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Contribution of aboveground plant respiration to carbon cycling in a Bornean tropical rainforet

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Bornean tropical rainforests have a different characteristic from Amazonian tropical rainforests, that is, larger aboveground biomass caused by higher stand density of large trees. Larger biomass may cause different carbon cycling and allocation pattern. However, there are fewer studies on carbon allocation and each component in Bornean tropical rainforests, especially for aboveground plant respiration, compared to Amazonian forests. In this study, we measured woody tissue respiration and leaf respiration, and estimated those in ecosystem scale in a Bornean tropical rainforest. Then, we examined carbon allocation using the data of soil respiration and aboveground net primary production obtained from our previous studies. Woody tissue respiration rate was positively correlated with diameter at breast height (dbh) and stem growth rate. Using the relationships and biomass data, we estimated woody tissue respiration in ecosystem scale though methods of scaling resulted in different estimates values (4.52 – 9.33 MgC ha^{-1} yr^{-1}). Woody tissue respiration based on surface area (8.88 MgC ha^{-1} yr^{-1}) was larger than those in Amazon because of large aboveground biomass (563.0 Mg ha^{-1}). Leaf respiration rate was positively correlated with height. Using the relationship and leaf area density data at each 5-m height, leaf respiration in ecosystem scale was estimated (9.46 MgC ha^{-1} yr^{-1}), which was similar to those in Amazon because of comparable LAI (5.8 m^2 m^{-2}). Gross primary production estimated from biometric measurements (44.81 MgC ha^{-1} yr^{-1}) was much higher than those in Amazon, and more carbon was allocated to woody tissue respiration and total belowground carbon flux. Large tree with dbh $>$ 60cm accounted for about half of aboveground biomass and aboveground biomass increment. Soil respiration was also related to position of large trees, resulting in high soil respiration rate in this study site. Photosynthesis ability of top canopy for large trees was high and leaves for the large trees accounted for 30% of total, which can lead high GPP. These results suggest that large trees play considerable role in carbon cycling and make a distinctive carbon allocation in the Bornean tropical rainforest.