

E-3 Clarification of the Environmental Formation Mechanism of the Tropical Forest (Final Report)

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1 Micro meteorology and exchange processes of energy, water and carbon dioxide between a tropical rain forest and the atmosphere were monitored in Pasoh Forest Reserve in Peninsular Malaysia. The meteorological monitoring gave essential information on vertical distributions of air temperature, vapor pressure and wind velocity within and above the forest canopy, and seasonal variation in albedo and effects of solar elevation on it. Sensible and latent heat fluxes were estimated through Bowen ratio method. Almost all available energy was distributed to latent heat during wet conditions, but the ratio of latent heat to the available energy decreased in dry conditions. An eddy correlation observation was also conducted to measure the fluxes. Although the statistical structures of the wind component were not suitable for the calculation of the eddy correlation fluxes, the carbon dioxide flux above the forest canopy as well as the sensible and latent heat fluxes was estimated through the method.

2 A hydrological study was carried out to understand runoff processes in forested catchment in tropics. The study covered field investigations for soil physical properties, structures of soil layer on a slope, rainfall characteristics, storm runoff responses, soil-moisture effects on storm runoff generation and evapotranspiration estimation from the water budget. The obtained results showed that soil on a slope was characterized by high permeability and that storm runoff responses depended strongly upon soil moisture conditions. It was suggested that water flow under the ground played an important role in storm runoff processes.

3 To investigate roles of termites in wood decay of tropical rain forests, experiments of in situ termite exclusion were adopted for measuring decaying speed of two kinds of wood material on forest floor of tropical rain forests. Although the hard wood (around 1.0 g/cm³) did not show different decay rate with presence of termite foraging, the soft wood (around 0.5 g/cm³) did show different decay rate (the difference of 8-folds at maximum).

4 Decomposition processes of 8 tree species litter have been studied in the Pasoh forest reserve and the decomposition rates were compared between the 8 tree species. Carbon and nitrogen dynamics during the decomposition of the 8 species were studied and were characterized by the leaching, immobilization and mobilization phases. The critical value of Carbon/nitrogen rates were about 30-40 and were significantly higher in the tropical tree species than in the temperate tree species. This result show that the mineralization of nitrogen occur at a high C/N ratio in the tropical forests.