

Siberia's hot 2020 "effectively impossible" without global warming

Enlarge / Average temperatures from March 19 to June 20.

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Generally speaking, 2020 has been a hell of a year. But in Siberia, there is an additional reason to make comparisons to the inferno: record-breaking warmth and its consequences. Wildfires have burned about 8,000 square miles, aided by a bumper crop of silk moths consuming the needles off conifers. And slumping permafrost also contributed to a massive diesel spill when a tank on unstable ground burst.

The immediate cause of this extreme year was last winter's jet stream pattern, which kept Siberia mild from later winter into spring, melting ice and snow early and boosting the warmth further. Then in June, a stubborn high pressure set up, as a northward wiggle of the jet stream brought warmer air from the south into Siberia. It was during this heatwave that the Russian town of Verkhoyansk apparently hit 38°C (100°F)—a first for any station above the Arctic Circle.

As with many extreme weather events in recent years, a team of scientists has completed a rapid analysis of the role of climate change in all this. The scientists analyzed both that record high temperature and the warm January-to-June across

the region, concluding “in both cases that this event would have effectively been impossible without human-induced climate change.”

These researchers, organized under the World Weather Attribution project, have standardized their approach to these analyses. That allows them to work incredibly quickly—sometimes publishing in as little as a week after an event—and also lends some confidence to their results, which are also submitted to scientific journals for the slow process of peer review.

The question with any weather event is not really “Did climate change cause this?” but rather how likely it is that climate change contributed to its severity. Answering this typically involves examining the weather records in that area to look for trends and running climate-model simulations with and without human activities.

The first thing the team analyzed was the six-month period for the whole Siberian region, which ran a little over 5°C above the 1981-2010 average. Based on the warming trend there, the scientists found that this warm stretch is still unusual—probably rarer than a once-in-a-century kind of event. But it is far more likely now than it would have been in 1900. Simulations taken from dozens of models agreed, albeit with a wide range of exact estimates. The team conservatively focuses on the low end of the range of all these estimates, concluding that the event is at least 600 times more likely in 2020 than it would have been in the climate of 1900. That may sound dramatic, but remember it’s the low end. The average estimate was actually *a factor of 99,000 increase in the probability*.

Put another way, a similarly rare event in the climate of 1900 would have been about 2.5 to 3.5°C (4.5-6°F) cooler—reaching only about 2°C over the 1981-2010 average.

The story for the record temperature in Verkhoyansk on June 20

(which has been verified by the Russian Meteorological Service but not yet by the World Meteorological Organization) is similar. Verkhoyansk has had a weather station since 1869, but since there are gaps in the data before 1926, the analysis starts there.

Because this is a single station, the limited number of datapoints cause the error bars on estimates to balloon. Considering the warmest June temperatures in climate-model simulations, the increase in the probability of this June's temperatures basically stretches to include infinity. The researchers again revert to the lowest estimates, stating that global warming has made this event "upwards of many thousands of times" more likely.

Compared to analyses of other heatwaves, that's strikingly high. Last year's European heatwave, for example, looked to be about 100 times more likely in the current climate.

To see what these events might look like with a few more decades of high greenhouse gas emissions, the researchers also extended the climate model calculations into the future. As you might expect, the already-eye-popping numbers get even more extreme by 2050. The January-through-June warmth Siberia just experienced grows to something like 160 million times more likely than it would have been in 1900. And an event with 2020's rarity would tack on another 2°C—clearing 7°C above the 1981-2010 average.

Simply put, these record-breaking temperatures were unambiguously boosted by human-caused global warming. That fits with the knowledge that heatwaves are among the weather extremes that are most clearly increasing due to climate change.

In a press release, team member Friederike Otto said:

This study shows again just how much of a game changer climate change is with respect to heatwaves. Given that

heatwaves are by far the deadliest extreme weather events in most parts of the world they must be taken very seriously. As emissions continue to rise we need to think about building resilience to extreme heat all over the world, even in Arctic communities—which would have seemed nonsensical not very long ago.

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