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Post-fire fluxes and sources of carbon in tropical peatlands, Brunei

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Tropical peatlands hold about 15–19% of the global organic carbon (C) pool of which 77% in Southeast Asia. Nonetheless, Southeast Asian peatlands have been exploited for timber and land for agriculture leading to frequent fires in the region. Direct C-emissions through peat combustion must be quantified to examine the impact of peat fires on global and regional C-budgets, however, it is also essential to evaluate oxidative decomposition of peat after fires for a complete understanding of ecosystem-scale fire impact. After a fire, ecosystems act as a C-source for months-to-years as C emissions to the atmosphere exceed photosynthesis.

Within this context, we are quantifying the magnitudes and patterns of ecosystem-atmosphere emissions of Reco and CH4 through cavity-ring spectroscopy along with dissolved organic carbon in an intact and in a degraded peat-swamp forest in Brunei, which was affected by 7 fires over the last 40 years. We are using natural tracers such as δ13C and 14C to investigate the age and sources (auto- and heterotrophic) of C contributing to Reco and CH4 while we are continuously monitoring soil temperature, water table level, and water quality parameters.

Preliminary data show overall higher Reco (138$\pm$12 mg C m-2 hr-1) and CH4 (3.5$\pm$1.2 mg C m-2 hr-1) in burnt areas compared to the intact peat-swamp forest (Reco 110$\pm$15 mg C m-2 hr-1; CH4 1.7$\pm$1.4 mg C m-2 hr-1) with differences between dry and wet season due to changes in water table level. 14C-CO_2 and 14C-CH4 showed an overall modern signature with no significant differences.

Once completed, our data set will provide useful information on our understanding of burnt peatlands carbon dynamics.