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Impacts of Tropical Deforestation on Local Climate

Callum Smith, Dominick Spracklen, and Jessica Baker
University of Leeds, ICAS, Earth and Environment, United Kingdom of Great Britain and Northern Ireland
(ee13c2s@leeds.ac.uk)

Tropical forests play a critical role in maintaining the balance of biophysical surface fluxes and strongly influence the local and regional climate. Tropical deforestation is therefore increasingly recognised as an issue of global importance as the environmental and climatic consequences of prolific land-cover changes are beginning to be better understood. Using remotely sensed atmospheric and land-surface datasets from 2000 to 2016, climate impacts of deforestation were analysed over three tropical forest domains; the Amazon basin, the Congo basin and South-East Asia (SEA). Trends in local climate responses were observed with increasing deforestation across all tropical regions. Climate analysis was conducted on co-located pixels to ensure geographical differences were accounted for. Land that was deforested over the analysis period showed a decrease in evapotranspiration (ET) and leaf area index (LAI) and a significant increase in daytime land surface temperature (T). Whilst the Amazon saw the greatest relative decrease in LAI (0.2 m^2/m^2), SEA showed the largest decrease in ET (1.5 mm/month) over the period. The climate response in Africa to deforestation is muted, with T increases of only 0.1□C compared with 0.18□C and 0.4□C for SEA and the Amazon respectively. In all regions the response of precipitation was not significant. Increasing temperatures will heighten ecosystem stress for the remaining vegetation and forest adjacent to regions of deforestation will be more susceptible further degradation. The results of this study highlight the differences in climate responses between the tropical regions and the need to consider each separately when conducting future analysis.