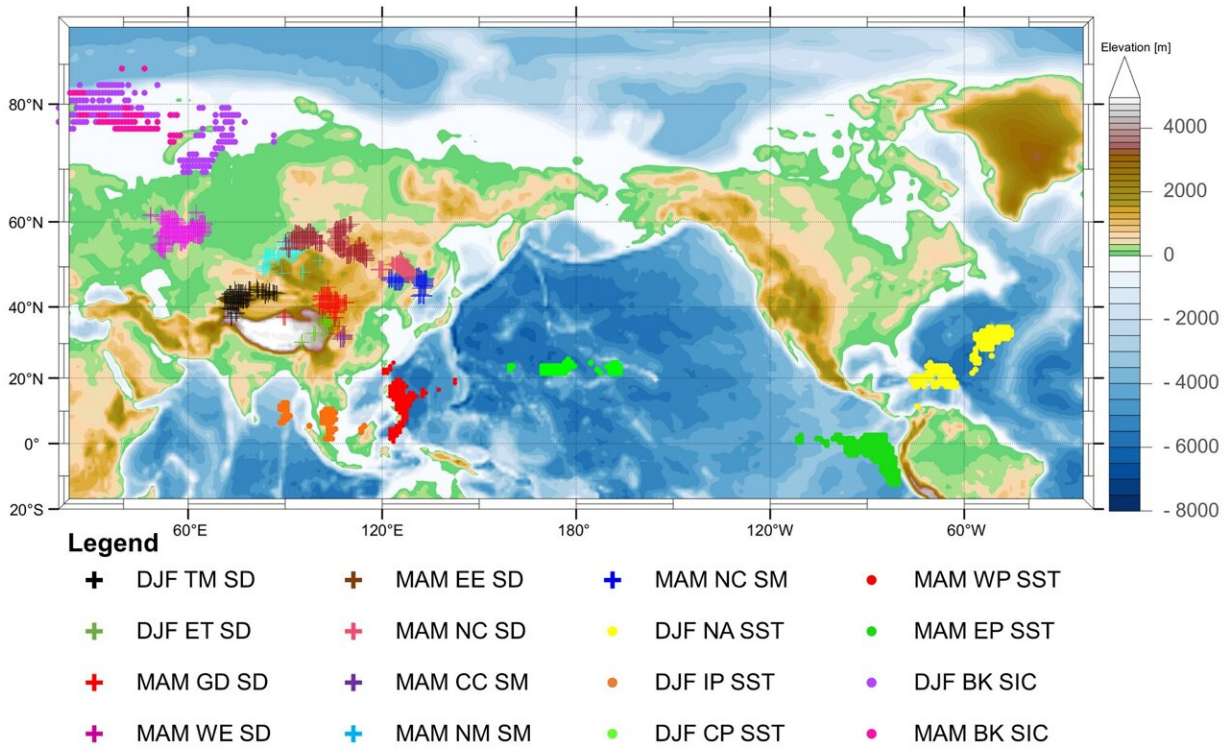
AI-driven approaches for predicting heat waves in South Korea using snowfall data from Mongolia and China

August 27 2024, by JooHyeon Heo



Geographical distribution of selected teleconnection drivers for heat wave frequency in South Korea. Credit: *npj Climate and Atmospheric Science* (2024). DOI: 10.1038/s41612-024-00722-1

