Session: C32 Poster: W124A

Evaluating global land-use change carbon emission in RCP scenarios

Etsushi Kato[†]; Michio Kawamiya
[†] JAMSTEC, Japan
Leading author: ekato@jamstec.go.jp

In CMIP5 experiments, new emissions scenarios for GCMs and Earth System Models (ESMs) have been constructed as Representative Concentration Pathways (RCPs) by a community effort of Integrated Assessment Modeling (IAMs) groups. In RCP scenarios, regional land-use scenarios have been depicted based on the socio-economic models of IAMs, and also downscaled spatially explicit land-use maps from the regional scenarios are prepared. In the land-use harmonization project (Hurtt et al. [1]), integrated gridded land-use transition data has been developed from the past reconstruction based on HYDE 3 agricultural data and FAO wood harvest data, and the future land-use scenarios from IAMs. These gridded land-use dataset is used as a forcing of some ESMs participating to the CMIP5 experiments, to assess the biogeochemical and biophysical effects of land-use and land cover change in the climate change simulation (Taylor et al. [2]). In this study, using the gridded land-use transition scenario data, global net CO2 emission by land-use change for each four RCPs scenarios is evaluated with an offline terrestrial biogeochemical model, VISIT (Vegetation Integrative SImulation Tool), utilizing a protocol to estimate carbon emission from deforested biomass and regrowing absorption from abandoned cropland and pasture which transit into the secondary lands. Using the model output, consistency of standard land-use change CO2 emission scenarios provided by RCPs are evaluated in terms of effect of CO2 fertilization, land-use transition itself, and land-use for the biomass crops aimed for the biomass based CCS in the scenarios. Also, to see the effect land-use change scenario onto the carbon cycle in ESMs experiments, additional simulations without land-use change are conducted with MIROC-ESM (Watanabe et al. [3]). A scenario with decreased agricultural land-use intensity such as RCP 6 shows possibility of further absorption of CO2 by the land-use change through the climate-carbon feedback. References [1] G.C. Hurtt et al., 2009, iLEAPS Newsletter, 7, 6-8. [2] K.E. Taylor et al., 2009, A Summary of the CMIP5 Experiment Design, http://www-pcmdi.llnl.gov/ [3] S. Watanabe et al., 2011, Geosci. Model Dev. Discuss., submitted