

Observations Reveal Local Deforestation-driven Cooling in Mid- to High Latitudes

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Objective

- Quantify the effect on surface temperature from spatial patterns of land use in the present climate
- Provide process understanding of how ongoing land-use activities such as land management for climate mitigation may feedback to climate change

New Science

- Surface air temperatures were found to be lower in open land than in nearby forested land. The effect is 0.85 ± 0.44 K (mean \pm one standard deviation) north of 45° N and 0.21 ± 0.53 K to the south. Below 35° N there is only weak evidence that deforestation leads to warming.
- Night-time temperature changes are an important contributor to the overall cooling effect.
- Results are based on comparisons of temperature at forested eddy covariance towers in the USA and Canada and nearby surface weather stations (as a proxy for small areas of cleared land).

Significance

- The observed latitudinal dependence is consistent with theoretical expectation of changes in energy loss from convection and radiation across latitudes in both the daytime and night-time phase of the diurnal cycle
- Climate mitigation options imposing land use changes need to consider potential albedo feedbacks

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