

Wind farms lift the temperature in their region

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A wind farm in South Australia

Wind turbines can modify the local climate by warming the atmosphere, according to a study that revealed an increase in temperature of 0.72 degrees over a region of Texas where four large wind farms have been built.

While converting the [kinetic energy](#) of wind into electricity, [wind turbines](#) modify exchanges between the ground and atmosphere, and affect the transfer of energy, momentum, mass and moisture within the air, the authors of the study said.

They analysed [satellite data](#) from 2003 to 2011 over a region in west-central Texas where four of the world's largest [wind farms](#) are home to

more than 2,350 turbines.

Most were built between 2005 and 2008, allowing the researchers to assess the difference between a scenario with the smallest impact on the local [climate](#) and a scenario with the greatest.

Their findings are published today in the journal *Nature* [Climate Change](#)

“Our results show a significant warming trend of up to 0.72 degree per decade, particularly at night-time, over wind farms relative to nearby non-wind-farm regions,” wrote lead author Liming Zhou, a Research Associate Professor from the Department of Atmospheric and Environmental Sciences at University at Albany. “We attribute this warming primarily to wind farms as its spatial pattern and magnitude couples very well with the geographic distribution of wind turbines.”

The temperature at night-time in summer increased by 0.46 degree over the same period.

Although the increase in temperatures could be attributed in some part to heat generated by the turbine footprint – the turbine blades, towers, access roads and so on – the footprint took up only a small percentage of the land area of wind farms, the researchers said.

Instead, it was likely that variations in wind speed, as well as fluctuations stirred up by turbines in the low part of the atmosphere, were largely responsible for the change. “The stronger wind speeds in [winter] than [summer] and at night-time than daytime ... probably drive wind turbines to generate more electricity and turbulence and consequently result in the strongest warming effect at night-time in [winter].”

Professor Steven Sherwood, co-director of the Climate Change Research

Centre at the University of New South Wales, said the findings “show that night-time temperatures went up by about 0.5 degree in the summer where the wind farm is. Daytime temperatures do not appear to be affected.

“This makes sense, since at night the ground becomes much cooler than the air just a few hundred meters above the surface, and the wind farms generate gentle turbulence near the ground that causes these to mix together, thus the ground doesn’t get quite as cool. This same strategy is commonly used by fruit growers, who fly helicopters over the orchards rather than windmills, to combat early morning frosts.”

More information: [DOI: 10.1038/nclimate1505](https://doi.org/10.1038/nclimate1505)

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