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Chemical Analyses of Fossil Wood Indicate a Lower Seasonal Temperature in the Arctic 12 to 5 Million Years Ago Compared to the Present-Day

Bárbara Almeida & Brian A. Schubert

School of Geosciences, University of Louisiana at Lafayette, Lafayette, LA 70504

Abstract

The global average temperature has increased 1.1°C since the beginning of the 20th century due to rising CO₂ levels in Earth's atmosphere, with greater rates of warming in northern high latitudes. In the last 50 years, the Arctic has experienced 2.7°C of warming, far outpacing the global average by 2.7 times, with a loss of nearly 50% of its sea ice since 1980. Here we demonstrate a new proxy for seasonal temperature based on chemical analyses of late Miocene-aged fossil wood (12 to 5 million years old), collected from northeastern Siberia. This period of geological time is a good analog for our future climate because temperatures were warmer than today, and the region had little to no sea ice. We estimate that the Siberian Arctic experienced a temperature seasonality 2.9 times lower compared with the modern settings, by calculating the difference between the warmest and coldest months mean temperatures. These data represent the first quantitative estimates of seasonal temperature for northeastern Siberia during the late Miocene, documenting a lower seasonal range in temperature with lengthened growing seasons relative to today.