Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

ACG30-19 会場:301B 時間:5 月 25 日 16:15-16:30

ミオンボ林における地上部バイオマスと森林火災の関係
Variability in aboveground woody biomass in miombo woodland under fire disturbances

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Miombo woodland is a savanna that spreads extensively over Africa, but it subjects to frequent fires (fire return intervals of 1-3 years) that are probably caused by human activities, such as cultivation, deforestation, and fuel wood collection. These activities result in degradation of miombo woodland. The degradation of large areas of miombo woodland involves the risks of rapid change in the current stable state of ecosystems to an alternative state and of increasing fire frequency and intensity. This study combined a process-based ecosystem model ORCHIDEE-FM with a fire regime model SPITFIRE to quantify the relative importance of fire regime and climate change in regulating aboveground woody biomass in miombo woodland under current and near-future climate conditions. The model was developed based on observations of resprouting and tree topkill rates in individual tree size classes for varying fire intensity. The model demonstrated that fire has a large impact on aboveground woody biomass and vegetation structure in miombo woodland. Aboveground woody biomass in miombo woodland significantly varies with fire regime with fire intensity and fire return interval. A shorter fire return interval and higher fire intensity results in a greater reduction of aboveground woody biomass by reducing the mean tree size. Although fire return interval in miombo woodland depends on human activities, fire intensity depends on the amount of grass fuel and on the season. For the current fire regime in miombo woodland, adaptive fire management is necessary to maintain today's aboveground woody biomass by controlling moderate fire intensity and frequency under current climate conditions. Under near-future climate with elevated CO_2 concentration and warmer climate, miombo woodland is perhaps more tolerant of fire disturbances by increase in the resprouting capacity and growth rate of woody plants.

キーワード: サバナ, ミオンボ, 森林火災, 地上部バイオマス
Keywords: savanna, miombo, fire, aboveground woody biomass