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熱帯泥炭林の蒸発散
Evapotranspiration of tropical peat ecosystems

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In Southeast Asia, mainly in Indonesia and Malaysia, peatland is widely distributed, coexisting with swamp forest, over an area of 2.48×10^5 km^2 and accumulates 11-14% of global peat carbon (Page *et al*., 2011). The peatland, however, has been rapidly degraded by deforestation and drainage. As a result, the proportion of forest cover in the peatlands of Peninsular Malaysia, Sumatra and Borneo fell from 77% to 36% from 1990 to 2010 (Miettinen *et al*., 2012). Such human pressures made the huge peat carbon pool vulnerable and raised the risk for the pool to be a large carbon source to the atmosphere chiefly because of peat fires and lowered groundwater level (GWL). The carbon balance of peatland is chiefly controlled by local hydrology, which determines saturation or unsaturation of surface peat. Under unsaturation conditions, peat is aerated, and its soil organic compounds are easily oxidized into carbon dioxide (CO_2). Therefore, drainage to lower GWL necessarily enhances oxidative peat decomposition and its resultant CO_2 emissions. Because tropical peatland is typically ombrotrophic, GWL varies according to residuals (storage change) between precipitation as input and evapotranspiration (ET) and runoff as output. Although precipitation can be also affected by large-scale deforestation, ET and runoff are directly affected by deforestation and drainage, respectively. To predict GWL under human pressures and assess the carbon balance of tropical peatland, therefore, it is crucial to quantify ET and elucidate the effects of disturbances on ET.

We have measured fluxes of sensible heat and latent heat using the eddy covariance technique and determined ET and energy balance at three sites within 15 km on tropical peatlands near Palangkaraya, Central Kalimantan, Indonesia (Hirano *et al*., 2012). The sites are different in disturbance degree: a relatively intact peat swamp forest with little drainage (UF), a heavily drained swamp forest (DF) and a drained burnt swamp forest (DB). Here we show the results of field measurement for four to six years between 2002 and 2009, including El Nino and La Nina events and discuss the effects of disturbances on the energy balance and ET of tropical peat swamp forest.

Because of energy imbalance (84 to 91% on an annual basis), ET was adjusted to close energy balance on a daily basis. Mean annual ET (±1 standard deviation) for the four years from 2004 to 2008 was 1636 ± 53, 1553 ± 117 and 1374 ± 75 mm y^{-1}, respectively, for the UF, DF and DB sites, which account for 67, 64 and 56% of mean annual precipitation of 2435 mm y^{-1}, respectively. Annual ET of the DB site was significantly smaller than those of the other sites, mainly owing to less transpiration due to few trees. This fact indicates that more water is lost by surface and groundwater runoff in the DB site. In addition, annual ET showed a positive linear relationship with annually mean GWL at each site. This significant linearity suggests that annually mean GWL is a robust indicator to assess the annual balances of carbon and water in tropical peat ecosystems (Hirano *et al*., 2012).

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