

MODELLING THE IMPACT OF SOUTHEAST ASIAN DEFORESTATION ON CLIMATE AND THE ATMOSPHERIC CIRCULATION

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ABSTRACT

The impact of tropical deforestation in Southeast Asia, referred to as single-region deforestation, has been simulated using the Unified Model, a general circulation model developed by the United Kingdom Meteorological Office. Using a 10-case ensemble approach, the model was run under 60-day integrations for the control and deforestation experiments to study effects on the January and July atmosphere, representing the winter and summer monsoon, respectively. In the deforestation experiments, tropical moist forest throughout the Southeast Asia was replaced by scrub grassland. The results for January and July were compared to previous modelling conclusions based on deforestation throughout the tropics.

Appreciable effects on local temperature and precipitation result from the change in radiative and other characteristics associated with the loss of forest cover and replacement with grassland. As far as the atmospheric circulation is concerned, the monsoonal flow in both months is disturbed, as are the local Walker and Hadley circulations. It is found that it is the circulation change that exerts the greatest effect on moisture availability over the deforested region. Notable differences occur between the results of this experiment based on single region deforestation and previous simulations based on multi-region deforestation. In both cases, for example, the monsoonal flow is perturbed but the nature of the disruption differs. While the previous simulations indicated weakening of both the winter and summer monsoons, the current results show the opposite.

The impact of Southeast Asian deforestation differs from that in other tropical regions, particularly the Amazon, in two important respects. First, induced changes in local hydrological processes are not as important as elsewhere because of the dominant convergent flow and the nearby oceanic moisture sources. Second, a related point, the effect of deforestation occurs through the medium of the large-scale monsoon circulation of the region which acts to export the effects over a wider area.