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The effect of the stratosphere on the Boreal response to Pliocene-era tropical Pacific sea surface temperatures

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Previous work has shown that the stratosphere modulates the Northern Hemisphere response to equatorial Pacific temperature anomalies associated with the El Niño Southern Oscillation. Here, we show that the stratosphere also plays a major role in modulating the response to tropical sea surface temperature anomalies representative of the mean state of the Pliocene era, approximately four million years ago. Changes in the occurrences of so-called sudden stratospheric warmings during Boreal winter and spring force a significant anomalous surface pressure response over the North Atlantic Ocean. The anomalous circulation pattern results in relatively cold winter-spring Eurasian surface temperatures and relatively warm surface temperatures in Greenland and North America. The implications of these results for simulating and understanding the climate of the Pliocene era 4 Myr ago are discussed.