As record-breaking heat waves become increasingly frequent in South

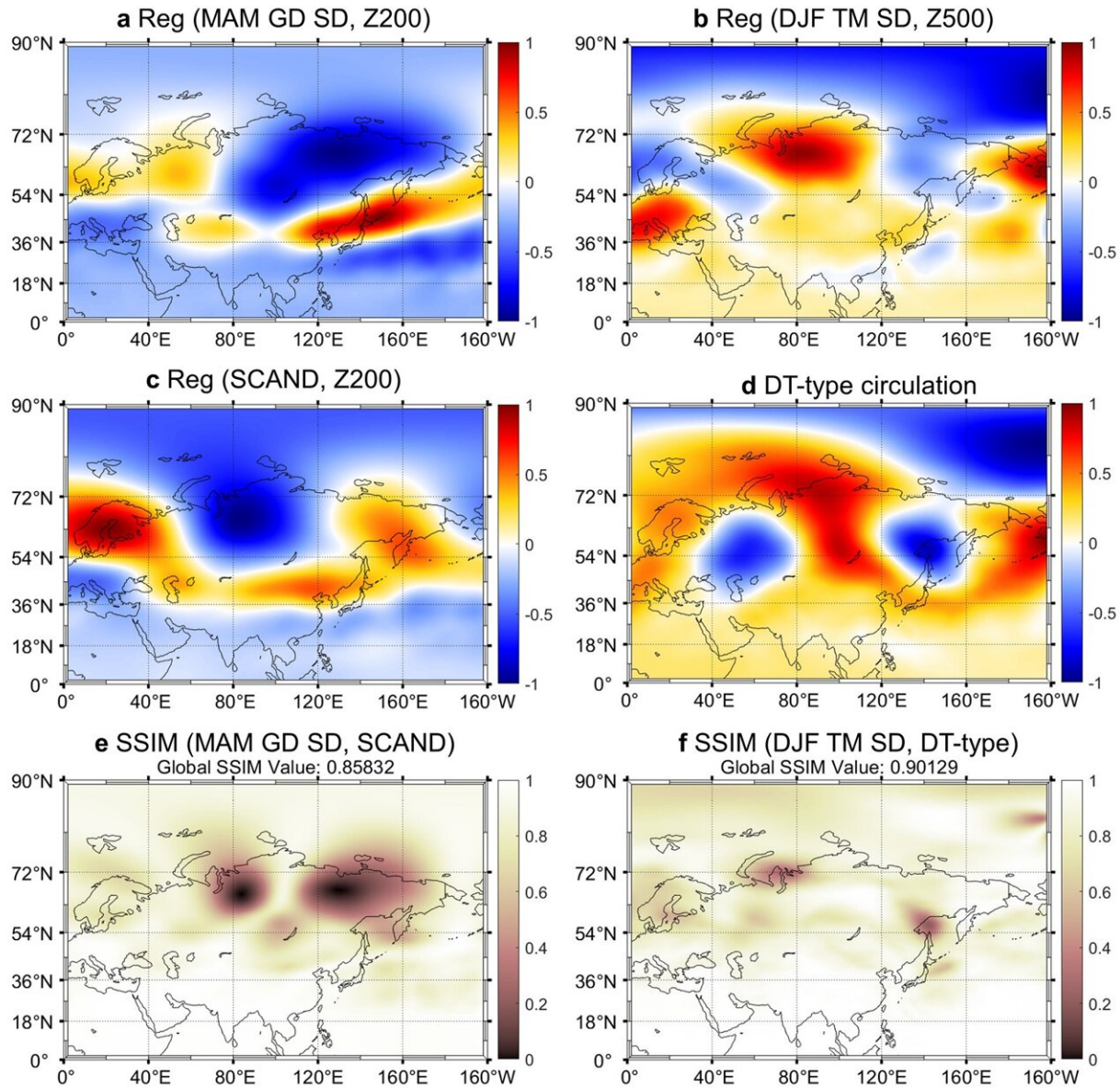
Korea, the development of AI-driven prediction technologies is emerging as a vital tool in responding to these extreme weather events and other climate changes.

Professor Jungho Im and his research team from the Department of Civil, Urban, Earth, and Environmental Engineering at UNIST have developed an innovative AI model for predicting heat waves. The paper is published in the journal *npj Climate and Atmospheric Science*.

This model analyzes a range of global climate factors, including sea surface temperature (SST), soil moisture (SM), snow depth (SD), and sea-ice concentration (SIC). Notably, the snow depth in the Mongolian desert and the Tianshan Mountains has been identified as a critical factor in forecasting the number of heat wave days in South Korea.

The concept of teleconnection—where the variability of terrestrial and oceanic conditions interacts with the atmosphere to influence weather patterns in distant regions—was foundational to this research. The team identified specific areas that significantly affect heat waves and integrated these findings into their prediction model.

Their research demonstrated that an increase in snow depth in the Tianshan Mountains during winter, coupled with a decrease in snow depth in the Gobi Desert during spring, are key variables in predicting summer heat waves. The analysis confirmed a correlation between heightened variability in snow depth in these regions and rising summer temperatures in Korea.



Atmospheric patterns induced by variability in the two snow depths and their relation to heat waves in South Korea. Credit: *npj Climate and Atmospheric Science* (2024). DOI: 10.1038/s41612-024-00722-1

Remarkably, the snow depth in the Tianshan Mountains played a significant role in predicting the heat wave experienced in 2023. The complexity of interactions among various climate factors, such as soil

moisture and sea surface temperature, is expected to evolve further in 2024.

Researcher Yeonsu Lee commented, "We have established a link between snow depth and heat waves in the Mongolian desert and the Tianshan Mountains. This structure aligns with existing large-scale teleconnection patterns and is likely to be crucial for improving heat wave predictions."

Professor Im noted, "By monitoring the relationship between previously unexamined teleconnection factors and heat waves, we can enhance prediction accuracy. This study will significantly contribute to our understanding and response to heat waves in Korea."

More information: Yeonsu Lee et al, Unveiling teleconnection drivers for heatwave prediction in South Korea using explainable artificial intelligence, *npj Climate and Atmospheric Science* (2024). DOI: 10.1038/s41612-024-00722-1

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