

# Do forests lead to more or fewer clouds? It depends

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Large-scale deforestation, forest restoration, forest fires, and droughts all have one thing in common: Most research on these topics focuses on forest ecosystems' impact on carbon storage and release. Other effects of

forests are less often explored, such as their effect on water cycles, climate, and daily weather. A recent study shows that local forest areas affect cloud formation differently in temperate and tropical regions.

It is often thought that forests evaporate more water than grasslands or agricultural land and that this higher [evaporation](#) leads to increased cloud formation. In the new global study, it was found that there may indeed be more clouds over forests in some regions, while the opposite is true in other regions and forests seem to create fewer clouds. And contrary to expectations, mechanisms other than evaporation were found to be a better explanation for cloud formation.

Up to two decades ago, effects like those of forests on cloud formation were difficult to investigate on a global scale. There were no satellite data available yet at a sufficiently high spatial resolution to capture individual plots of [forest](#). Moreover, long time series are needed for such research because cloud cover also has an element of randomness. The new study, published in *Nature Communications* this week, is the first to quantify the effect of local forest areas on cloud formation around the world.

## **Driving forces in cloud formation**

After analyzing 17 years' worth of high-resolution data from two different satellites, the authors found that forests generally lead to more clouds in temperate and boreal regions, but not so much in tropical regions, including the Amazon.

"This was surprising," says Ryan Teuling, associate professor at Wageningen University & Research, who contributed to the study, "because it conflicts with the persistent idea that tropical forests create their own clouds and even [rainfall](#)."

While this might happen at larger (sub) continental scales, the study found that at smaller regional scales, the amount of energy that is not used for evaporation but for heating up the atmosphere becomes the driving force behind the formation of clouds.

This heating is often more significant over forests in temperate regions, including most of Europe. It provides the mechanism for the air to rise and form clouds. On the other hand, in the tropics, the warming is more significant over deforested land, and most clouds will be found there rather than over the forest.

## Understanding the role of forests in the climate system

The results highlight that the role of forests in the [climate system](#) is still poorly understood and likely more complex than currently believed. Teuling notes, "Studies on impacts of deforestation or forest restoration on climate should take into account the impact on local [clouds](#), because they can reflect a significant amount of sunlight away from Earth, thus creating a cooling effect."

**More information:** Ru Xu et al, Contrasting impacts of forests on cloud cover based on satellite observations, *Nature Communications* (2022). [DOI: 10.1038/s41467-022-28161-7](https://doi.org/10.1038/s41467-022-28161-7)

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