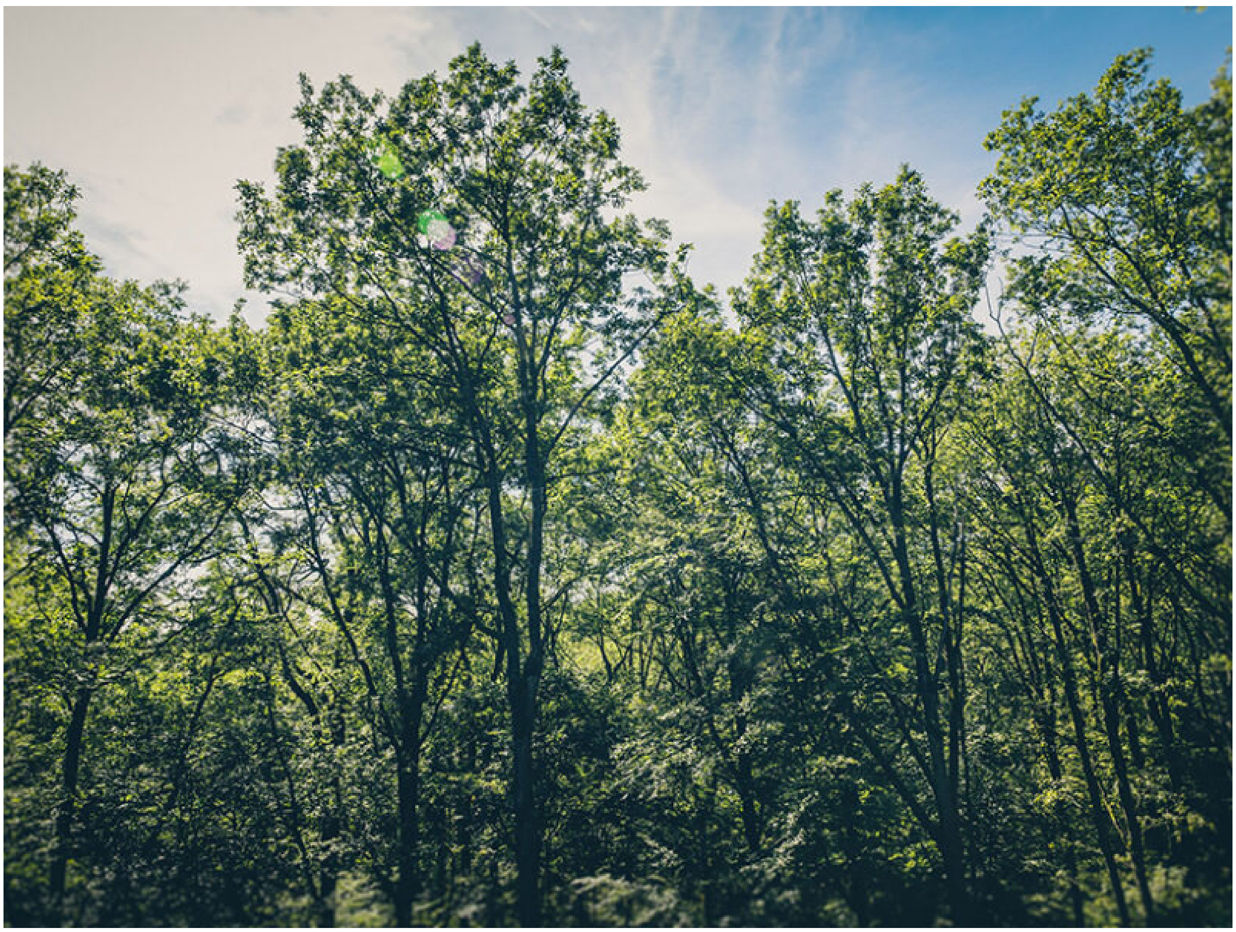
# Examining the intricacies of ozone removal by deciduous forests

August 10 2021, by Aaron Sidder



Deciduous forests are important sinks of ozone in the part of the atmosphere closest to Earth, where the molecule is an air pollutant injurious to humans and plants, as well as a greenhouse gas. Credit: Freerange Stock

Ozone plays a vital role in Earth's climate system. In the stratosphere, which begins about six miles (9.7 kilometers) off the ground, ozone protects the planet from harmful ultraviolet radiation. Lower in the atmosphere, however, the molecule is an air pollutant injurious to both humans and plants, as well as a greenhouse gas.

Ozone interacts with forests through a process known as dry deposition, often with harmful consequences. In this process, turbulence in the atmospheric boundary layer brings ozone to the surface where reactions on and inside leaves and soil remove ozone from the air. Ozone injury to plants results from ozone reactions inside leaves and can alter carbon and water cycling.

The mechanics of dry deposition are not completely understood, however. While we know that turbulent eddies in the atmosphere transport ozone to surfaces onto which the gas can be deposited, one remaining question is whether the organized nature of these eddies, known as organized turbulence, influences dry deposition. Uncertainty related to the mechanics of dry deposition makes it harder to understand ozone in the lower atmosphere and ozone's impacts on both plants and humans.

In a new study, Clifton and Patton use high-resolution computer simulations to examine the relationship between turbulent eddies and leaf ozone uptake. The authors hypothesized that organized turbulence generates local fluctuations in temperature, wind, and humidity that together with local changes in ozone might result in different rates of ozone uptake by leaves. They call this variation in leaf uptake "segregation of dry deposition." By taking segregation of dry deposition into account, scientists can better predict ozone dry deposition, the authors say.

The results showed that organized turbulence did not create more efficient areas of ozone uptake in the forest canopy. In other words, higher concentrations of ozone in some air motions together with higher leaf uptake in the same air motions did not result in more ozone uptake by the canopy. Therefore, the findings are a null result and indicate that segregation of dry deposition is likely an unimportant factor in a forest's ozone budget. Null results are less likely to be published but play an essential role in figuring out important natural processes.

**More information:** Olivia E. Clifton et al, Does Organization in Turbulence Influence Ozone Removal by Deciduous Forests? *Journal of Geophysical Research: Biogeosciences* (2021). DOI: 10.1029/2021JG006362

*This story is republished courtesy of Eos, hosted by the American Geophysical Union. Read the original story here.*

Provided by American Geophysical Union

Citation: Examining the intricacies of ozone removal by deciduous forests (2021, August 10) retrieved 15 May 2024 from https://phys.org/news/2021-08-intricacies-ozone-deciduous-forests.html