



## Wildfire effects on tropical peatlands

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The status of the world's peatlands is a matter of considerable concern since their degradation can lead to carbon emissions to the atmosphere and loss of carbon sink function. Tropical peatlands, located mostly in SE Asia, make a significant contribution to global terrestrial carbon storage, both in terms of their above-ground biomass (peat swamp forest) and thick deposits of peat; they are estimated to contain up to 70 Gt (3%) of the global soil carbon store. The carbon sink role of tropical peatland is, however, being impacted by rapid land-use changes that increase their susceptibility to degradation and fire. Recent estimates of carbon emissions arising from drainage and oxidation of tropical peatlands are within the range 100–240 Mt C yr<sup>-1</sup>. Over the past decade widespread fires have also had a major impact on the carbon balance. Page et al. (2002) calculated 810–2570 Mt C were released into the atmosphere as a result of the ENSO-related 1997/98 fires on Indonesian peatlands; significant emissions also occurred during the 2002 and 2006 fire events. In order to provide accurate spatial and temporal values for these emissions it is necessary to study the impact of peatland fires at a landscape scale and to acquire detailed information on fire history (location and return period), fire severity and the dynamics of post-fire vegetation succession and fire susceptibility. To facilitate this, we have employed a multi-temporal remote sensing approach for a study area of 450,000 ha of peatland in Central Kalimantan (Indonesian Borneo) in order to investigate the impacts of deforestation and drainage on peatland fires and vegetation dynamics. This paper will present results on the mapping and validation of burnt area, fire frequency and fire severity using a time series of satellite observations, and will discuss how these data are being used to model post-fire vegetation dynamics, to assess fire risk and the scale of fire-related carbon emissions. Our results show that once disturbed, peat swamp forest, in common with

other tropical forests, becomes more susceptible to degradation and fire as a result of the modification and fragmentation of the naturally closed structure of the forest, with repeated fires producing a heavily modified secondary ecosystem dominated by ferns, grasses and sedges, in which both fire risk and fire return period increase and, hence, a return to pre-fire vegetation becomes almost impossible. Over a 16 year period we show that more than 93% of the study area has been burnt on at least one occasion, and that fires are now a regular feature of every dry season, not just those of ENSO-years. By scaling up the emissions data for the study area, we are able to demonstrate that fires, alongside drainage and degradation, are resulting in globally significant carbon emissions from SE Asian peatlands and a rapid loss of their carbon sink function.