Does Amazonian deforestation cause global effects on temperature and precipitation?

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Some studies find global effects from Amazonian deforestation whereas others do not. The differences between the different studies are many, ranging from different resolution, quality of the control climate, land-atmosphere coupling to the statistical testing. The local effects are quite clear, generally deforestation leads to decreases in precipitation and increasing temperatures. The remaining question is whether some of these effects spread over to other regions of the globe.

We investigate the following questions using the Australian Community Climate Earth System Simulator (ACCESS) with prescribed sea surface temperatures: (1) Which statistical method(s) should be used to investigate global effects from local deforestation? (2) Does Amazonian deforestation cause statistically significant global effects in temperature and precipitation in ACCESS? (3) If yes, how large does the perturbation need to be to trigger global scale effects?

Our results show that a modified t-test, taking into account the autocorrelation in the time series, in addition with a test for field significance, taking into account the spatial correlation in the fields, can be a computationally efficient statistical method. In ACCESS, deforestation in Amazonia does not lead to statistically significant global effects, even if the perturbed area covers all of Amazonia. However, if we use simple statistical methods, significant teleconnections appear to emerge from the simulations but these are expressions of internal model variability. Further research will show if these results change if a slab-ocean is used instead of prescribed sea surface temperatures.