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The use of dynamic vegetation model for prediction of carbon emissions due to forest fires: A case study of Borneo Island

Arno Adi Kuntoro (1) and Hendri (2)

(1) Graduate School for International Development and Cooperation, Hiroshima University, Japan (arnoak@hotmail.com/ +81 82 4213642), (2) Graduate School for International Development and Cooperation, Hiroshima University, Japan (hendri888@gmail.com/ +81 82 4213642)

Tropical rainforests play an important role in maintaining the atmosphere-biosphere carbon balance in the global and regional scale due to their ability as carbon sink. Nowadays, rainforests are subjected to serious threats mainly due to human activities, such those occurring in most forests in Indonesia. Indonesia is one of the countries with the largest forest area, but ironically, is also one of the countries with the largest forest loss in the world. Forest degradation in Indonesia is mostly caused by various forms of anthropogenic activities such as uncontrolled logging activities and forest conversion to farmland or industrial plantation, which lead to the increase of fire prone area in formerly forest ecosystem and lead to a higher forest fire intensity especially in extreme interannual climate variability events such as El-Niño. The role of fire in the global/regional carbon cycle has been widely recognized since the last few decades so it is common that fire module is included in many earth system models In this study, a modified Lund Potsdam Jena Dynamic Global Vegetation Model (LPJ-DGVM) in 0.25o x 0.25o degree grid is used to simulate the effect of climate variability and land cover type to forest fire occurrence and in Borneo Island. Simulation of fire intensity and distribution is verified using hotspot data while prediction of total carbon emission is verified using the results of previous studies especially during one of the largest forest fire in Indonesia in 1997-1998 following an extreme El-Niño event. This study suggests that forest fire prediction using process-based model which includes the factors of climatology, land cover and interannual climate variability might be useful for regional future forest management to minimize forest loss due to forest fire, especially in tropical area such as Borneo Island.