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Effects of water stresses due to climate change on production and dynamics of tree community in tropical rain forests

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Recently, climate changes caused by the El Nino-Southern Oscillation have been reported to result in the widespread death of trees due to droughts in many parts of the world. Strong reductions in tree growth and litterfall production occurred during the record-hot 1997/98 El Nino. Tropical regions receive strong solar radiation, and tropical vegetation shows a strong feedback effect to carbon sequestration, water circulation, and climate formation. In addition, tropical forests are important ecosystems, and they act as a huge carbon sink because they accumulate 40-50% of land vegetation carbon of the Earth. In a biological community such as a tropical forest that consists of various species, response to changes in the physical environment depends on the operating functional group. A dynamic change in a particular functional group that plays a signi?cant role in the biological community may in?uence the structure and ecosystem functions of the tropical forests. The aim of this study is to predict the impact of drought on matter production and tree community dynamics in tropical rain forests by using a spatially explicit individual-based biogeochemical model developed for predicting vegetation dynamics in response to climate change at the global level, such as global warming (SEIB-DGVM). In the model simulation, applying stochastic rainfall model with the meteorological data, including the 1997/98 El Nino, of the tropical rain forests of Sumatra Island in Malaysia that were measured in 1997-2009, the rainfall experiments were performed by operating some parameters related to daily precipitation and frequency of rainfall events. Based on the experiment results, the turn of production with the amount of tree growth and death, and tree mortality dynamics in the tropical rain forests for 200 years were verified.

Keywords: drought, water stress, El Nino, tropical rain forests, matter production, SEIB-DGVM