An examination of water, energy, and carbon cycles in a subtropical evergreen broadleaf forest in Okinawa, Japan

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To examine water, energy, and carbon cycles in a subtropical forest ecosystem, we established a long-term ecosystem-monitoring site in a mature evergreen broadleaf forest in northern Okinawa Island in 2013. Using eddy covariance, chamber-based, and biometric methods, we collected data describing the unique characteristics of this subtropical forest. The total biomass of this forest was small as a mature broadleaf forest in Japan. However, annual evapotranspiration values were comparable to those of tropical rainforests due to the substantial precipitation, a moderate climate even in winter, and unique forest structure. Latent heat flux was also very high; in winter, all available energy was consumed as latent heat flux. Both carbon assimilation and ecosystem respiration were high, and these values were comparable to those of tropical forests. Half of the net primary production became necromass (litterfall and dead trees) due to frequent disturbance by typhoons, and carbon was released rapidly through heterotrophic respiration. Since increases in biomass were offset by necromass decomposition, it was suggested that net ecosystem production in this forest was very small.

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