Comparison of Fine Root Production among Several Types of Tropical Mangrove Stands in the Federated States of Micronesia using the Continuous Inflow Estimation Method

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The dynamics of blue carbon (BC), that is sequestered and stored in the ocean ecosystems (IPCC 2009), has gained considerable attention due to recent alarming concern about global warming. The BC stocks are substantial in the ocean ecosystems and they play an important role in global climate change mitigation (Alongi 2018). Mangrove forests are major components of coastal ecosystems in the tropical and subtropical zones. They are highly productive ecosystems with mean sequestration rates of organic carbons in the earth as well as salt marsh and seagrass ecosystems (Alongi 2020). Donate et al. (2011) described mangrove ecosystems as “among the most carbon(C)-rich forests in the tropics.”
Previous studies suggest that the high ability of C accumulation and sequestration in submerged soils of mangrove ecosystems are ensured by the high productivity of biomasses above and below the ground, especially that of root production. However, our understanding about the contribution of fine root production in mangrove ecosystems due to C sequestration and its fluxes is that blue carbons are limited by difficulties and uncertainties associated with fine root dynamics, such as their stocks, fluxes, and longevity in the invisible belowground root systems (Majdi and Kangas 1997).
On the other hand, recent reports proposed new approaches for estimating fine root dynamics in terrestrial forest ecosystems (Osawa and Aizawa 2012, Do et al. 2016). These approaches include continuous inflow estimate methods, which can provide more accurate and comprehensive evaluations of the fine root dynamics estimated by a simple mass balance model with compartments (i.e., stocks of living and dead masses) and flow (production, mortality, and decomposition) of organic materials originating from fine roots.
In this study, we tried to clarify the contribution of fine root dynamics including the processes of production, mortality, and decomposition to net primary production in mangrove ecosystems and carbon sequestration in BC ecosystems. To achieve this purpose, we performed continuous inflow estimates of fine root dynamics at several types of mangrove stands in Pohnpei Is., Federated States of Micronesia (FSM), by using a simple mass balance model with a combination of an ingrowth core method and litterbag experiment according to a study by Osawa and Aizawa (2012). In this presentation, we will report our findings related to these topics.

Keywords: Mangrove, Sea level rise, Fine root production, Blue carbon

