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Day-to-day temperature variability reduces economic growth

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Elevated annual average temperature has been found to impact macro-economic growth. However, various fundamental elements of the economy are affected by deviations of daily temperature from seasonal expectations which are not well reflected in annual averages. Here we show that increases in seasonally adjusted day-to-day temperature variability reduce macro-economic growth independent of and in addition to changes in annual average temperature. Combining observed day-to-day temperature variability with subnational economic data for 1,537 regions worldwide over 40 years in fixed-effects panel models, we find that an extra degree of variability results in a five percentage-point reduction in regional growth rates on average. The impact of day-to-day variability is modulated by seasonal temperature difference and income, resulting in highest vulnerability in low-latitude, low-income regions (12 percentage-point reduction). These findings illuminate a new, global-impact channel in the climate–economy relationship that demands a more comprehensive assessment in both climate and integrated assessment models.