Geophysical Research Abstracts
Vol. 18, EGU2016-4520, 2016
EGU General Assembly 2016

Characteristic of root decomposition in a tropical rainforest in Sarawak, Malaysi

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Woody roots play a significant role in forest carbon cycling, as up to 60 percent of tree photosynthetic production can be allocated to belowground. Root decay is one of the main processes of soil C dynamics and potentially relates to soil C sequestration. However, much less attention has been paid for root litter decomposition compared to the studies of leaf litter because roots are hidden from view. Previous studies have revealed that physico-chemical quality of roots, climate, and soil organisms affect root decomposition significantly. However, patterns and mechanisms of root decomposition are still poorly understood because of the high variability of root properties, field environment and potential decomposers. For example, root size would be a factor controlling decomposition rates, but general understanding of the difference between coarse and fine root decompositions is still lacking. Also, it is known that root decomposition is performed by soil animals, fungi and bacteria, but their relative importance is poorly understood. In this study, therefore, we aimed to characterize the root decomposition in a tropical rainforest in Sarawak, Malaysia, and clarify the impact of soil living organisms and root sizes on root litter decomposition. We buried soil cores with fine and coarse root litter bags in soil in Lambir Hills National Park. Three different types of soil cores that are covered by 1.5 cm plastic mesh, root-impermeable sheet (50um) and fungi-impermeable sheet (1um) were prepared. The soil cores were buried in February 2013 and collected 4 times, 134 days, 226 days, 786 days and 1151 days after the installation. We found that nearly 80 percent of the coarse root litter was decomposed after two years, whereas only 60 percent of the fine root litter was decomposed. Our results also showed significantly different ratio of decomposition between different cores, suggesting the different contribution of soil living organisms to decomposition process.