

**Topic:** Temporal variations of soil respiration in a dry dipterocarp forest

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### ABSTRACT

Tropical forests in Southeast Asia are one of the world's most important ecosystems but our understanding of their roles in the global carbon cycle and their response to global warming is not well understood. In this study, soil respiration in a dry dipterocarp forest in Western Thailand was measured over a four-year period (2008-2011). Hourly measurements of soil respiration from trenched and untrenched plots allowed us to investigate temporal variations of soil respiration ( $R_s$ ) and its components at multiple time scales. At diurnal, seasonal and inter-annual time scales, root respiration ( $R_b$ ), rather than microbial respiration ( $R_m$ ) was the main contributor to overall variability in soil respiration. Soil temperature alone was the main driver of diurnal variation while the combination of soil moisture and soil temperature determined the seasonal and inter-annual variations. Soil respiration was also related with fine root (<2 mm) and microbial biomass at seasonal time scales. The annual total soil respiration rates for these years were 3.20, 3.89, 3.52, 4.14  $\text{kgCO}_2 \text{ m}^{-2} \text{ yr}^{-1}$ , respectively. The four year average ratios of  $R_b$  to  $R_s$ , and  $R_m$  to  $R_s$  were  $34 \pm 6\%$  and  $66 \pm 4\%$ , respectively. The ratios varied in response to the changes between the wet and the dry seasons. The results suggest that in this dry dipterocarp forest, although there are high variations at different time scales, these variations are not results significantly different in the annual respiration rates. Instead, the annual emissions likely depend on the ratio between  $R_m$  and  $R_b$  and in this forest ecosystem,  $R_m$  is always quantitatively higher than  $R_b$ .

**Keywords:** Soil respiration, Root respiration, Microbial respiration, Microbial biomass, Root biomass, Dry dipterocarp forest