



Deforestation changes the surface climate of insular SE Asia

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Increasing observational and modelling evidence has shown the indubitable climate impacts of deforestation, which occur through the release of carbon stored as biomass and/or by altering the land surface water and energy balances. While this problem has been reasonably well addressed in North/South America, Australia and Europe, Southeast Asia (SE Asia) has been much less studied despite showing high deforestation rates during recent decades. In SE Asia, less than half of the original forest cover currently remains. In recent decades, the region has experienced one of the highest deforestation rates in the world, particularly in Indonesia, Myanmar and Cambodia. For the period 1990–2010, insular SE Asia had one of the highest global rates of deforestation at around 1% per year. Deforestation rate increased since year 1990 with annual change rates of 1.75 Mha (0.67 %) and 1.45 Mha (0.59%) for periods 1990-2000 and 2000-2010, respectively. The timber industry is one of the main immediate drivers of deforestation in SE Asia, where logging is often followed by conversion to palm oil plantations. Of these, 45% came from areas that were forests in 1989. In Indonesia only, containing ~44% of the region's forest cover, contributed almost 80% of deforestation in SE Asia in the 1990s and 2000s. Oil palm plantations occupies ~12.4 Mha of land, mainly in Indonesia and Malaysia. Currently, ~35% of Indonesian forests (~27 Mha) are within industrial concessions and, without abrupt measures to avoid forest loss, deforestation is expected to increase in the near future.

In this study, using realistic land cover maps that include palm oil plantations, we investigate how recent deforestation has affected the surface climate of SE Asia. We present results of two sets of simulations of a four model ensemble each for period 1981-2016 (36 years) at ~20 km horizontal resolution. We explore the changes on key atmospheric and hydrological variables and discuss the results in relation to the current and future role of forests on the surface climate of insular SE Asia.